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**Technical Report Series**

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**Life Span Study Report 11.  
Part 3. Noncancer Mortality, 1950–85,  
Based on the Revised Doses (DS86)**

Yukiko Shimizu, D.M.Sc.; Hiroo Kato, M.D.;  
William J. Schull, Ph.D.; David G. Hoel, Ph.D.



**Radiation Effects Research Foundation**

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## 業績報告書シリーズ

## 寿命調査 第11報 第3部

改訂被曝線量 (DS86) に基づく癌以外の死因による  
死亡率 (1950-85 年)<sup>§</sup>Life Span Study Report 11. Part 3.  
Noncancer Mortality, 1950-85, Based on the  
Revised Doses (DS86)清水由紀子<sup>1</sup> 加藤寛夫<sup>2</sup> William J. Schull<sup>3</sup> David G. Hoel<sup>4</sup>

## 要 約

寿命調査対象集団における 1950-85 年の死亡調査を行い、改訂被曝線量 (DS86 線量) と癌死亡率の関連については、すでに別に報告した (寿命調査 第11報, 第1部および第2部)。本報告では癌以外の死因による死亡について被曝線量との関連を調べた。

まだ限られた根拠しかないが、高線量域 (2 または 3 Gy 以上) において癌以外の疾患による死亡リスクの過剰があるように思われる。統計学的にみると、二次モデルまたは線形-閾値モデル (推定閾値線量 1.4 Gy [0.6-2.8 Gy]) のほうが、単純な線形または線形-二次モデルよりもよく当てはまる。癌以外の疾患による死亡率のこのような増加は、一般的に 1965 年以降で若年被爆群 (被爆時年齢 40 歳以下) において認められ、若年被爆者の感受性が高いことを示唆している。死因別にみると、循環器および消化器系疾患について、高線量域 (2 Gy 以上) で相対リスクの過剰が認められる。しかし、この相対リスクは癌の場合よりもはるかに小さい。

これらの所見は、死亡診断書に基づいているので信頼性には限界がある。おそらく最も重要な問題は、放射線誘発癌が他の死因に誤って分類される可能性があることである。高線量

<sup>§</sup>本業績報告書は研究計画書 RP 1-75 に基づく。本報告に基づく論文は、Radiation Research 130 : 249-266, 1992 に掲載された。本報告の日本語版は別に発行する。承認 1991 年 6 月 10 日。印刷 1993 年 1 月。

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域で癌以外の死因による死亡が増加していることは明白だが、どれだけこの誤りに起因するのかを明確かつ厳密に推定することは現在のところむずかしい。しかしながら、死因の分類の誤りだけで、この増加を完全には説明できないように思われる。

高線量を被曝した被爆者において癌以外の死因による死亡が増加しているという傾向を確認し、更に、そのような死亡増加が寿命短縮をもたらしているか否かを明らかにするためには、寿命調査対象の部分集団(成人健康調査対象)について2年に1回行う検診で確認される疾患、および寿命調査対象の死亡率に関して追跡調査をさらに行うことが必要であろう。



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**Technical Report Series**

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# **Life Span Study Report 11.**

## **Part 3. Noncancer Mortality, 1950–85, Based on the Revised Doses (DS86)<sup>§</sup>**

**Yukiko Shimizu, D.M.Sc.<sup>1</sup>; Hiroo Kato, M.D.<sup>2</sup>;  
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### **Summary**

Deaths in the RERF Life Span Study (LSS) sample have been determined for the years 1950–85 and previous reports have described analyses of cancer mortality using the revised Dosimetry System 1986 (DS86) doses (LSS Report 11, Parts 1 and 2). In this report, we examine the relationship to dose of deaths from all diseases other than cancer.

Although the evidence is still limited, there seems to be an excess risk for noncancer death at high doses (2 or 3 Gy and over). Statistically, a pure quadratic or a linear-threshold model (the estimated threshold dose is 1.4 Gy [0.6–2.8 Gy]) is found to fit better than a simple linear or linear-quadratic model. This increase in noncancer mortality is statistically demonstrable, generally, after 1965 and among the younger survivors (<40) at the time of the bombings, suggesting a sensitivity in this age group. For specific causes of death, an excess relative risk at the high dose level, that is,  $\geq 2$  Gy, is seen in circulatory and digestive diseases. The relative risk is, however, much smaller than that for cancer.

These findings, based as they are on death certificates, have their limitations. Most significant, perhaps, is the possible erroneous attribution of radiation-related cancer deaths to other causes. At present, the contribution such errors may make to the apparent increase in noncancer deaths at the higher doses cannot be estimated as rigorously as is obviously desirable. However, even now, this increase does not appear to be fully explicable in terms of classificatory errors.

Further follow-up of mortality in this LSS cohort as well as of disease revealed by the biennial physical examinations of the morbidity subsample (Adult Health

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Study) of the LSS cohort will be needed to confirm this suggestion of a radiation-related increase in mortality from causes other than cancer, and to determine whether it results in a demonstrable life-shortening among the heavily exposed atomic bomb survivors.

## Introduction

Since 1950, the Atomic Bomb Casualty Commission (ABCC) and its successor, the Radiation Effects Research Foundation (RERF), have studied a fixed cohort of atomic bomb (A-bomb) survivors and suitable comparison subjects, the Life Span Study (LSS) sample, to ascertain the effects of A-bomb radiation on mortality. Periodic analyses of the results of this surveillance continue. Recently, mortality in the LSS sample has been determined for 1950–85. So far, two reports on cancer mortality using the revised Dosimetry System 1986 (DS86) doses have been published in this series;<sup>1,2</sup> these reports concern (1) an assessment of the impact of the change in dosimetry from the Tentative 1965 Dose (T65D) to the DS86 system on site-specific estimates of radiation-related cancer mortality,<sup>1</sup> and (2) several of the biological issues regarding radiation-induced cancer.<sup>2</sup> Briefly, evidence of radiation-related increases in site-specific malignancies continues to emerge, and the increased number of cases with further follow-up has strengthened some of the previously noted associations. However, it has not been clear heretofore whether mortality from causes other than cancer is also increased and whether life-shortening occurs that is attributable to these other causes of death. Previous analyses of noncancer mortality during the period 1950–78<sup>3</sup> failed to reveal evidence of either of these possibilities except at doses above 4 Gy (T65DR).

The present study addresses two issues, namely (1) temporal trends in the dose-response relationship for mortality from causes other than cancer, using the additional data accumulated in the 7 years during 1979–85 and the new DS86 doses, and (2) life-shortening, if any, due to causes of death other than cancer.

## Methods

### *Exposure and the sample used in this analysis*

Among a total of 120,128 LSS sample subjects in the extended cohort (LSS-E85), there are 91,228 survivors on whom a T65DR dose<sup>4</sup> could be estimated; this excludes 26,517 individuals who were not in Hiroshima or Nagasaki at the time of the bombings (ATB), the “not-in-city” (NIC) group, and 2,383 A-bomb survivors on whom a dose (T65DR) could not be estimated. At the time of this analysis DS86 dose estimates were available on a total of 75,991 (83.3%) of these 91,228 exposed persons. Hereafter these 75,991 individuals will be referred to as the DS86 subcohort. Assignment of DS86 doses to individual survivors is described in detail elsewhere.<sup>5</sup> Briefly, for persons exposed in Hiroshima within 1,600 m (2,000 m in Nagasaki) in the open with burns and no shielding or in wooden Japanese buildings and with a detailed shielding history, doses were directly estimated by modeling the circumstances attending their exposure. The method used makes provision for structural shielding and attenuation of the energy deposited in specific tissues, posture, orientation, and age, but does not use explicit transmission factors for either the wooden structures or tissues. At

greater distances, if a detailed shielding history did not exist, doses were indirectly estimated using average transmission factors derived from the individuals exposed beyond 1,000 m in both Hiroshima and Nagasaki on whom doses were directly computed.<sup>6</sup> As in previous LSS reports, estimates of shielded kerma above 6 Gy have been truncated at 6 Gy; the doses on 99 individuals were so truncated. All analyses are with regard to shielded kerma since no single tissue surrogate seemed appropriate, given the heterogeneous nature and natural histories of the diseases involved.

### Ascertainment of death

Deaths are routinely identified through the obligatory household registries (*koseki*) that exist in Japan, and ascertainment is essentially complete. Causes of death are obtained from the Vital Statistics Death Schedules that are based on the death certificates. The underlying cause of death has been classified according to the International Classification of Disease (detailed code rubrics and the number of deaths from specific causes are shown in Table 1 and Appendix Table 1).

Among a total of 28,737 deaths that occurred during the period 1950–85 in the DS86 subcohort, there were 6,224 deaths from neoplasms—5,936 from malignant neoplasms and 288 from neoplasms of a benign or unspecified nature. These deaths and their relationship to ionizing radiation have been described previously.<sup>1,2</sup> The subjects of the present analysis are the remaining deaths, namely 20,777 deaths from all diseases except neoplasms, excluding 75 for which the cause of death was unknown, 1,515 from all external causes, and 146 from “blood disease” (Table 1). The accuracy of the diagnosis of death due to blood disease is very low, and such deaths often include cases of leukemia and malignant lymphoma.<sup>3</sup> We have for these reasons excluded blood disease from the present analysis. Therefore, throughout this manuscript, the term “noncancer” will refer to all diseases except neoplasm and blood disease. The number of person-years and deaths for a specific cause of death analyzed in this report are shown by radiation dose, sex, age ATB, and period in Appendix Tables 2–8.

### Statistical methods

The statistical methods we use are the same as those described in the first two parts of this series.<sup>1,2</sup> Briefly, they involve the use of a grouped-survival analysis based on a relative risk model.<sup>7</sup> Specifically, the model fitted can be described as follows. Let  $i$  be the stratum in the cross-classification of city, sex, age ATB, and follow-up interval;  $j$  be the exposure category; and  $Y_{ij}$ ,  $PY_{ij}$ ,  $M_{ij}$  be the numbers of deaths, person-years at risk, and the mortality rate in stratum  $i$  and dose group  $j$ , respectively.

In the statistical analyses the person-years and the numbers of deaths are aggregated and stratified by city, sex, 11 categories of age ATB (<5 years of age, 5–9, 10–14, 15–19, 20–24, 25–29, 30–34, 35–39, 40–44, 45–49, and  $\geq 50$ ), 7 follow-up intervals (1950–55, 1956–60, 1961–65, 1966–70, 1971–75, 1976–80, 1981–85), and 10 categories of radiation dose (0, 0.01–0.05, 0.06–0.09, 0.10–0.19, 0.20–0.49, 0.50–0.99, 1.00–1.99, 2.00–2.99, 3.00–3.99, and  $\geq 4.00$  Gy), yielding 3,080 strata. The 7 follow-up periods were further aggregated in some analyses into the years 1950–65, 1966–75, and 1976–85.

**Table 1.** Number of deaths by cause of death among 75,991 Dosimetry System 1986 (DS86) subcohort members (1950–85)

| Cause of death                                 | No. of deaths | ICD 9th code                    |
|------------------------------------------------|---------------|---------------------------------|
| All causes                                     | 28,737        |                                 |
| External cause of death                        | 1515          | E800–E999                       |
| Unknown                                        | 75            |                                 |
| All diseases                                   | 27,147        | 001–799                         |
| Neoplasm                                       | 6224          | 140–208, 210–239                |
| Blood disease                                  | 146           | 280–289                         |
| All diseases except neoplasm and blood disease | 20,777        | 001–799 except 140–239, 280–289 |
| Infectious disease                             | 1413          | 001–139                         |
| Circulatory disease                            | 11,164        | 390–459                         |
| Stroke                                         | 6202          | 430–438                         |
| Heart (circulatory disease except stroke)      | 4962          | 390–429, 440–459                |
| Respiratory disease                            | 2036          | 460–519                         |
| Digestive disease                              | 2149          | 520–579                         |
| Others                                         | 4015          |                                 |

Under these circumstances, mortality in the  $ij$ th stratum can be modeled as:

$$M_{ij} = M_{i0}RR_{ij} ,$$

where  $RR_{ij}$  is the relative risk in stratum  $i$  of exposure group  $j$ , relative to exposure group 0, after adjusting the background mortality rate for city, sex, age ATB, and time since exposure. More specifically,  $RR_{ij}$  is modeled as:

$$\begin{aligned} RR_{ij} &= 1 + b_1 D_{ij} , \\ RR_{ij} &= 1 + b_1 D_{ij}^2 , \text{ or} \\ RR_{ij} &= 1 + b_1 D_{ij} + b_2 D_{ij}^2 , \end{aligned}$$

where  $D_{ij}$  is the mean total dose in the  $ij$ th category.

Since a priori there is little or no reason to believe that the effect of ionizing radiation on deaths attributable to causes other than cancer is stochastic in nature, we have routinely also fitted to the data a linear threshold model of the form:

$$RR_{ij} = \begin{cases} 1 + b_1(D_{ij} - D_T) & \text{if } D_{ij} > D_T \\ 1 & \text{otherwise} \end{cases} ,$$

where  $D_T$  is the threshold dose. To determine the threshold, the deviance was computed for arbitrary values and the threshold was taken to be that value which resulted in the smallest deviance.



To examine the effects of potential modifiers of the radiation-related risk, the following simple model was used:

$$\text{Modified } RR_{ij} = 1 + (RR_{ij} - 1) \cdot \exp(aX),$$

where  $X$  is the factor modifying the radiation effect, such as city, sex, age ATB, and time since exposure.

Parameters are estimated by the method of maximum likelihood, assuming that the numbers of deaths,  $Y_{ij}$ , are independent Poisson random variables with expected values  $E(Y_{ij}) = PY_{ij} \cdot M_{i0} \cdot RR_{ij}$ , where  $PY_{ij}$ , the person-years at risk, is treated as constant. Justification for this approximation is derived from the fact that the resulting likelihood function is identical to that obtained from a survival time model with the hazard function approximated by a step function that is constant on each interval of follow-up.<sup>7</sup> The program AMFIT<sup>8</sup> was used to fit various models. The differences in deviance between nested alternative models are used to assess the improvement in fit as a result of adding terms to the dose-response function.

## Results

### *All diseases except neoplasm and blood disease*

In Table 2, the relative risks of mortality from all diseases except neoplasm and blood disease in the nine dose groups, relative to that of the 0 Gy dose group, are shown by city, sex, age ATB, and period. The results are also shown for the statistical tests for the homogeneity of the estimated relative risks among dose categories and the significance of the dose response based on linear, linear-quadratic, quadratic, or linear-threshold models with the threshold dose 1.5 Gy. The relative risk tends to be higher in the highest dose range (i.e.,  $\geq 2$  Gy) in both cities, both sexes, and all age ATB groups combined for the total period 1950–85 (Figure 1). Statistically, the linear-quadratic model fits significantly better than the linear model, but not better than the quadratic model. These tests correspond to tests of the quadratic term and linear term in the linear-quadratic model, respectively (Table 2). Comparison of the goodness of fit of the linear and quadratic models shows the quadratic model fits better than the linear model, but the difference cannot be tested statistically because the linear and quadratic models are not nested. Although we assumed the threshold dose to be 1.5 Gy in testing the fit of the linear-threshold model, without assuming the threshold dose is significant ( $p = .01$ ), when the threshold dose is estimated formally it is 1.4 Gy and its 90% confidence limits are 0.6–2.8 Gy. This threshold model improves the fit when compared to the simple linear model ( $p = .02$ ). These results suggest the dose response is nonlinear, indicating that the increase is primarily in the high dose range.

The estimated relative risks in Table 2 suggest a difference between cities and between sexes. However, comparison of the sexes and cities statistically fails to reveal a significant difference in either instance. Dose response by age ATB group also suggests that the relative risk tends to be higher in the highest dose range, though it is statistically significant only for those exposed at ages 30–39 ATB. The analysis for those survivors exposed before age 30 ATB, combining the three

**Table 2.** Relative risk (vs. 0 Gy) for mortality from all diseases except neoplasm and blood disease, 1950–85

| Class     | No. of deaths | Radiation dose (Gy) |           |           |           |           |           |           |                |       |       | Test (p value) <sup>a</sup> |                 |                                               |       |       |
|-----------|---------------|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|----------------|-------|-------|-----------------------------|-----------------|-----------------------------------------------|-------|-------|
|           |               | 0                   | 0.01–0.05 | 0.06–0.09 | 0.10–0.19 | 0.20–0.49 | 0.50–0.99 | 1.00–1.99 | 2.00–3.00–3.99 | ≥4.00 | Homo. | L                           | LQ <sup>b</sup> | Q                                             | LT    |       |
| Total     | 20,777        | 1.0                 | 1.03      | 0.97      | 0.97      | 0.97      | 1.15      | 0.96      | 1.13           | 1.16  | 1.38  | 0.02                        | 0.06            | 0.004 (–, +*)                                 | 0.007 | 0.003 |
| City      |               |                     |           |           |           |           |           |           |                |       |       |                             |                 |                                               |       |       |
| Hiroshima | 14,436        | 1.0                 | 1.03      | 0.96      | 0.96      | 0.96      | 1.00      | 0.96      | 1.17           | 1.01  | 1.53  | 0.01                        | 0.07            | 0.01 (–, +*)                                  | 0.006 | 0.003 |
| Nagasaki  | 6341          | 1.0                 | 1.03      | 0.99      | 1.04      | 0.99      | 1.11      | 0.93      | 0.96           | 2.34  | 1.08  | 0.43                        | 0.53            | 0.79 (+, +)                                   | 0.50  | 0.41  |
| Sex       |               |                     |           |           |           |           |           |           |                |       |       |                             |                 |                                               |       |       |
| Male      | 9344          | 1.0                 | 1.03      | 0.94      | 0.95      | 0.96      | 0.98      | 0.95      | 1.05           | 1.17  | 1.60  | 0.03                        | 0.06            | 0.004 (–, +**)                                | 0.003 | 0.002 |
| Female    | 11,433        | 1.0                 | 1.03      | 0.99      | 0.99      | 0.97      | 1.04      | 0.97      | 1.21           | 1.13  | 1.07  | 0.66                        | 0.48            | 0.77 (+, –)                                   | 0.55  | 0.40  |
| Age ATB   |               |                     |           |           |           |           |           |           |                |       |       |                             |                 |                                               |       |       |
| <10       | 324           | 1.0                 | 0.80      | 0.78      | 1.20      | 1.25      | 0.76      | 0.46      | 1.46           | 1.29  | 1.35  | 0.31                        | 0.83            | 0.95 (–, +)                                   | 0.76  | 0.49  |
| 10–19     | 814           | 1.0                 | 1.06      | 1.03      | 0.73      | 0.94      | 1.07      | 1.07      | 0.62           | 0.81  | 2.21  | 0.28                        | 0.35            | 0.20 (–, +)                                   | 0.13  | 0.18  |
| 20–29     | 929           | 1.0                 | 0.97      | 0.80      | 0.92      | 0.98      | 0.74      | 1.07      | 0.94           | 0.72  | 2.03  | 0.48                        | 0.43            | 0.16 (–, + <sup>Sug.</sup> )                  | 0.13  | 0.16  |
| 30–39     | 2441          | 1.0                 | 1.12      | 1.09      | 1.05      | 0.84      | 1.26      | 0.94      | 1.87           | 1.47  | 1.81  | 0.002                       | 0.01            | 0.02 (+, +)                                   | 0.006 | 0.003 |
| 40–49     | 5995          | 1.0                 | 1.07      | 0.97      | 0.99      | 1.05      | 1.07      | 1.07      | 1.22           | 0.95  | 1.28  | 0.37                        | 0.14            | 0.27 (+, –)                                   | 0.34  | 0.36  |
| >50       | 10,274        | 1.0                 | 1.00      | 0.96      | 0.95      | 0.95      | 0.96      | 0.89      | 0.95           | 1.45  | 1.10  | 0.39                        | 0.58            | 0.16 (– <sup>Sug.</sup> , + <sup>Sug.</sup> ) | 0.66  | 0.36  |
| Period    |               |                     |           |           |           |           |           |           |                |       |       |                             |                 |                                               |       |       |
| 1950–55   | 2901          | 1.0                 | 1.07      | 0.95      | 0.91      | 0.92      | 0.99      | 0.74      | 0.97           | 1.49  | 1.46  | 0.09                        | 0.91            | 0.04 (–*, +*)                                 | 0.30  | 0.13  |
| 1956–60   | 2999          | 1.0                 | 0.97      | 0.93      | 0.93      | 1.06      | 0.71      | 0.94      | 0.88           | 1.08  | 1.10  | 0.07                        | 0.41            | 0.20 (–, + <sup>Sug.</sup> )                  | 0.97  | 0.80  |
| 1961–65   | 2969          | 1.0                 | 1.12      | 0.96      | 1.01      | 1.00      | 1.20      | 0.87      | 1.07           | 1.24  | 1.52  | 0.08                        | 0.47            | 0.60 (–, +)                                   | 0.33  | 0.25  |
| 1966–70   | 2958          | 1.0                 | 1.03      | 0.86      | 0.97      | 1.04      | 0.94      | 1.18      | 1.23           | 0.96  | 1.21  | 0.49                        | 0.24            | 0.46 (+, –)                                   | 0.42  | 0.54  |
| 1971–75   | 2988          | 1.0                 | 0.97      | 0.95      | 0.95      | 0.92      | 1.16      | 1.02      | 1.13           | 1.04  | 1.45  | 0.48                        | 0.11            | 0.28 (+, –)                                   | 0.18  | 0.22  |
| 1976–80   | 3057          | 1.0                 | 0.94      | 1.01      | 1.05      | 0.82      | 0.96      | 0.98      | 1.34           | 1.00  | 1.34  | 0.11                        | 0.37            | 0.35 (–, +)                                   | 0.18  | 0.14  |
| 1981–85   | 2905          | 1.0                 | 1.11      | 1.11      | 0.94      | 1.03      | 1.17      | 0.97      | 1.30           | 1.27  | 1.59  | 0.14                        | 0.12            | 0.28 (+, +)                                   | 0.12  | 0.11  |

NOTE: ATB = at the time of the bombings.

<sup>a</sup>Significance for homogeneity (Homo.) of 10 dose groups regardless of pattern, fitted linear (L), linear-quadratic (LQ), quadratic (Q), and linear-threshold (LT) models. The threshold dose is assumed to be 1.5 Gy.

<sup>b</sup>The signs within parentheses for LQ are those of the regression coefficients (i.e., the linear and quadratic terms). The statistical significance of these coefficients is also shown. <sub>SUG</sub>  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ .

decennial age groups, 0-9, 10-19, and 20-29, reveals a statistically significant increased risk with the quadratic ( $p = .03$ ) and linear-threshold ( $p = .04$ ) models. Furthermore, it is observed that the risk is significantly higher for those exposed before age 40 ATB than for those  $\geq 40$  ATB.

Table 3 and Figure 2 give the dose response for mortality from all diseases except neoplasm and blood disease for the three successive periods (i.e., 1950-65, 1966-75, 1976-85) within two age ATB groups, under 40 years and 40 years or over. As shown in Table 3 and Figure 2, for those exposed before 40 ATB the increase tends to appear in the most recent period (1976-85). The nonlinear models (linear-threshold or quadratic) appear to fit better than the simple linear model in this period. However, the dose-response curve for those exposed at age 40 or older ATB in the earliest period (1950-65) is U shaped (i.e., a negative downward slope for the low doses and an upward slope in the high dose).

Table 4 shows the change in the regression coefficient by period for the  $<40$  and  $\geq 40$  ATB groups separately. The coefficients in the quadratic and linear-threshold models for  $<40$  ATB tend to be greater in the later period. Although the coefficients among the three periods are not significantly different, when only two periods are used ( $\leq 1965$ ,  $>1965$ ), the difference is marginally significant for both the quadratic and linear-threshold models ( $p = .06$ ). The coefficients in the linear-quadratic model for  $\geq 40$  ATB are significantly different among the three periods. This is due to the difference between the periods  $\leq 1965$  and  $>1965$ . There is a negative downward slope for the linear term and an upward slope for the quadratic term before 1966, implying a decreasing risk at low doses and an increasing one at high doses, and no radiation effects in  $>1965$ . When the period before 1966 is further divided into 5-year intervals, and age ATB  $\geq 40$  is divided into 40-49 and  $\geq 50$ , the downward slope in the U-shaped dose response is greater for the period 1950-60 and age ATB  $\geq 50$  (Appendix Table 9).

As described above, the analyses of the separate age and period subgroups revealed that the dose-response pattern differs by age ATB and observation period. These findings lead us to an alternative analysis fitting a different, "mixed," statistical model to the total data. In this model, we assume the dose response fits the linear-quadratic model in the early periods, whereas the quadratic model fits the recent periods, but the coefficients differ by age ATB.

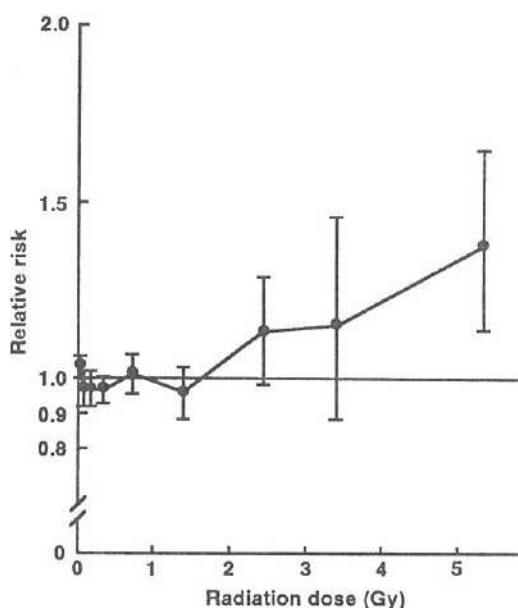


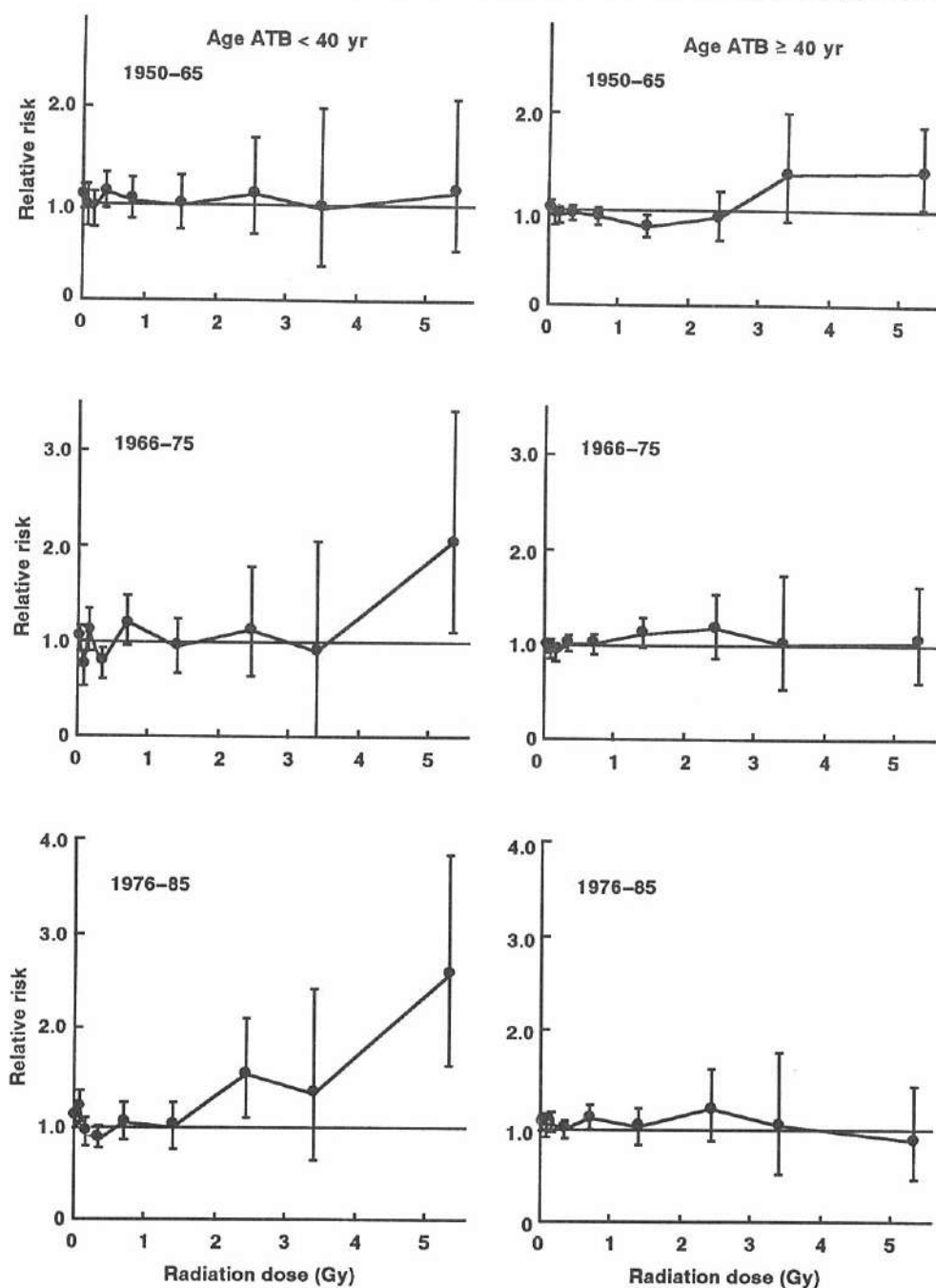
Figure 1. Dose-response curve of mortality from all diseases except neoplasm and blood disease—both cities, both sexes, all ages at the time of the bombings, 1950-85. The bars indicate the 90% confidence intervals of relative risk.

**Table 3.** Relative risk (vs. 0 Gy) for mortality from all diseases except neoplasm and blood disease in groups combined by age at the time of the bombings (ATB) and period, 1950-85 (cities and sexes combined)

| Age<br>ATB | Period  | No. of<br>deaths | Radiation dose (Gy) |           |           |           |           |           |           |            |       |       | Test (p value) <sup>a</sup> |                              |                                            |        |        |
|------------|---------|------------------|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|------------|-------|-------|-----------------------------|------------------------------|--------------------------------------------|--------|--------|
|            |         |                  | 0                   | 0.01-0.05 | 0.06-0.10 | 0.10-0.19 | 0.20-0.49 | 0.50-0.99 | 1.00-1.99 | 2.00-3.00- | ≥4.00 | Homo. | L                           | LQ <sup>b</sup>              | Q                                          | LT     |        |
| <40        | 1950-65 | 1399             | 1.0                 | 1.06      | 0.96      | 0.94      | 1.14      | 0.95      | 1.00      | 1.12       | 0.97  | 1.14  | 0.94                        | 0.67                         | 0.85 (+, -)                                | 0.84   | 0.81   |
|            | 1966-75 | 1159             | 1.0                 | 1.04      | 0.71      | 1.13      | 0.77      | 1.22      | 0.94      | 1.14       | 0.92  | 2.08  | 0.02                        | 0.15                         | 0.14 (-, +)                                | 0.06   | 0.07   |
|            | 1976-85 | 1950             | 1.0                 | 1.03      | 1.16      | 0.91      | 0.84      | 1.01      | 0.95      | 1.52       | 1.31  | 2.56  | 0.006                       | 0.01                         | 0.001 (-, + <sup>**</sup> )                | 0.0005 | 0.0003 |
| ≥40        | 1950-65 | 7470             | 1.0                 | 1.05      | 0.94      | 0.95      | 0.97      | 0.94      | 0.83      | 0.93       | 1.39  | 1.41  | 0.02                        | 0.73                         | 0.005 (- <sup>**</sup> , + <sup>**</sup> ) | 0.22   | 0.08   |
|            | 1966-75 | 4787             | 1.0                 | 0.99      | 0.96      | 0.93      | 1.03      | 1.02      | 1.14      | 1.19       | 1.04  | 1.06  | 0.72                        | 0.16 (+ <sub>Sug.</sub> , -) | 0.16                                       | 0.62   | 0.76   |
|            | 1976-85 | 4012             | 1.0                 | 1.01      | 1.00      | 1.03      | 0.96      | 1.08      | 0.98      | 1.18       | 1.01  | 0.85  | 0.96                        | 0.91                         | 0.74 (+, -)                                | 0.75   | 0.79   |

<sup>a</sup>Significance for homogeneity (Homo.) of 10 dose groups regardless of pattern, fitted linear (L), linear-quadratic (LQ), quadratic (Q), and linear-threshold (LT) models. The threshold dose is assumed to be 1.5 Gy.

<sup>b</sup>The signs within parentheses for LQ are those of the regression coefficients (i.e., the linear and quadratic terms). The statistical significance of these coefficients is also shown. <sup>Sug.</sup>  $p < .10$ ; \*  $p < .05$ ; \*\*  $p < .01$ .



**Figure 2.** Dose-response curves of mortality from all diseases except neoplasm and blood disease by age at the time of the bombings (ATB) and period. The bars indicate the 90% confidence intervals of relative risk.



Table 4. Change in regression coefficient by period

| Period  | Age ATB < 40 |      |        |      | Age ATB ≥ 40 |            |       |
|---------|--------------|------|--------|------|--------------|------------|-------|
|         | Q            | Test | LT     | Test | LQ           |            | Test  |
|         |              |      |        |      | $\alpha_1$   | $\alpha_2$ |       |
| 1950-65 | 0.0028       | 0.13 | 0.0249 | 0.10 | -0.1589      | 0.0468     | 0.008 |
| 1966-75 | 0.0310       |      | 0.2152 |      | 0.1249       | -0.0248    |       |
| 1976-85 | 0.0508       |      | 0.3977 |      | 0.0482       | -0.0132    |       |

NOTE: The tests are of the homogeneity of the coefficients among the three periods. Quadratic (Q) model:  $RR = 1 + \alpha_1 d^2$ , where  $d$  is in gray; linear-threshold (LT) model:  $RR = 1 + \alpha_1(d - 1.5)$ ; and linear-quadratic (LQ) model:  $RR = 1 + \alpha_1 d + \alpha_2 d^2$ . ATB = at the time of the bombings.

For simplicity, observation period and age ATB were categorized. The observation period was divided into the time up through 1965, and the following years up through 1985, and age was divided into under 40 and 40 and over ATB. Since a linear-quadratic dose response fits the data in the period prior to 1961 and in the 50 and over ATB age group better than prior to 1966 and in the 40 and over ATB age group, the year 1960 and 50 years of age ATB were also used as cut points.

Appendix Table 10 shows the results of the regression analyses. They confirm that, in the early period, risk follows a linear-quadratic model in which the linear term is significantly negative and the quadratic term is significantly positive, and the significance is due to the older age ATB group. In the later period, however, a quadratic model fits the data better, and the recent increase seems to result from the younger age ATB group. The equations for the models we selected (model 5-4 in Appendix Table 10) are as follows:

For age ATB < 40 in the period 1950-65:  $RR = 1 + 0.0606d - 0.0112d^2$ ;  
 for age ATB ≥ 40 in the period 1950-65:  $RR = 1 - 0.1597d + 0.0469d^2$ ;  
 for age ATB < 40 in the period 1966-85:  $RR = 1 + 0.0425d^2$ ; and  
 for age ATB ≥ 40 in the period 1966-85:  $RR = 1 + 0.0008d^2$ .

Appendix Figure 1 shows four dose-response curves based on model 5-4.

Although a linear-quadratic model described the data best prior to 1961 and 50 years of age and over ATB, whereas the quadratic model was best after 1965 and under 40 years of age ATB, the model with three categories (period: ≤1960, 1961-65, and 1966-85; age ATB: <40, 40-49, and ≥50) did not fit better when compared with models collapsing the data to two categories (i.e., period: ≤1960, >1960 or ≤1965, >1965; age ATB: <40, ≥40 or <50, ≥50). Models collapsing the data fit equally well (Models 5-4, 5-5, 6-4, and 6-5 in Appendix Table 10).

### Specific diseases

Although it is not necessarily supported by statistical significance, the dose-response curves for specific diseases follow that of all diseases except neoplasm and blood disease in general. That is, the dose responses are nonlinear in the

total period and the excess mortality stems largely from deaths in the younger ages ATB and in the recent period. In the early years, a U-shaped dose response (downward slope in low dose and upward slope in high dose) is seen for the older ages ATB.

The relative risk of mortality from specific diseases among deaths due to disease other than neoplasm and blood disease, and the results of statistical tests of the significance of the dose response are shown in Table 5 for the total and in Table 6 for the <40 age ATB group in 1966–85, where the excess was observed in the category diseases other than neoplasm and blood disease. Figure 3 shows the dose response for both groups—the younger ages in the recent period and the older ages in the early period. The results of testing the model for variations in risk with age ATB and period are presented in Appendix Table 11.

*Infectious disease.* There is no evidence of a dose-related trend in mortality for infectious disease in the total data and the dose response is not modified by age ATB, sex, and follow-up interval, although a downward slope in the period prior to 1966 and in the 40 and over age ATB group is marginally significant (Figure 3). Mortality from tuberculosis, which includes the majority of deaths from infectious disease, does not reveal any relationship with radiation dose (data are not shown).

*Circulatory disease.* Mortality from circulatory disease in the years 1950–85 shows a significant association with dose. Mortality from stroke, however, does not, but circulatory disease other than stroke (which we shall refer to as heart disease) shows a significant trend over the total period (Table 5). In the later years (1966–85) and the younger (<40) age ATB groups, however, mortality from circulatory disease as a whole, as well as stroke or heart disease, shows a significant association with dose, and the dose-response curve appears to be nonlinear (Table 6). Mortality from “coronary heart disease,” which includes the largest number of deaths within the heart disease category, reveals the same trend seen for heart disease in this period and in this age ATB category (Table 6).

A difference in the risks by age ATB and period is observed in circulatory disease as a whole, as well as in stroke or heart disease, as observed in the mortality from all diseases except neoplasm and blood disease. A “mixed” model, assuming a quadratic dose response for young ages ATB in the recent period and a U-shaped dose response for the older age ATB groups in the early period, fits significantly better than the quadratic model in the total period for circulatory disease as a whole and for stroke (Appendix Table 11). The U-shaped dose response in the early period is predominant for stroke and the excess in the later period is greater for heart disease (Table 6, Figure 3).

*Respiratory disease.* Mortality from respiratory disease exhibits a nonlinear dose response in the total period (Table 5). This dose response does not change by follow-up interval, though the coefficient in the later period tends to be greater than in the earlier one. However, this dose response for age 40 ATB in 1966–85 is not statistically significant.

*Digestive disease.* A significant increasing trend with dose is seen in mortality from digestive disease for the period 1950–85 (Table 5). This increase is demonstrable in the later period and in the younger ages ATB (Table 6). Among digestive disease categories, mortality from liver cirrhosis reveals the same dose response as do digestive diseases collectively (Table 6). The dose-response curve

**Table 5.** Number of deaths and relative risk (vs. 0 Gy) for mortality from major causes of death, 1950–85 (cities and sexes combined)

| Cause of death                                 | Total            | Radiation dose (Gy) |              |              |              |              |              |             |             |            |            | Test ( <i>p</i> value) <sup>a</sup> |      |                              |             |
|------------------------------------------------|------------------|---------------------|--------------|--------------|--------------|--------------|--------------|-------------|-------------|------------|------------|-------------------------------------|------|------------------------------|-------------|
|                                                |                  | 0                   | 0.01–0.05    | 0.06–0.09    | 0.10–0.19    | 0.20–0.49    | 0.50–0.99    | 1.00–1.99   | 2.00–2.99   | 3.00–3.99  | ≥4.00      | Homo.                               | L    | LQ <sup>b</sup>              | Q LT        |
| All diseases except neoplasm and blood disease | No. 20,777<br>RR | 9490<br>1.00        | 5159<br>1.03 | 1109<br>0.97 | 1411<br>0.97 | 1796<br>0.97 | 1032<br>1.15 | 506<br>0.96 | 149<br>1.13 | 45<br>1.16 | 80<br>1.38 | 0.02                                | 0.06 | 0.004 (–, +*)                | 0.007 0.003 |
| Infectious disease                             | No. 1413<br>RR   | 651<br>1.00         | 367<br>1.12  | 64<br>0.90   | 85<br>0.98   | 126<br>1.11  | 64<br>0.98   | 38<br>0.98  | 10<br>0.95  | 5<br>1.49  | 3<br>0.63  | 0.59                                | 0.65 | 0.69 (+, –)                  | 0.46 0.53   |
| Circulatory disease                            | No. 11,164<br>RR | 5025<br>1.00        | 2767<br>1.03 | 605<br>0.98  | 775<br>0.99  | 981<br>0.98  | 590<br>1.08  | 273<br>0.98 | 85<br>1.24  | 20<br>1.00 | 43<br>1.43 | 0.10                                | 0.03 | 0.09 (+, +)                  | 0.03 0.02   |
| Stroke                                         | No. 6202<br>RR   | 2816<br>1.00        | 1551<br>1.04 | 314<br>0.92  | 443<br>1.01  | 538<br>0.97  | 307<br>1.01  | 156<br>1.00 | 45<br>1.18  | 7<br>0.64  | 25<br>1.49 | 0.24                                | 0.37 | 0.21 (–, +)                  | 0.44 0.18   |
| Heart disease                                  | No. 4962<br>RR   | 2209<br>1.00        | 1216<br>1.03 | 291<br>1.07  | 332<br>0.96  | 443<br>1.00  | 283<br>1.18  | 117<br>0.95 | 40<br>1.32  | 13<br>1.45 | 18<br>1.36 | 0.11                                | 0.03 | 0.07 (+, –)                  | 0.09 0.06   |
| Respiratory disease                            | No. 2036<br>RR   | 888<br>1.00         | 528<br>1.14  | 135<br>1.26  | 162<br>1.19  | 150<br>0.87  | 95<br>1.02   | 45<br>0.91  | 17<br>1.46  | 4<br>1.15  | 12<br>2.19 | 0.002                               | 0.21 | 0.03 (–, +*)                 | 0.03 0.01   |
| Digestive disease                              | No. 2149<br>RR   | 1002<br>1.00        | 510<br>0.98  | 105<br>0.87  | 142<br>0.94  | 194<br>1.01  | 98<br>0.92   | 63<br>1.10  | 14<br>0.93  | 8<br>1.76  | 13<br>2.00 | 0.28                                | 0.04 | 0.05 (–, +)                  | 0.01 0.02   |
| Other                                          | No. 4015<br>RR   | 1924<br>1.00        | 987<br>0.95  | 200<br>0.86  | 247<br>0.83  | 345<br>0.91  | 185<br>0.89  | 87<br>0.83  | 23<br>0.88  | 8<br>1.05  | 9<br>0.81  | 0.10                                | 0.11 | 0.13 (– <sup> Sug</sup> , +) | 0.41 0.65   |

<sup>a</sup>Significance for homogeneity (Homo.) of 10 dose groups regardless of pattern, fitted linear (L), linear-quadratic (LQ), quadratic (Q), and linear-threshold (LT) models. The threshold dose is assumed to be 1.5 Gy.

<sup>b</sup>The signs within parentheses for LQ are those of the regression coefficients (i.e., the linear and quadratic terms). The statistical significance of these coefficients is also shown. <sup>Sug</sup><sub>p</sub> < .10; \**p* < .05.

**Figure 3.** Dose-response curves of specific diseases for age at the time of the bombings (ATB) < 40 in 1966–85 and age ATB ≥ 40 in 1950–65. The bars indicate the 90% confidence intervals of relative risk.

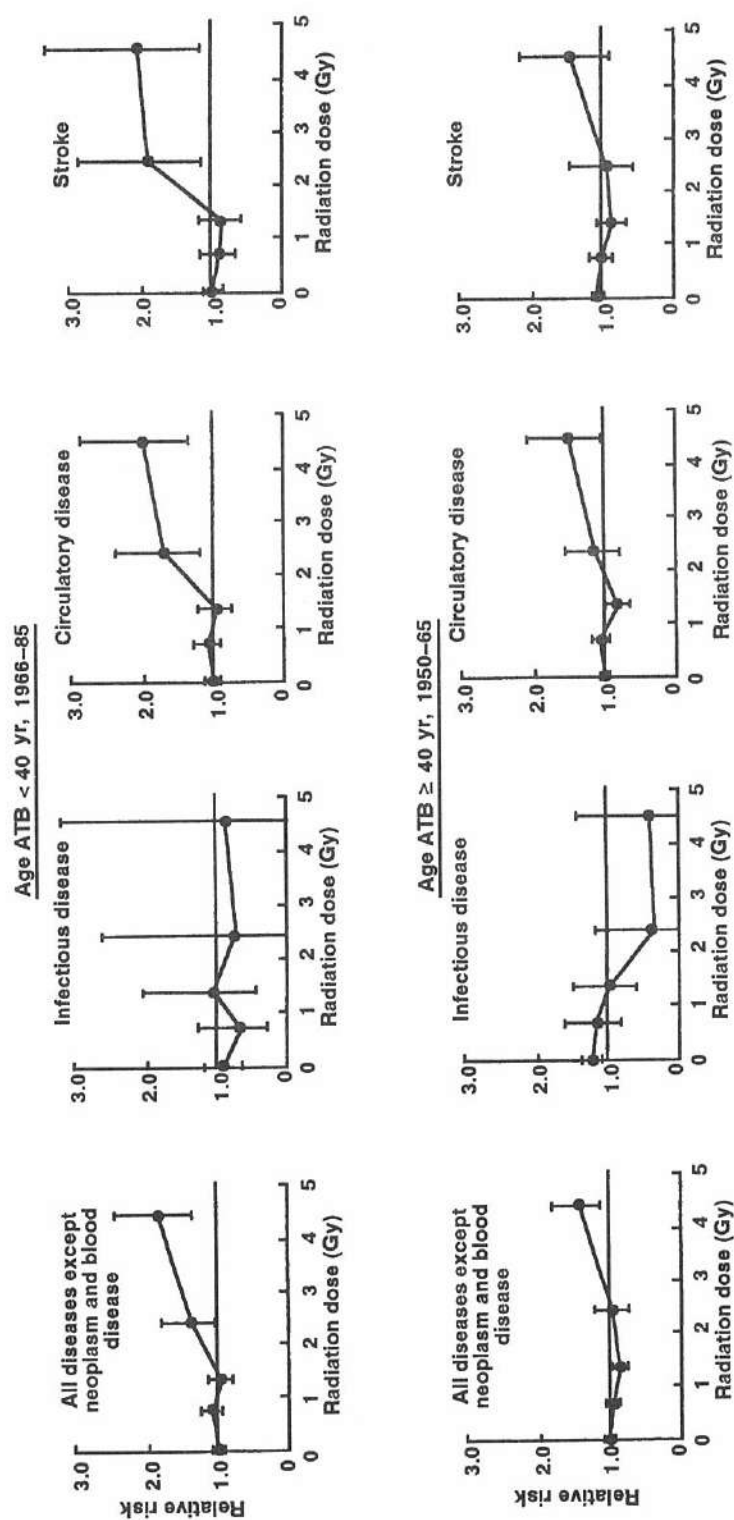
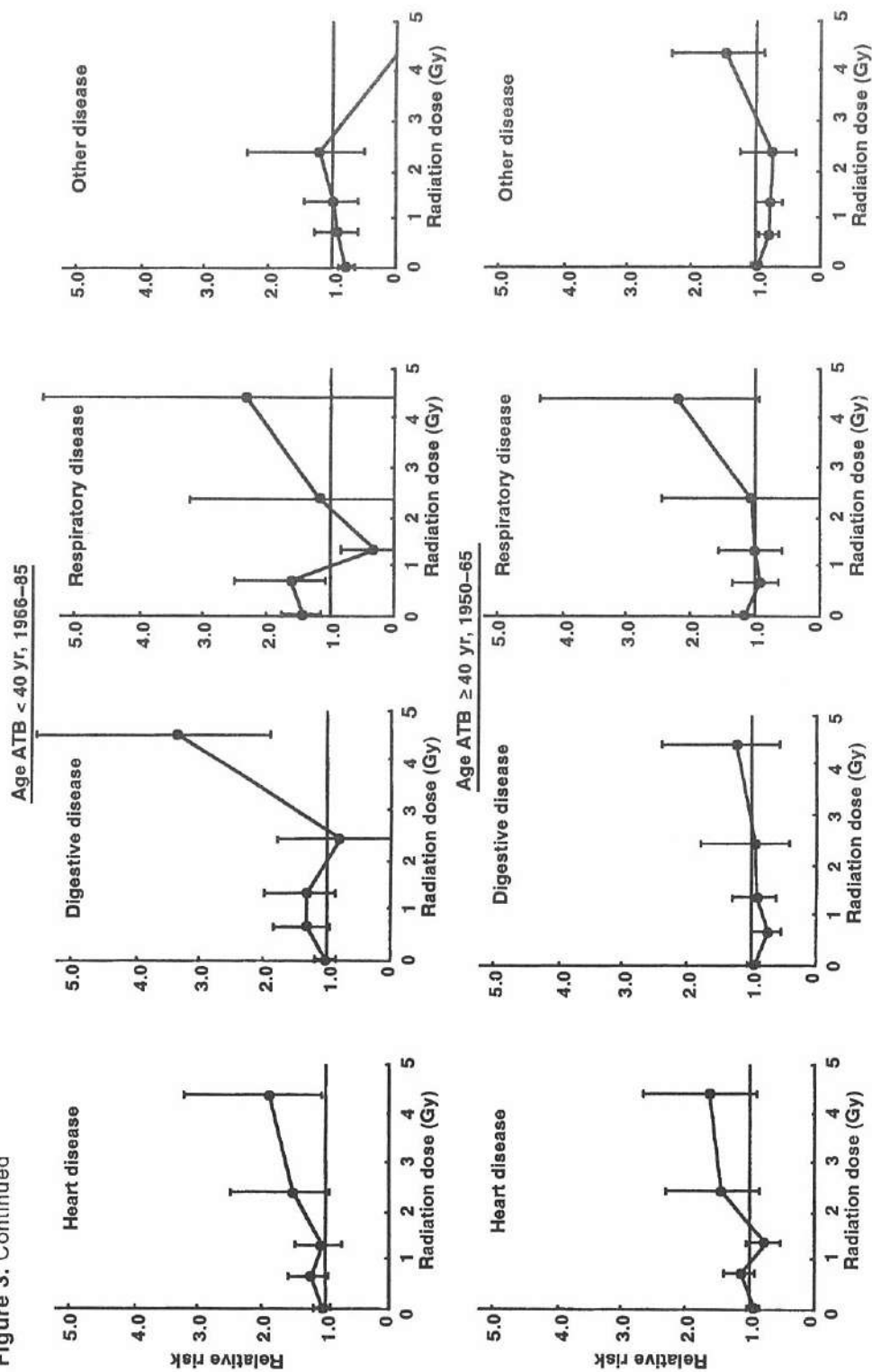


Figure 3. Continued



**Table 6.** Relative risk (vs. 0 Gy) of mortality from major causes of death for age at the time of the bombings < 40, 1966–85 (cities and sexes combined)

| Cause of death                                 | No. of deaths | Radiation dose (Gy) |           |           |           |           |       | Test (p value) <sup>a</sup> |       |                                              |        |
|------------------------------------------------|---------------|---------------------|-----------|-----------|-----------|-----------|-------|-----------------------------|-------|----------------------------------------------|--------|
|                                                |               | 0                   | 0.01–0.49 | 0.50–0.99 | 1.00–1.99 | 2.00–2.99 | ≥3.00 | Homo.                       | L     | LQ <sup>b</sup>                              | Q LT   |
| All diseases except neoplasm and blood disease | 3109          | 1.0                 | 0.98      | 1.09      | 0.95      | 1.37      | 1.83  | 0.01                        | 0.004 | 0.0002 (–, + <sup>**</sup> )                 | 0.0001 |
| Circulatory disease                            | 1764          | 1.0                 | 1.00      | 1.06      | 0.94      | 1.69      | 1.98  | 0.03                        | 0.02  | 0.002 (–, + <sup>*</sup> )                   | 0.0003 |
| Stroke                                         | 884           | 1.0                 | 0.97      | 0.89      | 0.84      | 1.88      | 2.04  | 0.08                        | 0.11  | 0.007 (– <sup>Sug.</sup> , + <sup>**</sup> ) | 0.004  |
| Heart disease                                  | 880           | 1.0                 | 1.04      | 1.24      | 1.06      | 1.52      | 1.92  | 0.28                        | 0.07  | 0.12 (–, +)                                  | 0.04   |
| Coronary heart disease                         | 363           | 1.0                 | 1.35      | 1.25      | 0.92      | 2.57      | 2.38  | 0.03                        | 0.11  | 0.14 (–, +)                                  | 0.04   |
| Respiratory disease                            | 276           | 1.0                 | 1.40      | 1.64      | 0.31      | 1.18      | 2.33  | 0.007                       | 0.43  | 0.26 (–, +)                                  | 0.14   |
| Digestive disease                              | 455           | 1.0                 | 0.96      | 1.29      | 1.29      | 0.76      | 3.33  | 0.021                       | 0.002 | 0.005 (+, +)                                 | 0.003  |
| Liver cirrhosis                                | 281           | 1.0                 | 0.90      | 1.39      | 1.15      | 1.16      | 3.93  | 0.02                        | 0.003 | 0.005 (+, +)                                 | 0.002  |

<sup>a</sup>Significance for homogeneity (Homo.) of six dose groups regardless of pattern, fitted linear (L), linear-quadratic (LQ), quadratic (Q), and linear-threshold (LT) models. The threshold dose is assumed to be 1.5 Gy.

<sup>b</sup>The signs within parentheses for LQ are those of the regression coefficients (i.e., the linear and quadratic terms). The statistical significance of the coefficients is also shown. <sup>Sug.</sup> $p < .10$ ; <sup>\*</sup> $p < .05$ ; <sup>\*\*</sup> $p < .01$ .



**Table 7.** Risk estimates of mortality from all diseases except neoplasm and blood disease based on a linear-threshold model, with the threshold dose assumed to be 1.4 Gy

| Disease                                        | Estimated RR at 2 Gy | Excess deaths per 10 <sup>4</sup> PYGy | Attributable risk (%) <sup>a</sup> |
|------------------------------------------------|----------------------|----------------------------------------|------------------------------------|
| All diseases except neoplasm and blood disease |                      |                                        |                                    |
| Total                                          | 1.06 (1.02, 1.09)    | 1.18 <sup>b</sup> (0.51, 1.19)         | 0.36 (0.16, 0.59)                  |
| Age ATB < 40, period: 1966–85                  | 1.19 (1.10, 1.29)    | 1.69 (0.90, 2.62)                      | 1.49 (0.79, 2.30)                  |
| All malignant neoplasm <sup>c</sup>            | 1.78 (1.64, 1.92)    | 10.00 (8.36, 11.8)                     | 10.2 (8.50, 12.0)                  |
| Leukemia                                       | 8.84 (6.78, 11.8)    | 2.29 (1.18, 2.73)                      | 55.4 (45.7, 66.3)                  |
| All malignant neoplasm except leukemia         | 1.58 (1.46, 1.72)    | 7.41 (5.83, 9.08)                      | 7.86 (6.19, 9.64)                  |

NOTE: The values within parentheses are the 90% confidence intervals.

<sup>a</sup>Based on 41,719 subjects exposed to  $\geq 0.01$  Gy (average = 0.295 Gy).

<sup>b</sup>For the linear-threshold model the excess deaths depend on dose (i.e., excess death = 0 if the dose  $\leq 1.4$  Gy, 3.26 if the dose  $> 1.4$  Gy, and the average is 1.18).

<sup>c</sup>The risk estimate is based on the linear model for all subjects.<sup>2</sup>

of digestive disease in the early period and the older ages ATB is similar to that for all diseases except neoplasm and blood disease (Figure 3). Statistically, the model, which assumes a linear-quadratic dose response in the early period and a quadratic response in the later period, fits better than using the quadratic model for the entire period. This period-dependent model is not modified by age ATB (Appendix Table 11).

**Other diseases.** This category includes miscellaneous diseases. Deaths from senility contribute the largest number. Deaths from other causes bear no relationship to radiation dose in the total period (Table 5). However, the dose response in the early period follows the linear-quadratic model in which the linear term is significantly negative and the quadratic term is significantly positive. In the later period, there is no statistically significant evidence of a trend with dose, though we observe a negative dose response (Figure 3).

#### **Risk estimates of mortality from all diseases except neoplasm and blood disease**

To afford a comparison with the risks from cancer, summary measures of risk—relative risk at 2 Gy, excess deaths per 10<sup>4</sup> PYGy, and attributable risk (%)—are shown for all diseases except neoplasm and blood disease both for all subjects and for those age < 40 ATB in the years 1966–85 (Table 7).

The relative and attributable risks are still much lower than those seen for cancer, and the excess deaths are also much lower despite the high background rate, reflecting no excess in the dose range 0 to < 1.4 Gy. Incidentally, there are no excess deaths if the dose is  $\leq 1.4$  Gy and the excess deaths are 3.26 if the dose is  $> 1.4$  Gy. The average is 1.18 in the entire population.

### Life-shortening

The analysis of mortality in the LSS sample has been guided in part by an interest in the possible loss of life ascribable to causes other than cancer. The best evidence of such a loss would be an increased age-specific mortality over the entire spectrum of disease, especially disease characteristic of the later decades of life. The Gompertz function, which is the logarithm of the age-specific death rate, has been shown to describe adequately the mortality rate from most chronic diseases in adults. The logarithm of the age-specific death rate yields a straight line, and life-shortening is suggested by an elevation of the Gompertz function. When the Gompertz function based on all nonexternal causes of death exclusive of cancer and blood diseases in the survivors exposed to 2 Gy or more is contrasted with the comparison (0 Gy) group, it is observed that radiation-induced life-shortening is due not only to the induction of neoplasms but to other nonexternal causes of death as well (Figure 4). The evidence for the latter is seen especially clearly in the younger age ATB groups (Figure 5A) in which the mortality rates are consistently and strikingly higher in the  $\geq 2$  Gy group as contrasted with the 0 Gy group. When the observations for the age ATB < 40 group were distributed over three periods, that is, 1950–65, 1966–75, and 1976–85 (Figure 5B), an apparent increase in mortality at 2 Gy or more is not observed until after 1966, while, for the age ATB  $\geq 40$  group, a slight increase exists in the early period, 1950–65 (at >50 years of age at death).

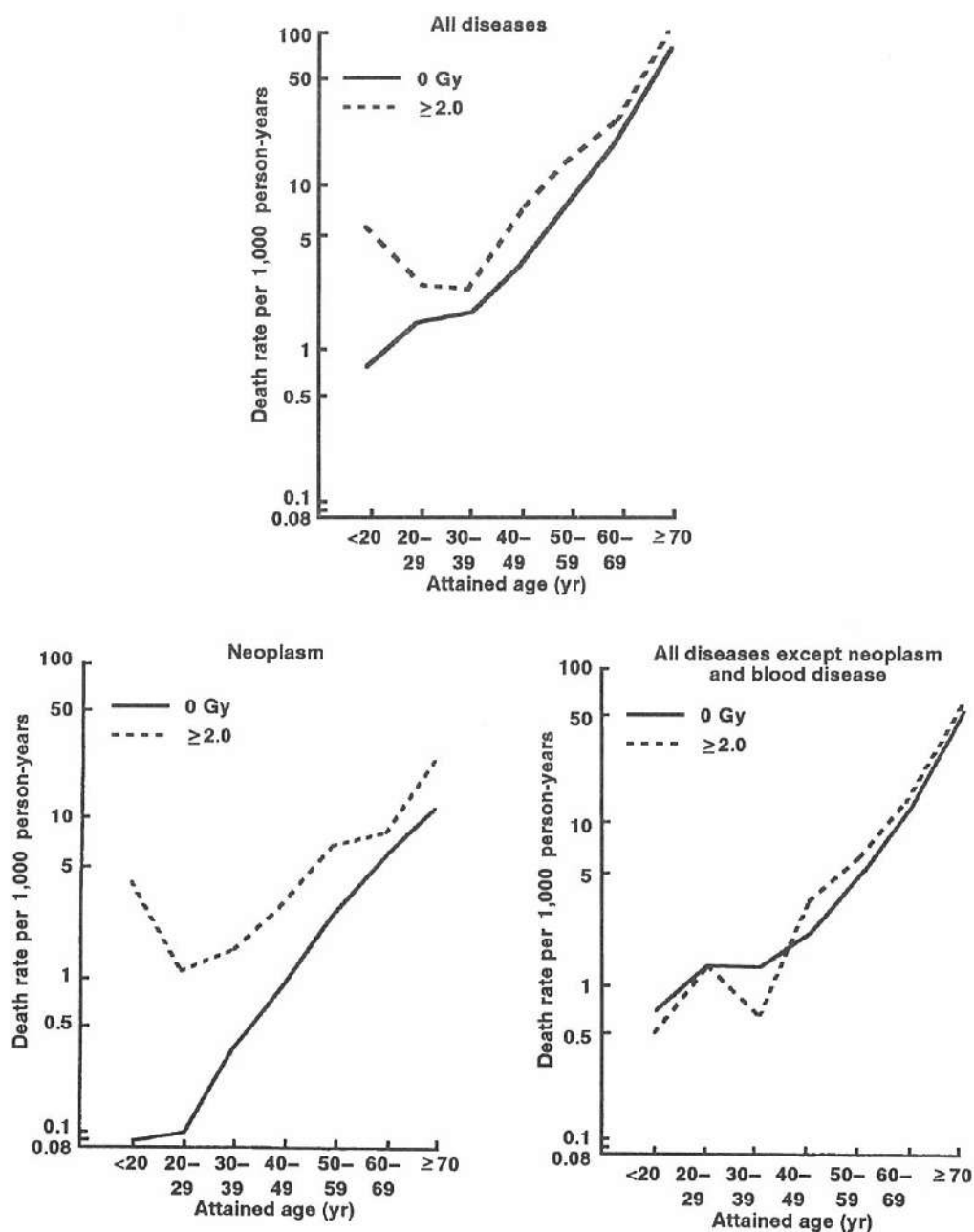
Life-shortening is expressed in years of life lost. We represented it by loss of life expectancy. Table 8 shows the results of the projection in regard to loss of life expectancy attributable to the additional cases of all diseases except neoplasm and blood disease among those exposed to 2 Gy and over. For reference, loss of life expectancy for malignant neoplasm for the same subjects ( $\geq 2$  Gy) is also shown. The loss of life expectancy is defined as the difference in life expectancies between the exposed and nonexposed groups. Life expectancy for the nonexposed was calculated by using the Japanese life table of 1985. A constant excess relative risk over all age and sex categories was assumed for those exposed to 2 Gy and over (average = 3.3 Gy). Excess relative risks are 0.10 and 1.29 for all diseases except neoplasm and blood disease and malignant neoplasm,<sup>2</sup> respectively. The calculated loss of male life expectancy at 0 years of age for all diseases except neoplasm and blood disease is 0.4 years, as contrasted to 3 years for malignant neoplasm.

**Table 8.** Projection of loss of life expectancy (in years) among survivors exposed to  $\geq 2$  Gy (mean dose = 3.3 Gy)

| Sex                                           | Age ATB (year) |      |      |      |      |      |      |      |
|-----------------------------------------------|----------------|------|------|------|------|------|------|------|
|                                               | 0              | 10   | 20   | 30   | 40   | 50   | 60   | 70   |
| All disease except neoplasm and blood disease |                |      |      |      |      |      |      |      |
| Male                                          | 0.42           | 0.42 | 0.42 | 0.40 | 0.37 | 0.30 | 0.21 | 0.06 |
| Female                                        | 0.32           | 0.31 | 0.31 | 0.30 | 0.28 | 0.25 | 0.18 | 0.05 |
| Malignant neoplasm                            |                |      |      |      |      |      |      |      |
| Male                                          | 2.91           | 2.90 | 2.87 | 2.79 | 2.55 | 1.92 | 1.03 | 0.17 |
| Female                                        | 2.17           | 2.16 | 2.12 | 1.99 | 1.71 | 1.27 | 0.68 | 0.12 |

NOTE: ATB = at the time of the bombings.

Figure 4. Age-specific death rates for all diseases, neoplasm, and all diseases except neoplasm and blood disease by radiation dose.



**Is the dose response for noncancer deaths the result of misdiagnosed cancer deaths?**

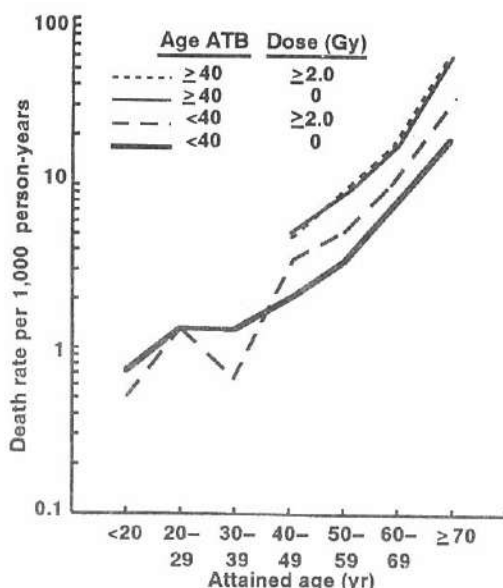
As stated before, the observed excess mortality from blood disease stemmed largely from misdiagnoses in the cause of death through the erroneous inclusion of cases of leukemia within this category. For all diseases other than neoplasm and blood disease a spurious positive dose response could arise through the inclusion of misclassified cases of radiation-related cancer. To examine this possibility, we compared the observed relative risk of noncancer mortality with the mortality expected assuming that (a) there was, in fact, no radiation-induced excess of noncancer deaths, but (b) the number of misdiagnosed cancer cases increased as the excess cancer risk increased with dose.

Table 9 shows the proportion of cancers observed at autopsy among deaths from all diseases except neoplasm and blood disease. Ten percent of reportedly noncancer deaths were found on autopsy to be cancer deaths, and although this proportion increased with dose, it was not statistically significant. The increase in the percentage of cancers among the noncancer death certificate cases from 10% (<1 Gy) to 18% ( $\geq 1$  Gy) is about what one would expect based on an observed relative risk of radiation-induced cancer of 1.8 for  $\geq 1$  Gy (mean dose = 2.1 Gy), suggesting that the probability of a classificatory error is not dose dependent, but the expected number of errors increases as the relative risk of cancer increases. Table 10 shows the proportion of cancer deaths based on autopsy among noncancer deaths by cause of death. The proportion varies from 5.5% (stroke) to 19.8% (liver cirrhosis).

We calculate the relative risk of a noncancer death being an erroneously assigned cancer death, assuming no radiation-related excess in noncancer deaths, as follows:

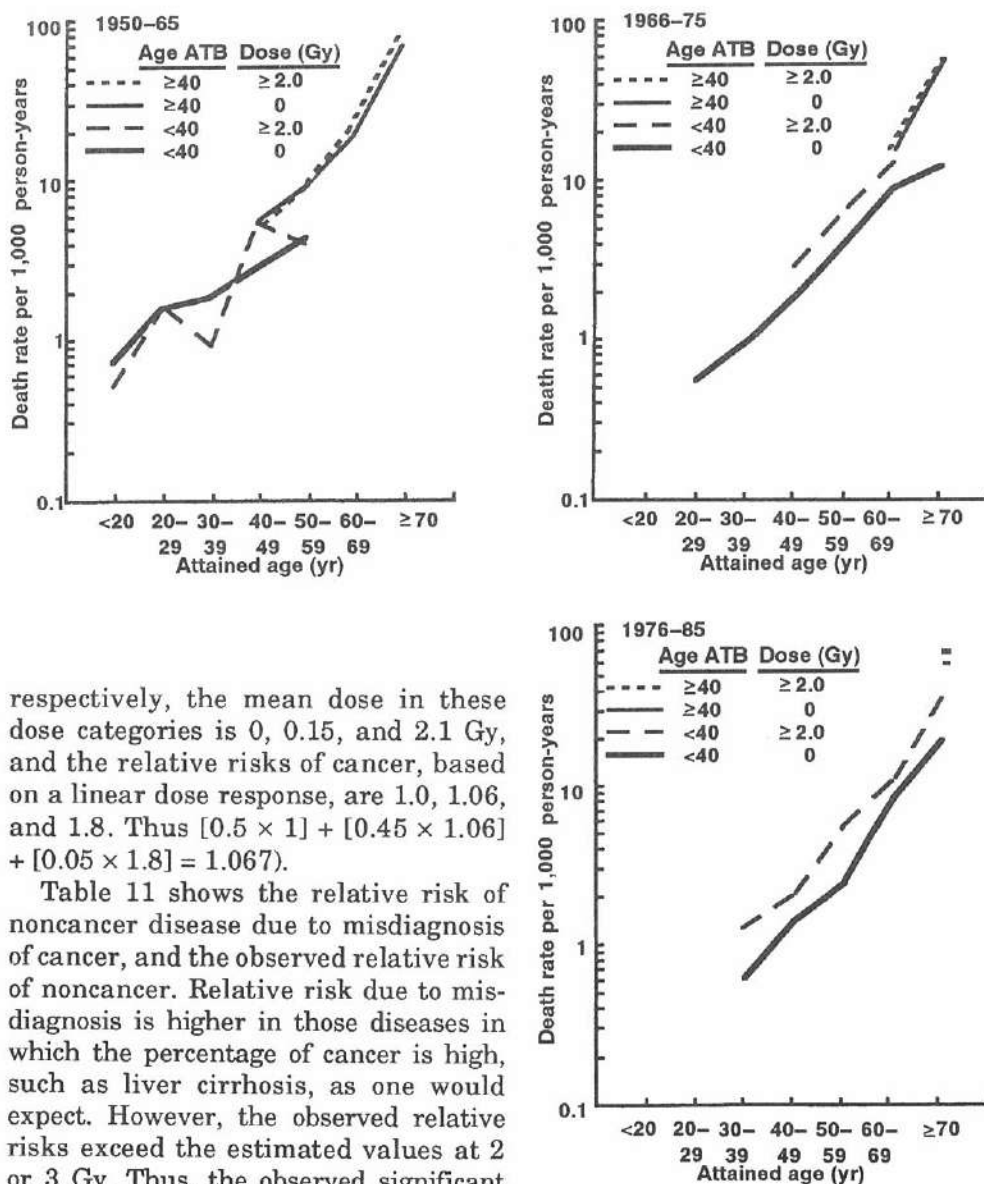
$$1 + (\text{excess RR of cancer}) \times (\text{percentage of cancer among noncancer deaths}) .$$

To calculate the expected relative risk, based solely on misdiagnosis, we used the relative risk for all cancers, reported in Part 2 of this series,<sup>2</sup> of 1.4, 1.8, and 2.2 at 1, 2, and 3 Gy, respectively. The percentage of cancer in the total autopsy series, 9.9%, was adjusted (divided by 1.067) to account for the fact that the autopsies also include exposed individuals (i.e., the distribution of autopsied subjects is 0.5, 0.45, and 0.05 for 0 Gy, 0.01–0.99 Gy, and  $\geq 1$  Gy,



**Figure 5A.** Age-specific death rates for all diseases except neoplasm and blood disease by radiation dose and age at the time of the bombings (ATB).

**Figure 5B.** Age-specific death rates for all diseases except neoplasm and blood disease by radiation dose, age at the time of the bombings (ATB), and period.



respectively, the mean dose in these dose categories is 0, 0.15, and 2.1 Gy, and the relative risks of cancer, based on a linear dose response, are 1.0, 1.06, and 1.8. Thus  $[0.5 \times 1] + [0.45 \times 1.06] + [0.05 \times 1.8] = 1.067$ .

Table 11 shows the relative risk of noncancer disease due to misdiagnosis of cancer, and the observed relative risk of noncancer. Relative risk due to misdiagnosis is higher in those diseases in which the percentage of cancer is high, such as liver cirrhosis, as one would expect. However, the observed relative risks exceed the estimated values at 2 or 3 Gy. Thus, the observed significant excess mortality at high doses cannot be entirely explained by the misclassification of cancer.

**Table 9.** Autopsy results for noncancer death certificate cases, all diseases except neoplasm and blood disease

| Radiation dose (Gy) | No. of deaths | No. of autopsies | Autopsy rate (%) | Cancer found on autopsy |      |
|---------------------|---------------|------------------|------------------|-------------------------|------|
|                     |               |                  |                  | No.                     | %    |
| Total               | 20,777        | 2610             | 12.6             | 251                     | 9.6  |
| 0                   | 9490          | 908              | 9.6              | 102                     | 11.2 |
| 0.01–0.99           | 10,507        | 1561             | 14.9             | 124                     | 7.9  |
| 1.00–1.99           | 506           | 93               | 18.4             | 19                      | 20.4 |
| ≥2.00               | 274           | 48               | 17.5             | 6                       | 12.5 |

9.2  
17.7

**Table 10.** Proportion of cancer deaths based on autopsy diagnosis among deaths stated to be due to noncancer causes on the death certificate

| Cause of death                                 | No. of deaths | No. of autopsies | Cancer found on autopsy |      |
|------------------------------------------------|---------------|------------------|-------------------------|------|
|                                                |               |                  | No.                     | %    |
| All diseases except neoplasm and blood disease | 20,777        | 2610             | 251                     | 9.6  |
| Circulatory disease                            | 11,164        | 1368             | 84                      | 6.1  |
| Stroke                                         | 6202          | 798              | 44                      | 5.5  |
| Heart disease                                  | 4962          | 570              | 40                      | 7.0  |
| Respiratory disease                            | 2036          | 244              | 31                      | 12.7 |
| Digestive disease                              | 2149          | 308              | 59                      | 19.2 |
| Liver cirrhosis                                | 697           | 121              | 24                      | 19.8 |

NOTE: Data for infectious and other diseases are not shown.

**Table 11.** Relative risk of noncancer death based solely on misdiagnosis from radiation-induced cancer assuming no excess in noncancer deaths

| Disease                                        | Relative risk |             |             |
|------------------------------------------------|---------------|-------------|-------------|
|                                                | 1 Gy          | 2 Gy        | 3 Gy        |
| All diseases except neoplasm and blood disease | 1.04 (1.04)   | 1.07 (1.17) | 1.11 (1.38) |
| Circulatory disease                            | 1.02 (1.05)   | 1.05 (1.21) | 1.07 (1.46) |
| Stroke                                         | 1.02          | 1.04        | 1.07        |
| Heart disease                                  | 1.03          | 1.05        | 1.08        |
| Digestive disease                              | 1.07 (1.09)   | 1.14 (1.38) | 1.22 (1.86) |
| Liver cirrhosis                                | 1.07          | 1.15        | 1.22        |

NOTE: Values within parentheses are the estimated relative risk (RR) of noncancer mortality based on model 5-4 of Appendix Tables 10 and 11 for age &lt; 40 at the time of the bombings (ATB), 1966–85. Model 5-4 is as follows:

$$RR = 1 + \alpha_{1j} \cdot d \cdot I(T \leq 1965) + \alpha_{2j} \cdot d^2 + \alpha_{3j} \cdot d^2 \cdot I(T \leq 1965),$$

where  $j$  = age ATB category;  $d$  is in gray; and  $I(T \leq 1965) = 1$  if the period is 1950–65 and 0 if the period is 1966–85.



## Discussion

It is important to examine the hypothesis that radiation shortens life through an increase in a variety of causes of death other than cancer. In our most recent previous analysis,<sup>3</sup> based on the revised T65D, the cumulative mortality from all causes except neoplasm, calculated by the life table method, did not in general increase with dose. Neither did analyses of individual disease categories show such an effect. However, it was noted<sup>3</sup> that the only evidence of a radiation-related effect on mortality from causes other than cancer came from the highest T65DR exposure group,  $\geq 4$  Gy. A significant elevation was seen for the entire cohort as well as in three of the combination groups (Hiroshima, females, and the 35–49 age groups).

With the accumulation of seven more years of follow-up beyond that available for the previous analysis and with the new dosimetry, we find stronger evidence of an excess in risk from noncancer mortality at doses of 2 Gy and over. In previous analyses of the LSS sample,<sup>3,9</sup> it was pointed out that the observed excess mortality from blood disease stemmed largely from misdiagnoses of the cause of death through the erroneous inclusion of cases of leukemia within this rubric. In the present analysis, when deaths from "blood disease" were compared with the leukemia registry in the period 1950–82, the same finding holds true (Appendix Table 12). Therefore, we have excluded blood disease from noncancer deaths in our analysis. Mortality from all diseases except neoplasm and blood disease shows a significant increase with dose for the entire period 1950–85 (Table 2). This increasing trend, however, is not linear but linear threshold. Furthermore, the dose response is different between follow-up intervals and age ATB. In the early period, it follows a linear-quadratic model, where the linear term is significantly negative and the quadratic term is significantly positive. In the later period, however, a linear-threshold dose response fits the data better. In addition, the recent increase seems to result from the younger (<40) age ATB groups (Figure 2). When the analysis was extended to specific disease categories (e.g., circulatory disease, respiratory disease, and digestive disease), the dose response in these disease categories generally exhibits the same tendency as that seen for all diseases except neoplasm and blood disease (Figure 3).

The present analyses are based on 83% of the 91,000 members in the LSS sample who have T65DR doses; however, recently DS86 doses have been estimated on an additional 12,000 or so persons, so that now the new doses are available on 95% of the sample. Preliminary analyses of this larger cohort do not alter the present results. However, we must await further follow-up to reach a definite conclusion as to the reality of this recent increase in noncancer mortality, since many members of the younger age ATB group have not yet entered those ages at which mortality normally increases appreciably.

It is not unreasonable to assume that the effects of radiation on cancer induction (which is presumed to be a stochastic phenomenon), and on noncancer mortality differ, and that the latter may follow a nonstochastic process with a threshold dose. However, given the recent evidence of a transforming gene in the atheromatous plaque,<sup>10</sup> the increase in cardiovascular disease is a particularly intriguing finding, and may suggest, if the association is real, that the effect of

ionizing radiation on atherosclerosis should be treated as a stochastic phenomenon. Further data will be especially interesting in this regard.

When the observations on deaths attributable to all diseases except neoplasms and blood diseases are displayed as a Gompertz curve (age at death specific mortality rate in a logarithmic scale), a significant increase is seen in the  $\geq 2$  Gy group (Figures 5A and 5B) especially for age ATB < 40.

The loss of life expectancy was calculated for both the cancer and noncancer cases. The calculated losses of life expectancy, on average, at 0 years of age are 0.4 and 3 years for noncancer and cancer, respectively. The higher value for cancer undoubtedly reflects the larger excess relative risk (sevenfold) and relatively earlier appearance of cancer death than noncancer death, though the background death rates are higher (three- to fourfold) for noncancer death. In the present analysis, we used the stationary population described in the 1985 Japanese life table, and cancer and noncancer death rates in 1985. Our estimated value should be close to, but not exactly the same as, that estimated for the LSS cohort *only* after all of the subjects have died. The life lost from a fatal cancer was estimated for 2.0 Gy and over (average = 3.3 Gy) in order to compare this value with that for noncancer death. Life lost at 1 Gy is 0 years from noncancer death, since the threshold dose was estimated to be 1.4 Gy, but 0.9 years for cancer deaths. This latter value is well within the range estimated in the UNSCEAR report.<sup>11</sup> However, the estimated life lost from radiation-related disease can be expected to vary greatly with the age composition and death rates in the background population. Therefore the estimated life lost we calculate should be seen as being merely a useful guide appropriate possibly only to the Japanese.

### ***Factors that may spuriously cause the dose effect on noncancer mortality***

The findings we have described, based as they are on death certificates, have their limitations, and a number of factors other than radiation could contribute to the apparent increase in noncancer deaths. Most significant, perhaps, is the possible erroneous attribution of radiation-related cancer deaths to other causes. To examine the impact of such errors on the observed increased relative risk of noncancer mortality, we have utilized the information on classification errors revealed by the autopsy and tumor registry data that are available as well as the clinical data provided by the Adult Health Study (AHS).

We have discussed the autopsy material in the Results section. Elsewhere, Sposto et al.<sup>12</sup> report a statistical analysis of these same data whose purpose is to determine whether the observed dose response in noncancer mortality can be attributed solely to misclassification of cancer deaths. He and his colleagues too conclude that the nonlinear dose response in noncancer mortality cannot be explained by simple misclassification of cancer into the noncancer category. Indeed, they conclude that "the significance of the noncancer dose response was relatively insensitive to underestimating the cancer misclassification rate, but sensitive to assuming that cancer misclassification was positively associated with dose." However, they, like we, find a positive association of misclassification with dose improbable since it would require the physician certifying the cause of death to know the dose, and for the most part the survivors themselves do not know their actual doses.

Since tumor registries exist in Hiroshima and Nagasaki, the tumor registry data for the period 1958 (when they began) through 1985 were also investigated as a source of material for this problem of misdiagnosis. The proportion of cancer included in all diseases except neoplasm and blood disease is lower than that based on autopsy data (see Appendix Tables 17A, 17B). Thus, if the relative risk of noncancer deaths is calculated using the tumor registry data, assuming no radiation-induced excess of noncancer deaths but that the number of misdiagnosed cancer cases increases as the excess cancer risk increases with dose, the risk should be lower than that derived from the autopsy series.

Other problems such as the accuracy of the death certificate, dosimetry change, place of death, and other confounding factors are discussed in detail in the Appendix. Briefly, none of these factors, singly at least, will explain the excess in noncancer deaths observed. We find the accuracy of the diagnosis of disease when the death certificate is compared with autopsy or clinical findings to be fairly good. For the autopsy findings, if not only the primary but the contributory causes of death are considered, the confirmation rates range from 69% (coronary heart diseases) to 86% (stroke) exclusive of such diagnoses as senility, nephritis and nephrosis (Appendix Table 13), and other infectious diseases except for tuberculosis that are either difficult to confirm at autopsy or cannot be confirmed (senility for example). It should be noted that these latter diseases, with the exception of senility, make a small contribution to the totality of causes of death.

When the causes of death as stated on the death certificates of members of the AHS exposed to 2 Gy or more were compared with the clinical diagnoses made at the biennial examinations, the confirmation rate was 83% for all causes of death and was also high for each separate cause (Appendix Table 14). These findings, while reassuring, obviously do not set to rest all of the uncertainties in diagnosis, and particularly so in those nonaccidental deaths that occurred suddenly.

### **Other studies**

Other studies with which these findings can be compared are few. However, the follow-up study of ankylosing spondylitis patients who received radiation therapy<sup>13</sup> suggests that there was a 51% increase in deaths from diseases other than neoplasm. The high mortality was not confined to those diseases recognized clinically to be associated with spondylitis, but was observed also for all other groups of disease, though to a lesser extent. The report,<sup>13</sup> however, concluded that the excess was likely to be associated with the disease itself rather than with X-ray treatment, since a similar excess was also observed in unirradiated patients.<sup>14</sup> However, it is worthwhile to mention that the excess in unirradiated patients was confined to males and that the excess in patients with X-ray treatment was higher among females, where an excess in unirradiated patients was not observed. This suggests that there may be a relationship between radiation therapy and mortality from diseases other than neoplasm not related to ankylosing spondylitis. Among U.S. radiologists,<sup>15</sup> a higher mortality has been reported not only from cancer but also from cardiovascular diseases and from other nonneoplastic diseases when compared with other medical specialists. Among British radiologists,<sup>16</sup> however, an increase in mortality from noncancer causes was not observed.

The findings we have described on heart disease are supported by an earlier study<sup>17</sup> of the incidence of stroke and coronary heart disease among the participants in the AHS in the years 1958 through 1974. It was conducted on cases ascertained on the bases of specific criteria using clinical findings including ECG results and autopsy, and did not depend simply on the clinical diagnosis made at the time of the AHS examination. This study showed the incidence to be significantly higher among women in Hiroshima who were heavily exposed, that is, who received a T65 dose of  $\geq 2.00$  Gy. However, since an exposure effect was not seen in women in Nagasaki or in men in either city, and since there was some evidence of a higher autopsy rate among the heavily exposed women in Hiroshima, this association was not widely accepted as real although it could not be explained by a confounding of any of the major cardiovascular risk factors such as smoking, an elevated level of serum cholesterol, or the occurrence of hypertension. This study has since been extended to include the years 1958 (when the AHS began) through 1986. The new results<sup>18</sup> confirm the earlier elevation seen in risk among heavily exposed women in Hiroshima, but now there is also a significantly elevated risk among Nagasaki men. It is also interesting to note that the period prevalence for liver cirrhosis, based on clinical diagnoses, appears to be increased among the participants in the AHS in the high dose groups.<sup>19</sup> These findings, although based on a substantially smaller sample, are consistent with the observations on mortality within the LSS sample as a whole.

### ***Comments on the arguments by Stewart and Kneale***

In two recent papers, Stewart and Kneale<sup>20,21</sup> have suggested that the LSS cohort of A-bomb survivors studied by RERF may be biased. This notion is derived from the fact that the LSS sample was established in 1950, and that deaths occurring before the follow-up studies, that is, during 1945–50, may have served to select survivors who were resistant to a radiation effect. In their analysis, based on the T65 doses, they found no radiation dose response in cardiovascular disease categories. They did, however, observe a U-shaped dose response for deaths in the general category of all nonneoplastic diseases other than cardiovascular disease. They also found that the negative downward slope for the lower doses was more pronounced in the earlier period, and decreased in time, while the upward slope at the higher doses, presumably ascribable to bone marrow scarring, remained relatively unchanged. This, they maintained, was consistent with their idea that the early survival or selection effects could cause an underestimation of cancer risk among A-bomb survivors.

It should be noted that it is difficult to characterize the general category “all diseases except neoplasm and cardiovascular disease,” since it includes many diseases that are unlikely to be related to immune competence, though Stewart and Kneale called this category “infectious disease.” However, the ICD category “infectious disease” consists of only “tuberculosis” and “other infectious disease.” We observe no dose response in these disease categories. It should be mentioned too that the earlier analysis<sup>3</sup> of deaths in the LSS sample specifically addressed tuberculosis. In that report, data from population surveys in the late 1940s were analyzed, and no relationship was observed between dose and death due to infectious disease.



Given Stewart and Kneale's contention that the A-bomb survivor data are biased, we have examined their hypothesis more closely with the present observations on mortality during 1950-85 and the new doses. We have further subdivided the disease categories and have sorted the data into three periods: 1950-65, 1966-75, and 1976-85. A summary of these results follows.

(1) Mortality from diseases of the circulatory system (cardiovascular disease) shows a significant increase with dose particularly for the younger age groups ATB in the recent period. Mortality from both stroke and circulatory disease other than stroke (i.e., heart disease) exhibits a significant increasing trend for the latest period. This finding is inconsistent with their findings showing no excess in cardiovascular disease mortality.

(2) Mortality from all diseases except neoplasm, cardiovascular disease, and blood disease (the latter was excluded because of the frequency of misdiagnosis of blood disease based on death certificates) suggests a U-shaped dose response function for the total period and it is clearly significant in the early years, as Stewart and Kneale observed. However, this tendency was seen only for age 40 and over ATB in the period 1950-65. Further division of this disease category reveals that a similar, significant U-shaped dose response is observed only for the "other" disease category in which the majority of deaths were attributed to senility. This is in general a poorly understood or ill-defined condition, but it seems unlikely to be related to immune competence or to bone marrow damage as their hypothesis would suggest. Incidentally, for circulatory disease, a U-shaped dose response was observed for age 40 and over ATB in the early period as well. This finding is inconsistent with Stewart and Kneale's argument that the selection effect is particularly important for infectious diseases and that there is no evidence to support a selection effect for circulatory disease.

(3) The critical question then, is whether this selection effect is significant with respect to the interpretation of cancer risk. A deficit in noncancer mortality is observed in the early period and the possible confounding with cancer mortality is likely to be confined to the same period. In epidemiological studies in general, the "healthy worker effect" does not have much impact on cancer mortality after several years of follow-up.<sup>22-24</sup> Since radiation-induced cancers (with the exception of leukemia) are observed primarily in the later period, the healthy worker effect would not be applicable. Incidentally, the lifetime risks of leukemia and all cancers except leukemia were calculated after correction for the selection effect observed before 1966 among those who were 40 years of age or more ATB. The adjusted lifetime risks of leukemia and all cancers except leukemia increased by only 7% and 5%, respectively, as compared with the unadjusted risks.<sup>25</sup> Little and Charles<sup>26</sup> also have recently analyzed the selection bias in the A-bomb survivors using published data. They too concluded that there is no evidence to suggest that selection on this basis might confer correspondingly reduced susceptibility to radiation-induced cancer.

UNSCEAR's recent comparison<sup>11</sup> of the risks of causes in the LSS with those in the ankylosing spondylitis patients and women treated for a cervical malignancy shows reasonably good agreement between the LSS risks and those obtained from the use of medical X-ray data. Indeed, the risks in the LSS sample are generally higher than the others, which is inconsistent with Stewart and Kneale's argument.

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## Appendix. Discussion of Factors that May Spuriously Cause the Dose Effect on Noncancer Mortality

### *Accuracy of the underlying cause of death cited on the death certificate*

Perforce, in the present analyses, we have accepted at face value the underlying cause (or causes) of death cited on the death certificate. It must be borne in mind, however, that many causes of death so reported are inaccurate, and these inaccuracies could obscure a true radiation effect or create a spurious one. It should be further noted that these inaccuracies are not unique to this study. They plague, to a greater or lesser degree, all epidemiological uses of death certificates.

To provide some insight into the degree of inaccuracy in the present instance, we have compared the statements on the death certificates with the findings at autopsy for all of those deaths in the entire LSS sample in which an autopsy occurred at ABCC-RERF during the period 1950-85.<sup>27</sup> Appendix Table 13 presents the confirmation and detection rates this comparison revealed. It will be noted that these rates are lower generally than those seen when cancer is the cause of death.<sup>28</sup> But, *when not only the primary cause but the contributory causes are considered, the accuracy of the diagnoses on the death certificate is fairly good.* Justification for considering all causes, principal and contributory, in assessing accuracy rests largely on the variation among pathologists in their selection of the principal cause of death when several possible explanations exist. The obvious implication of these reporting inaccuracies, nonetheless, is that cause-specific analyses will vary, possibly substantially, in their reliability. However, if accuracy is not related to dose, and we have no evidence that it is, then the findings reported are acceptable approximations to the truth.

The clinical diagnoses at the AHS examination were also collated with the cause of death among those members of the AHS sample with doses of 2 Gy or higher. The results are shown in Appendix Table 14. It is possible that diseases that could occur suddenly, that is, a stroke or heart attack (coronary heart disease), may have occurred after the last symptom-free examination under the AHS program. Similarly, if the duration from the last examination to death is fairly long, say 10 years, the cause of death might not be related to the diseases found at the last AHS examination. Accordingly, such deaths were categorized as "undetermined" and 59 were excluded from the following observations. The larger proportion of the undetermined deaths were said to be attributable to stroke and heart disease. For the remaining deaths, if the causes of death matched the clinical diagnosis in ICD disease category at any cycle of the AHS examination, directly or "in the established sequence," the cause of death was regarded as "confirmed" by a clinical diagnosis. The confirmation rate thus determined is 83% for all causes of deaths and is also high for each separate cause of death.

For liver cirrhosis, the death certificates were also compared to the total examined AHS sample in Hiroshima using all information available,<sup>29</sup> that is, autopsy findings, clinical diagnosis, clinical laboratory findings, including liver function test and HBs antigen, and the epidemiological survey information, (history of liver cirrhosis and alcohol intake). The results are given in Appendix Table 15, where the priority assigned to a given source of information decreases from the top when more than two sources of material were available.

The number of cases confirmed by either autopsy findings or AHS diagnosis is  $19 + 18 = 37$ , or 48.1% of 77 deaths ascribed to liver cirrhosis on the death certificate. When the source material was extended to include less certain sources of information, such as a past history in the epidemiological survey, the total number of confirmed cases increases to 57, or 74.0%. Sixteen of 23 autopsy cases (69.6%) were confirmed by principal pathological diagnosis, as shown in Part B of Appendix Table 15.

### **Misdiagnosis of cancer deaths**

Some proportion of the excess deaths from noncancer diseases could be attributable to the inclusion of misclassified cases of radiation-related cancer. To investigate this possibility, autopsy findings and cancer cases, registered in the Hiroshima and Nagasaki tumor registries, were collated with the stated underlying cause of death.

**Autopsy data.** A systematic autopsy procurement program began at ABCC in 1961. In the early years the autopsy rate was relatively high, 30%–40%, but it decreased with time and <20% of deaths occurring in 1975 were autopsied. At this time the systematic procurement of autopsies was stopped. Over the years 1966–85 the autopsy rate was very low, around 10%–20%, and particularly so for survivors in the younger age ATB groups. Unfortunately for our purposes, these were the years when the significant excess mortality from all diseases except neoplasm and blood disease appeared. Thus, the recent autopsy data, though valuable in their own right, provide a limited basis on which to examine the possible role of misdiagnosed cancer cases in the apparent increase in deaths ascribed to other causes. Nevertheless, using the data that are available, we have attempted to examine the effect of missed diagnoses on the dose-response relationships among the young ATB (<40) in the period 1966–85. Using the values in the lower panel in Appendix Table 16A, we estimate that among the  $67 - 42.9 = 24.1$  excess deaths in the  $\geq 2$  Gy group, the number of possibly misdiagnosed cases of cancer would be  $67 \times 1/10$  (1/10 represents the proportion of observed cancer cases among all deaths in this rubric) = 6.7. Thus, not all of the excess seen in this category of death can be explained by the inclusion of misdiagnosed cases of cancer. When the observations were extended to all ages ATB and all periods combined, similar results were obtained, but the effect is less statistically significant (Appendix Table 16A).

For heart disease (Appendix Table 16B), the estimated number of deaths from cancer erroneously included in the total of 44 deaths in the  $\geq 1$  Gy group is  $44 \times 1/10$  (1/10 represents the proportion of observed cancer cases among all deaths in this dose group attributed to heart disease) = 4.4. Since the excess number of deaths in the  $\geq 1$  Gy group is 7.9 ( $44 - 36.1$ ), not all of this excess can be explained by the inclusion of misdiagnosed cases of cancer. It is important to note that this estimate, 4.4, assumes that all cancers in the  $\geq 1$  Gy group are radiation related; whereas, in fact, *at most 40% are*.

For liver cirrhosis (Appendix Table 16C), among the  $20 - 12.5 = 7.5$  excess deaths in the  $\geq 1$  Gy group, the number of cancer deaths erroneously attributed to liver cirrhosis would be at most  $20 \times 1/2$  (1/2 represents the actual proportion of cancer cases observed among the deaths attributed to liver cirrhosis) = 10. In

the worst case, that is, if we assumed that all cancer cases in this rubric were radiation-related, there would be no dose-response effect.

For comparison with the results described above, similar analyses are included in Appendix Tables 16D–F for circulatory disease (including heart disease), coronary heart disease, and stroke.

**Tumor registry data.** Appendix Table 17A shows the number and proportion of cancers reported in the tumor registry for the various dose groups. Since the significant excess mortality from all diseases except neoplasm and blood disease appeared after 1965 and in the younger age ATB (<40) group, the proportions of cancer reported in the tumor registry in this group are also shown. The proportion of cancer is 4.3% overall and is higher in the high-dose group. The ratio of the proportion of cancers in the  $\geq 2$  Gy group to that in the 0 Gy group is about 2. This value is close to the relative risk of cancer for the  $\geq 2$  Gy group. The proportions of cancer seen in 1966–85 among individuals under 40 ATB are almost the same as those in the total period for all ages. The tendency of the proportion to be higher in the high-dose group, however, is less clear in this time and age group. Since these proportions are lower than those observed in the autopsy series (Table 9), even if the relative risk of noncancer mortality based solely on misdiagnosis from radiation-induced cancer is calculated using tumor registry data, it is lower than in the autopsy series (Table 11).

**Clinical data.** Similarly, the information on cancer, based on clinical diagnosis at physical examination (the majority were duplicated with tumor registry data, naturally), revealed 12 cancer cases, which is 9.0% of the 133 patients, who were exposed to  $\geq 2.0$  Gy.

### **Place of death**

We have also examined the possibility of bias related to the place of death, that is to say, whether death occurred at home or in a hospital.

As shown in Appendix Table 18A, the proportion of deaths occurring in a hospital differs by radiation dose, year of death, age ATB, and assigned cause. Deaths occurred relatively more frequently in a hospital within the high dose group ( $\geq 2.0$  Gy), in the more recent period (1976–85), in the younger age ATB group (<40), and for malignant neoplasm.

The greater proportion of deaths occurring in a hospital in the high dose group (vs. the 0 Gy group) is reflected in a higher estimated relative risk at 1 Gy for “deaths at hospital” than that for “deaths at home” for specific causes as well as for all noncancer deaths combined. A similar, but less significant tendency is observed for all cancer except leukemia (Appendix Table 18B).

The accuracy of causes of death on death certificates for specific diseases differs by place of death as shown in Appendix Table 18C in terms of the confirmation and detection rates.

As previously mentioned, place of death is confounded by radiation dose, and it is worthwhile, therefore, to examine the effect on the dose response of making an adjustment for place of death in terms of a correction factor for the accuracy of death certificate diagnoses (ratio of confirmation to detection rates), as shown in Appendix Table 18C. Since the data available for such an adjustment are limited to certain diseases, adjustments were made only for deaths attributed to

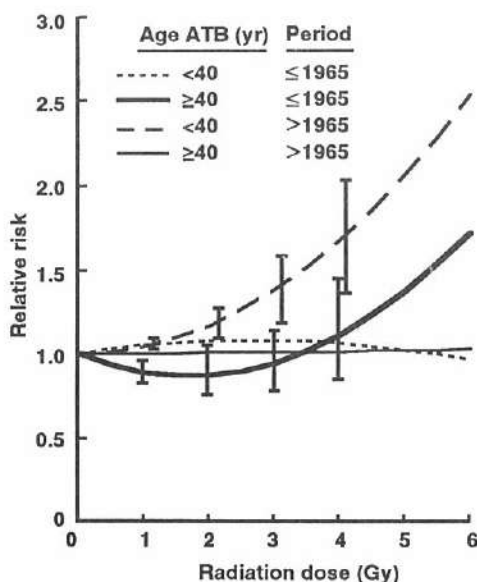
heart disease and liver cirrhosis. It will be noted that the relative risks of heart disease and liver cirrhosis (total period, all ages ATB) in the  $\geq 2$  Gy group, which were 1.34, and 1.66, are 1.26 and 1.60 after adjustment, respectively (see Appendix Table 18D). Thus, in summary, an excess relative risk still occurs after adjustment for both heart disease and liver cirrhosis.

### General risk factors

It is well known that noncancer mortality is related to factors other than radiation, such as the association between smoking and mortality from cardiovascular disease, and the association between alcohol intake and mortality due to liver cirrhosis. Accordingly, if the high radiation dose group includes a larger proportion of subjects having these risk factors than the low dose groups, spurious radiation effects could arise. So far, no positive correlation between radiation dose and smoking or alcohol intake has been observed in this cohort.<sup>17,30</sup> Nonetheless, further investigations of other possible confounding factors as well as of the interaction between radiation and other risk factors, if any, are obviously needed.

### DS86 subcohort

The present analyses are based on 83% of the 91,000 members of the LSS sample who have a T65DR dose. It is conceivable that one of the reasons for the excess mortality observed in the present report is the fact that these analyses are limited to the DS86 subcohort. However, recently doses have been estimated on an additional 12,000 or so persons so that doses are now available on 95% of the sample. The relative risks of this larger cohort do not differ from those seen in the DS86 subcohort.



**Appendix Figure 1.** Estimated dose-response curve for all diseases except neoplasm and blood disease. The bars indicate the 90% confidence interval. ATB = at the time of the bombings.

Appendix Table 1. Number of deaths by cause of death

| Cause of death                                    | No. of deaths | ICD 9th code          |
|---------------------------------------------------|---------------|-----------------------|
| <b>All diseases except neoplasm</b>               | <b>20,923</b> |                       |
| <i>Infectious disease</i>                         | 1413          | 001-139               |
| Tuberculosis                                      | 1151          | 010-018               |
| Other infectious disease                          | 262           | (001-139)-(010-018)   |
| <i>Blood disease</i>                              | 146           | 280-289               |
| <i>Circulatory disease</i>                        | 11,164        | 390-459               |
| Stroke                                            | 6202          | 430-438               |
| Heart disease (Circulatory disease except stroke) | 4962          | 390-429, 440-459      |
| Rheumatic heart disease                           | 180           | 390-398               |
| Hypertensive heart disease                        | 626           | 401-405               |
| Other hypertensive disease                        | 337           | 401, 403, 405         |
| Coronary heart disease                            | 1765          | 410-414               |
| Endocarditis                                      | 297           | 424                   |
| Cardiac insufficiency                             | 1095          | 428                   |
| Other heart disease                               | 385           | 415-423, 425-427, 429 |
| Other circulatory disease                         | 277           | 440-458               |
| <i>Respiratory disease</i>                        | 2036          | 460-519               |
| Acute bronchitis                                  | 57            | 446.0                 |
| Pneumonia                                         | 1233          | 480-486               |
| Influenza                                         | 44            | 487                   |
| Chronic bronchitis                                | 191           | 490, 491              |
| Emphysema                                         | 108           | 492                   |
| Asthma                                            | 329           | 493                   |
| Other                                             | 74            |                       |
| <i>Digestive disease</i>                          | 2149          | 520-579               |
| Peptic ulcer                                      | 392           | 531-533               |
| Appendicitis                                      | 27            | 540-543               |

Continued



**Appendix Table 1. Continued**

| Cause of death                                   | No. of deaths | ICD 9th code            |
|--------------------------------------------------|---------------|-------------------------|
| Intestinal obstruction                           | 137           | 550–553, 560            |
| Gastritis                                        | 290           | 535, 555, 556, 558, 562 |
| Liver cirrhosis                                  | 697           | 571                     |
| Other liver disease                              | 168           | 570, 572, 573           |
| Other                                            | 438           |                         |
| <i>Urinary disease</i>                           | 513           | 580–599                 |
| Acute nephritis, nephrosis                       | 107           | 580, 581, 584           |
| Other urinary disease                            | 406           | 582, 583, 585–589       |
| <i>Other</i>                                     | 3502          | The rest                |
| Senility                                         | 1565          | 797                     |
| Other                                            | 1937          |                         |
| <b>Neoplasm</b>                                  | 6224          |                         |
| <i>Malignant neoplasm</i>                        | 5936          | 140–208                 |
| <i>Neoplasm of benign and unspecified nature</i> | 288           | 210–239                 |
| <b>External cause of death</b>                   | 1515          | E800–E999               |
| <i>Accident</i>                                  | 932           | E800–E949               |
| <i>Suicide</i>                                   | 527           | E950–E959               |
| <i>Homicide</i>                                  | 34            | E960–E969               |
| <i>Other external causes</i>                     | 22            | E970–E999               |
| <b>Unknown cause of death</b>                    | 75            |                         |
| <b>Total (all causes of death)</b>               | 28,737        |                         |

Appendix Table 2A. Number of person-years at risk, sexes combined

| Period  | Age ATB | Radiation Dose (Gray) |        |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|--------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0      | .01<br>-.05 | .05<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 2185336               | 984271 | 553960      | 119991      | 148869      | 188322      | 102709      | 55281         | 18311         | 5923          | 6919  |
|         | 0-9     | 549018                | 238281 | 180917      | 30765       | 38031       | 44878       | 19879       | 10577         | 3405          | 1090          | 1193  |
|         | 10-19   | 497893                | 243257 | 111655      | 25988       | 28791       | 39838       | 24623       | 13581         | 5634          | 2278          | 2269  |
|         | 20-29   | 320042                | 140542 | 80740       | 17483       | 22348       | 27326       | 16660       | 9811          | 3317          | 912           | 1104  |
|         | 30-39   | 335011                | 145483 | 84791       | 19039       | 24128       | 32187       | 16248       | 8827          | 2569          | 722           | 1017  |
|         | 40-49   | 298752                | 133394 | 69923       | 16287       | 23522       | 27095       | 16207       | 8310          | 2444          | 681           | 889   |
|         | 50+     | 184622                | 83313  | 45935       | 10430       | 12850       | 18998       | 9092        | 4374          | 942           | 241           | 447   |
| 1950-55 | Total   | 388982                | 175299 | 98148       | 21183       | 26618       | 33632       | 18496       | 9977          | 3272          | 1058          | 1302  |
|         | 0-9     | 83250                 | 36166  | 24322       | 4654        | 5767        | 6799        | 3020        | 1621          | 544           | 166           | 191   |
|         | 10-19   | 77233                 | 37759  | 17298       | 3995        | 4430        | 6177        | 3839        | 2140          | 876           | 361           | 357   |
|         | 20-29   | 50694                 | 22217  | 12778       | 2745        | 3526        | 4365        | 2619        | 1575          | 541           | 148           | 180   |
|         | 30-39   | 56681                 | 24529  | 14432       | 3213        | 4074        | 5323        | 2810        | 1484          | 474           | 142           | 199   |
|         | 40-49   | 60585                 | 27039  | 14168       | 3291        | 4679        | 5542        | 3267        | 1729          | 522           | 139           | 210   |
|         | 50+     | 80540                 | 27588  | 15149       | 3287        | 4143        | 5426        | 2941        | 1427          | 315           | 98            | 165   |
| 1956-60 | Total   | 350755                | 157785 | 88486       | 19247       | 24093       | 30355       | 16719       | 9028          | 2959          | 936           | 1146  |
|         | 0-9     | 78817                 | 34252  | 23050       | 4414        | 5452        | 6428        | 2881        | 1529          | 507           | 155           | 170   |
|         | 10-19   | 72466                 | 35350  | 16246       | 3783        | 4178        | 5807        | 3600        | 2001          | 825           | 335           | 340   |
|         | 20-29   | 47424                 | 20780  | 11958       | 2586        | 3301        | 4070        | 2483        | 1461          | 500           | 140           | 165   |
|         | 30-39   | 52582                 | 22765  | 13364       | 2998        | 3801        | 4959        | 2594        | 1380          | 426           | 122           | 172   |
|         | 40-49   | 54101                 | 24124  | 12659       | 2910        | 4204        | 4926        | 2856        | 1551          | 480           | 125           | 188   |
|         | 50+     | 45364                 | 20514  | 11209       | 2556        | 3158        | 4165        | 2245        | 1108          | 241           | 60            | 110   |
| 1961-65 | Total   | 330790                | 148816 | 83501       | 18175       | 22744       | 28599       | 15730       | 8487          | 2791          | 877           | 1070  |
|         | 0-9     | 78348                 | 34025  | 22943       | 4395        | 5428        | 6399        | 2838        | 1514          | 482           | 155           | 170   |
|         | 10-19   | 71620                 | 34936  | 18082       | 3742        | 4146        | 5720        | 3545        | 1961          | 816           | 330           | 340   |
|         | 20-29   | 46653                 | 20468  | 11733       | 2551        | 3261        | 3991        | 2428        | 1431          | 493           | 131           | 165   |
|         | 30-39   | 50926                 | 22111  | 12897       | 2889        | 3657        | 4844        | 2503        | 1346          | 405           | 110           | 165   |
|         | 40-49   | 49902                 | 22292  | 11638       | 2692        | 3925        | 4525        | 2728        | 1405          | 427           | 111           | 159   |
|         | 50+     | 33341                 | 14984  | 8208        | 1906        | 2325        | 3120        | 1688        | 830           | 169           | 40            | 71    |
| 1966-70 | Total   | 310411                | 139893 | 78383       | 17100       | 21361       | 26894       | 14659       | 7869          | 2619          | 843           | 988   |
|         | 0-9     | 77936                 | 33796  | 22866       | 4373        | 5405        | 6371        | 2823        | 1505          | 473           | 155           | 189   |
|         | 10-19   | 70860                 | 34612  | 15902       | 3698        | 4093        | 5653        | 3504        | 1924          | 813           | 325           | 338   |
|         | 20-29   | 45780                 | 20124  | 11500       | 2507        | 3207        | 3909        | 2385        | 1381          | 476           | 130           | 162   |
|         | 30-39   | 48752                 | 21214  | 12258       | 2764        | 3525        | 4673        | 2385        | 1302          | 374           | 106           | 152   |
|         | 40-49   | 44682                 | 20007  | 10323       | 2434        | 3584        | 4055        | 2434        | 1243          | 371           | 104           | 128   |
|         | 50+     | 22400                 | 10142  | 5535        | 1326        | 1549        | 2033        | 1127        | 514           | 112           | 24            | 40    |
| 1971-75 | Total   | 289580                | 130438 | 73458       | 16011       | 19907       | 24820       | 13551       | 7271          | 2431          | 793           | 901   |
|         | 0-9     | 77452                 | 33560  | 22757       | 4337        | 5374        | 6339        | 2802        | 1492          | 470           | 155           | 185   |
|         | 10-19   | 69881                 | 34155  | 15656       | 3672        | 4040        | 5580        | 3454        | 1890          | 795           | 320           | 319   |
|         | 20-29   | 44709                 | 19670  | 11277       | 2437        | 3112        | 3796        | 2344        | 1334          | 458           | 125           | 155   |
|         | 30-39   | 45948                 | 19997  | 11564       | 2637        | 3320        | 4439        | 2204        | 1219          | 341           | 93            | 133   |
|         | 40-49   | 38096                 | 16979  | 8876        | 2127        | 3082        | 3418        | 2093        | 1040          | 301           | 85            | 96    |
|         | 50+     | 13494                 | 6077   | 3327        | 801         | 978         | 1248        | 654         | 296           | 66            | 15            | 32    |
| 1976-80 | Total   | 268137                | 120730 | 68599       | 14766       | 18279       | 23046       | 12338       | 6621          | 2219          | 738           | 800   |
|         | 0-9     | 76956                 | 33380  | 22593       | 4309        | 5337        | 6295        | 2786        | 1470          | 468           | 154           | 185   |
|         | 10-19   | 68671                 | 33596  | 15402       | 3802        | 3987        | 5495        | 3375        | 1844          | 766           | 310           | 295   |
|         | 20-29   | 43284                 | 19026  | 10963       | 2376        | 3016        | 3687        | 2252        | 1257          | 440           | 120           | 147   |
|         | 30-39   | 42419                 | 18466  | 10702       | 2417        | 3052        | 4168        | 2007        | 1115          | 301           | 82            | 110   |
|         | 40-49   | 30042                 | 13333  | 7190        | 1676        | 2378        | 2711        | 1612        | 792           | 215           | 69            | 85    |
|         | 50+     | 6765                  | 2929   | 1750        | 386         | 510         | 690         | 308         | 144           | 29            | 3             | 18    |
| 1981-85 | Total   | 248881                | 111310 | 63385       | 13508       | 16668       | 21175       | 11216       | 6007          | 2021          | 680           | 712   |
|         | 0-9     | 76256                 | 33102  | 22386       | 4284        | 5267        | 6246        | 2750        | 1445          | 462           | 150           | 163   |
|         | 10-19   | 67162                 | 32848  | 15068       | 3495        | 3919        | 5405        | 3305        | 1802          | 742           | 297           | 280   |
|         | 20-29   | 41499                 | 18259  | 10529       | 2281        | 2924        | 3508        | 2168        | 1171          | 410           | 118           | 130   |
|         | 30-39   | 37702                 | 16400  | 9574        | 2120        | 2700        | 3781        | 1745        | 982           | 247           | 65            | 87    |
|         | 40-49   | 21344                 | 8621   | 5070        | 1158        | 1669        | 1919        | 1116        | 549           | 149           | 48            | 43    |
|         | 50+     | 2718                  | 1080   | 758         | 169         | 188         | 316         | 131         | 57            | 10            | 0             | 10    |

Appendix Table 2B. Number of person-years at risk, males

| Period  | Age ATB | Radiation Dose (Gray) |        |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|--------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0      | .01<br>-.05 | .05<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 834895                | 397381 | 195972      | 46969       | 53983       | 68679       | 36529       | 22583         | 7016          | 2460          | 3323  |
|         | 0-9     | 268107                | 117945 | 77314       | 14903       | 18683       | 21540       | 9614        | 5429          | 1635          | 593           | 450   |
|         | 10-19   | 212988                | 110233 | 43413       | 11721       | 11278       | 18509       | 8943        | 5774          | 2763          | 932           | 1401  |
|         | 20-29   | 65622                 | 31847  | 14343       | 3818        | 3985        | 5088        | 3215        | 2230          | 587           | 189           | 320   |
|         | 30-39   | 98454                 | 48410  | 20467       | 5680        | 5923        | 9014        | 4654        | 2973          | 622           | 301           | 409   |
|         | 40-49   | 114493                | 54037  | 23524       | 6490        | 8792        | 9954        | 6226        | 3810          | 895           | 218           | 508   |
|         | 50+     | 75253                 | 34911  | 16911       | 4357        | 5322        | 6534        | 3877        | 2367          | 513           | 227           | 235   |
| 1950-55 | Total   | 154800                | 73892  | 35996       | 8584        | 9988        | 12819       | 6951        | 4328          | 1313          | 488           | 680   |
|         | 0-9     | 40852                 | 17999  | 11733       | 2269        | 2833        | 3277        | 1467        | 838           | 272           | 89            | 76    |
|         | 10-19   | 33485                 | 17342  | 8838        | 1810        | 1751        | 2569        | 1434        | 915           | 431           | 155           | 221   |
|         | 20-29   | 10848                 | 5236   | 2383        | 616         | 670         | 852         | 528         | 388           | 89            | 33            | 53    |
|         | 30-39   | 17658                 | 8595   | 3739        | 997         | 1083        | 1573        | 861         | 530           | 124           | 63            | 94    |
|         | 40-49   | 25355                 | 11994  | 5209        | 1433        | 1861        | 2260        | 1358        | 855           | 223           | 43            | 121   |
|         | 50+     | 26623                 | 12527  | 6096        | 1460        | 1791        | 2289        | 1302        | 803           | 173           | 85            | 97    |
| 1956-60 | Total   | 137446                | 65306  | 31971       | 7713        | 8929        | 11341       | 6187        | 3847          | 1173          | 408           | 574   |
|         | 0-9     | 38618                 | 17015  | 11102       | 2151        | 2681        | 3096        | 1386        | 786           | 252           | 86            | 85    |
|         | 10-19   | 31242                 | 16141  | 6395        | 1713        | 1648        | 2410        | 1328        | 848           | 409           | 140           | 210   |
|         | 20-29   | 10022                 | 4838   | 2202        | 578         | 620         | 773         | 488         | 357           | 85            | 30            | 50    |
|         | 30-39   | 16225                 | 7915   | 3436        | 929         | 993         | 1443        | 795         | 482           | 107           | 51            | 75    |
|         | 40-49   | 22193                 | 10496  | 4566        | 1230        | 1654        | 1951        | 1213        | 750           | 185           | 40            | 108   |
|         | 50+     | 19145                 | 8900   | 4270        | 1112        | 1334        | 1869        | 976         | 623           | 136           | 60            | 86    |
| 1961-65 | Total   | 127636                | 60703  | 29759       | 7194        | 8278        | 10487       | 5734        | 3522          | 1065          | 367           | 528   |
|         | 0-9     | 38298                 | 16861  | 11030       | 2137        | 2667        | 3079        | 1371        | 775           | 228           | 85            | 85    |
|         | 10-19   | 30804                 | 15919  | 6307        | 1696        | 1627        | 2381        | 1296        | 832           | 401           | 135           | 210   |
|         | 20-29   | 9776                  | 4736   | 2124        | 568         | 611         | 753         | 477         | 345           | 85            | 26            | 50    |
|         | 30-39   | 15583                 | 7637   | 3266        | 889         | 938         | 1398        | 760         | 462           | 100           | 45            | 70    |
|         | 40-49   | 19893                 | 9434   | 4097        | 1111        | 1504        | 1704        | 1095        | 658           | 162           | 36            | 92    |
|         | 50+     | 13302                 | 6117   | 2935        | 793         | 931         | 1173        | 735         | 449           | 89            | 40            | 41    |
| 1966-70 | Total   | 117795                | 56150  | 27492       | 6668        | 7679        | 9623        | 5205        | 3180          | 978           | 343           | 477   |
|         | 0-9     | 38048                 | 16723  | 10984       | 2123        | 2649        | 3062        | 1365        | 771           | 223           | 85            | 64    |
|         | 10-19   | 30377                 | 15722  | 6202        | 1679        | 1595        | 2348        | 1272        | 819           | 399           | 132           | 210   |
|         | 20-29   | 9457                  | 4603   | 2044        | 547         | 580         | 729         | 467         | 327           | 85            | 25            | 50    |
|         | 30-39   | 14553                 | 7192   | 2994        | 829         | 888         | 1320        | 898         | 438           | 87            | 45            | 61    |
|         | 40-49   | 16943                 | 8023   | 3436        | 976         | 1341        | 1455        | 917         | 562           | 127           | 33            | 73    |
|         | 50+     | 8417                  | 3886   | 1833        | 515         | 626         | 709         | 485         | 284           | 56            | 24            | 19    |
| 1971-75 | Total   | 108255                | 51573  | 25463       | 6138        | 7026        | 8851        | 4676        | 2872          | 910           | 326           | 418   |
|         | 0-9     | 37760                 | 16589  | 10924       | 2092        | 2635        | 3037        | 1354        | 765           | 220           | 85            | 60    |
|         | 10-19   | 29804                 | 15438  | 6049        | 1681        | 1574        | 2316        | 1244        | 805           | 389           | 130           | 199   |
|         | 20-29   | 9084                  | 4432   | 1965        | 531         | 539         | 702         | 452         | 309           | 85            | 25            | 45    |
|         | 30-39   | 13179                 | 6518   | 2694        | 771         | 797         | 1219        | 605         | 404           | 80            | 41            | 48    |
|         | 40-49   | 13861                 | 6408   | 2770        | 806         | 1103        | 1170        | 772         | 452           | 97            | 30            | 53    |
|         | 50+     | 4768                  | 2189   | 1062        | 277         | 378         | 408         | 249         | 137           | 40            | 15            | 12    |
| 1976-80 | Total   | 98929                 | 47059  | 23609       | 5628        | 6369        | 8129        | 4107        | 2560          | 825           | 293           | 349   |
|         | 0-9     | 37474                 | 16472  | 10833       | 2076        | 2623        | 3010        | 1342        | 755           | 220           | 84            | 60    |
|         | 10-19   | 29087                 | 15074  | 5902        | 1618        | 1558        | 2267        | 1204        | 786           | 373           | 124           | 181   |
|         | 20-29   | 8564                  | 4162   | 1880        | 511         | 506         | 671         | 415         | 272           | 83            | 25            | 40    |
|         | 30-39   | 11569                 | 5718   | 2363        | 691         | 684         | 1106        | 511         | 360           | 70            | 32            | 34    |
|         | 40-49   | 10033                 | 4656   | 2123        | 590         | 808         | 872         | 540         | 320           | 65            | 25            | 34    |
|         | 50+     | 2202                  | 977    | 509         | 142         | 191         | 202         | 95          | 68            | 14            | 3             | 0     |
| 1981-85 | Total   | 90034                 | 42898  | 21683       | 5043        | 5712        | 7430        | 3670        | 2274          | 753           | 256           | 316   |
|         | 0-9     | 37057                 | 16287  | 10709       | 2056        | 2596        | 2980        | 1329        | 740           | 220           | 80            | 60    |
|         | 10-19   | 28187                 | 14597  | 5721        | 1545        | 1525        | 2217        | 1165        | 770           | 362           | 116           | 170   |
|         | 20-29   | 7871                  | 3839   | 1747        | 467         | 458         | 609         | 387         | 231           | 75            | 25            | 33    |
|         | 30-39   | 9708                  | 4836   | 1975        | 575         | 540         | 958         | 423         | 297           | 54            | 23            | 27    |
|         | 40-49   | 6415                  | 3026   | 1323        | 343         | 521         | 583         | 332         | 213           | 36            | 12            | 27    |
|         | 50+     | 796                   | 314    | 207         | 58          | 72          | 84          | 33          | 23            | 5             | 0             | 0     |

Appendix Table 2C. Number of person-years at risk, females

| Period  | Age ATB | Radiation Dose (Gray) |        |             |             |             |             |             |               |               |               |       |  |
|---------|---------|-----------------------|--------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|--|
|         |         | Total                 | 0      | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |  |
| Total   | Total   | 1350441               | 586890 | 357988      | 73022       | 85688       | 119643      | 68180       | 32677         | 11295         | 3463          | 3596  |  |
|         | 0-9     | 280910                | 120337 | 83603       | 15862       | 19347       | 23339       | 10265       | 5148          | 1770          | 497           | 743   |  |
|         | 10-19   | 284927                | 133024 | 68242       | 14266       | 17514       | 23329       | 15680       | 7787          | 2871          | 1346          | 868   |  |
|         | 20-29   | 254420                | 108696 | 66396       | 13666       | 18362       | 22238       | 13445       | 7381          | 2729          | 723           | 784   |  |
|         | 30-39   | 236557                | 97073  | 64324       | 13359       | 18205       | 23173       | 11594       | 5854          | 1947          | 421           | 608   |  |
|         | 40-49   | 184259                | 79357  | 46400       | 9797        | 14729       | 17101       | 9981        | 4500          | 1549          | 463           | 382   |  |
|         | 50+     | 109369                | 48403  | 29024       | 6073        | 7528        | 10464       | 5215        | 2008          | 429           | 13            | 212   |  |
| 1950-55 | Total   | 234182                | 101606 | 62151       | 12599       | 16630       | 20813       | 11545       | 5650          | 1959          | 588           | 642   |  |
|         | 0-9     | 42398                 | 18168  | 12589       | 2385        | 2934        | 3523        | 1552        | 784           | 272           | 77            | 115   |  |
|         | 10-19   | 43768                 | 20417  | 10481       | 2185        | 2679        | 3608        | 2404        | 1225          | 446           | 206           | 137   |  |
|         | 20-29   | 39846                 | 16981  | 10396       | 2129        | 2855        | 3513        | 2091        | 1187          | 451           | 118           | 127   |  |
|         | 30-39   | 39023                 | 15934  | 10693       | 2216        | 2991        | 3750        | 1949        | 955           | 350           | 79            | 105   |  |
|         | 40-49   | 35230                 | 15045  | 8959        | 1857        | 2818        | 3282        | 1909        | 875           | 299           | 97            | 89    |  |
|         | 50+     | 33917                 | 15061  | 9053        | 1827        | 2353        | 3137        | 1639        | 624           | 142           | 13            | 68    |  |
| 1956-60 | Total   | 213309                | 92479  | 56515       | 11534       | 15164       | 19015       | 10533       | 5181          | 1786          | 531           | 572   |  |
|         | 0-9     | 40199                 | 17237  | 11948       | 2263        | 2772        | 3332        | 1474        | 743           | 255           | 70            | 105   |  |
|         | 10-19   | 41224                 | 19209  | 9851        | 2070        | 2530        | 3397        | 2272        | 1153          | 417           | 195           | 130   |  |
|         | 20-29   | 37402                 | 15941  | 9756        | 2008        | 2681        | 3298        | 1975        | 1104          | 415           | 110           | 115   |  |
|         | 30-39   | 38358                 | 14850  | 9928        | 2070        | 2808        | 3517        | 1799        | 898           | 320           | 71            | 97    |  |
|         | 40-49   | 31908                 | 13627  | 8093        | 1680        | 2549        | 2975        | 1743        | 801           | 275           | 85            | 80    |  |
|         | 50+     | 26219                 | 11614  | 6939        | 1444        | 1824        | 2486        | 1269        | 483           | 105           | 0             | 45    |  |
| 1961-65 | Total   | 203154                | 88113  | 53743       | 10982       | 14465       | 18112       | 9997        | 4965          | 1727          | 510           | 542   |  |
|         | 0-9     | 40050                 | 17164  | 11913       | 2258        | 2761        | 3319        | 1467        | 739           | 254           | 70            | 105   |  |
|         | 10-19   | 40816                 | 19018  | 9775        | 2047        | 2520        | 3399        | 2250        | 1128          | 415           | 195           | 130   |  |
|         | 20-29   | 38877                 | 15732  | 9609        | 1983        | 2651        | 3238        | 1951        | 1036          | 408           | 105           | 115   |  |
|         | 30-39   | 35363                 | 14474  | 9632        | 2000        | 2719        | 3448        | 1743        | 883           | 305           | 65            | 95    |  |
|         | 40-49   | 30010                 | 12859  | 7541        | 1581        | 2421        | 2821        | 1633        | 747           | 265           | 75            | 66    |  |
|         | 50+     | 20039                 | 8867   | 5273        | 1113        | 1394        | 1947        | 954         | 381           | 80            | 0             | 30    |  |
| 1966-70 | Total   | 182818                | 83744  | 50891       | 10431       | 13682       | 17072       | 9454        | 4689          | 1641          | 500           | 511   |  |
|         | 0-9     | 39888                 | 17073  | 11883       | 2250        | 2756        | 3310        | 1458        | 735           | 250           | 70            | 105   |  |
|         | 10-19   | 40483                 | 18890  | 9700        | 2019        | 2497        | 3305        | 2232        | 1105          | 414           | 193           | 128   |  |
|         | 20-29   | 36323                 | 15521  | 9456        | 1860        | 2626        | 3180        | 1918        | 1054          | 391           | 105           | 112   |  |
|         | 30-39   | 34200                 | 14022  | 9263        | 1935        | 2637        | 3353        | 1687        | 884           | 287           | 61            | 91    |  |
|         | 40-49   | 27738                 | 11983  | 6887        | 1458        | 2243        | 2599        | 1517        | 681           | 244           | 72            | 55    |  |
|         | 50+     | 13983                 | 6256   | 3702        | 810         | 922         | 1324        | 642         | 250           | 55            | 0             | 21    |  |
| 1971-75 | Total   | 181325                | 78865  | 47996       | 9873        | 12880       | 15969       | 8874        | 4399          | 1520          | 466           | 483   |  |
|         | 0-9     | 39692                 | 16971  | 11833       | 2245        | 2739        | 3303        | 1448        | 727           | 250           | 70            | 105   |  |
|         | 10-19   | 40077                 | 18717  | 9607        | 2012        | 2466        | 3264        | 2210        | 1085          | 406           | 190           | 120   |  |
|         | 20-29   | 35625                 | 15238  | 9313        | 1906        | 2574        | 3094        | 1892        | 1025          | 373           | 100           | 110   |  |
|         | 30-39   | 32770                 | 13479  | 8870        | 1866        | 2523        | 3220        | 1599        | 814           | 261           | 52            | 85    |  |
|         | 40-49   | 24435                 | 10571  | 6107        | 1320        | 1979        | 2248        | 1321        | 588           | 203           | 55            | 43    |  |
|         | 50+     | 8726                  | 3888   | 2265        | 524         | 600         | 840         | 404         | 159           | 26            | 0             | 20    |  |
| 1976-80 | Total   | 169208                | 73672  | 44990       | 9139        | 11909       | 14918       | 8231        | 4061          | 1393          | 445           | 451   |  |
|         | 0-9     | 39483                 | 16908  | 11760       | 2233        | 2714        | 3286        | 1444        | 715           | 247           | 70            | 105   |  |
|         | 10-19   | 39584                 | 18522  | 9500        | 1984        | 2429        | 3227        | 2171        | 1058          | 393           | 186           | 114   |  |
|         | 20-29   | 34720                 | 14864  | 9084        | 1865        | 2509        | 3015        | 1837        | 985           | 357           | 95            | 107   |  |
|         | 30-39   | 30850                 | 12749  | 8339        | 1728        | 2368        | 3062        | 1496        | 755           | 231           | 50            | 76    |  |
|         | 40-49   | 20009                 | 8677   | 5067        | 1088        | 1570        | 1839        | 1073        | 472           | 150           | 44            | 32    |  |
|         | 50+     | 4563                  | 1952   | 1241        | 244         | 319         | 488         | 210         | 77            | 15            | 0             | 18    |  |
| 1981-85 | Total   | 156647                | 68412  | 41702       | 8465        | 10958       | 13745       | 7516        | 3733          | 1268          | 424           | 396   |  |
|         | 0-9     | 38200                 | 16816  | 11677       | 2228        | 2672        | 3286        | 1421        | 705           | 242           | 70            | 103   |  |
|         | 10-19   | 38975                 | 18251  | 9347        | 1950        | 2394        | 3188        | 2141        | 1032          | 380           | 181           | 110   |  |
|         | 20-29   | 33628                 | 14419  | 8782        | 1815        | 2466        | 2899        | 1781        | 941           | 335           | 93            | 97    |  |
|         | 30-39   | 27994                 | 11564  | 7598        | 1545        | 2180        | 2823        | 1321        | 685           | 193           | 44            | 60    |  |
|         | 40-49   | 14928                 | 6595   | 3747        | 816         | 1148        | 1336        | 785         | 336           | 113           | 36            | 17    |  |
|         | 50+     | 1922                  | 768    | 550         | 111         | 116         | 232         | 97          | 34            | 5             | 0             | 10    |  |

**Appendix Table 3A. Number of deaths from all diseases except neoplasm and blood disease, sexes combined**

| Period  | Age ATB | Radiation Dose (Gray) |      |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 20777                 | 9490 | 5159        | 1109        | 1411        | 1786        | 1032        | 508           | 149           | 45            | 80    |
|         | 0-9     | 324                   | 158  | 78          | 13          | 26          | 32          | 9           | 3             | 3             | 1             | 1     |
|         | 10-19   | 814                   | 402  | 189         | 44          | 34          | 61          | 42          | 24            | 6             | 3             | 9     |
|         | 20-29   | 929                   | 435  | 230         | 42          | 59          | 78          | 36          | 31            | 9             | 2             | 7     |
|         | 30-39   | 2441                  | 1059 | 630         | 144         | 168         | 187         | 142         | 61            | 30            | 7             | 13    |
|         | 40-49   | 5995                  | 2676 | 1441        | 310         | 448         | 540         | 326         | 167           | 52            | 13            | 22    |
|         | 50+     | 10274                 | 4760 | 2591        | 556         | 676         | 898         | 477         | 220           | 49            | 19            | 28    |
| 1950-55 | Total   | 2901                  | 1360 | 768         | 143         | 174         | 227         | 135         | 54            | 18            | 9             | 13    |
|         | 0-9     | 53                    | 22   | 13          | 1           | 4           | 9           | 3           | 0             | 1             | 0             | 0     |
|         | 10-19   | 149                   | 83   | 39          | 4           | 5           | 9           | 2           | 6             | 0             | 1             | 0     |
|         | 20-29   | 143                   | 63   | 35          | 6           | 14          | 12          | 7           | 4             | 0             | 0             | 2     |
|         | 30-39   | 196                   | 84   | 52          | 13          | 7           | 16          | 14          | 5             | 3             | 1             | 1     |
|         | 40-49   | 438                   | 201  | 113         | 24          | 24          | 42          | 20          | 7             | 6             | 0             | 1     |
|         | 50+     | 1922                  | 907  | 516         | 95          | 120         | 139         | 89          | 32            | 8             | 7             | 9     |
| 1956-60 | Total   | 2899                  | 1430 | 725         | 154         | 194         | 283         | 105         | 75            | 17            | 6             | 10    |
|         | 0-9     | 45                    | 23   | 11          | 1           | 4           | 5           | 0           | 0             | 1             | 0             | 0     |
|         | 10-19   | 108                   | 60   | 16          | 3           | 1           | 13          | 3           | 3             | 2             | 1             | 0     |
|         | 20-29   | 108                   | 47   | 31          | 3           | 5           | 13          | 3           | 5             | 1             | 0             | 0     |
|         | 30-39   | 183                   | 78   | 43          | 10          | 18          | 16          | 8           | 3             | 3             | 1             | 3     |
|         | 40-49   | 515                   | 239  | 118         | 31          | 38          | 48          | 20          | 17            | 1             | 2             | 1     |
|         | 50+     | 2040                  | 883  | 506         | 106         | 128         | 188         | 65          | 47            | 9             | 2             | 6     |
| 1961-65 | Total   | 2969                  | 1319 | 776         | 151         | 197         | 252         | 171         | 66            | 19            | 6             | 12    |
|         | 0-9     | 28                    | 20   | 4           | 1           | 2           | 0           | 0           | 1             | 0             | 0             | 0     |
|         | 10-19   | 84                    | 28   | 26          | 7           | 5           | 10          | 2           | 5             | 1             | 0             | 0     |
|         | 20-29   | 90                    | 44   | 24          | 3           | 5           | 10          | 3           | 1             | 0             | 0             | 0     |
|         | 30-39   | 212                   | 85   | 62          | 17          | 10          | 15          | 17          | 4             | 2             | 0             | 0     |
|         | 40-49   | 605                   | 273  | 156         | 20          | 41          | 47          | 42          | 15            | 5             | 1             | 5     |
|         | 50+     | 1850                  | 889  | 504         | 103         | 134         | 170         | 107         | 40            | 11            | 5             | 7     |
| 1966-70 | Total   | 2958                  | 1357 | 725         | 143         | 201         | 268         | 139         | 88            | 23            | 5             | 9     |
|         | 0-9     | 41                    | 23   | 7           | 2           | 4           | 3           | 2           | 0             | 0             | 0             | 0     |
|         | 10-19   | 86                    | 40   | 22          | 1           | 7           | 7           | 4           | 3             | 2             | 0             | 0     |
|         | 20-29   | 103                   | 50   | 23          | 1           | 9           | 7           | 4           | 6             | 1             | 0             | 2     |
|         | 30-39   | 285                   | 136  | 81          | 9           | 21          | 18          | 12          | 2             | 5             | 0             | 1     |
|         | 40-49   | 811                   | 381  | 194         | 36          | 55          | 79          | 40          | 30            | 8             | 3             | 5     |
|         | 50+     | 1632                  | 747  | 398         | 94          | 105         | 154         | 77          | 47            | 7             | 2             | 1     |
| 1971-75 | Total   | 2988                  | 1378 | 692         | 164         | 212         | 250         | 175         | 77            | 22            | 6             | 12    |
|         | 0-9     | 40                    | 17   | 12          | 4           | 1           | 4           | 2           | 0             | 0             | 0             | 0     |
|         | 10-19   | 119                   | 60   | 28          | 6           | 3           | 6           | 10          | 3             | 0             | 0             | 3     |
|         | 20-29   | 124                   | 60   | 26          | 8           | 11          | 8           | 5           | 4             | 1             | 1             | 0     |
|         | 30-39   | 361                   | 153  | 87          | 15          | 31          | 28          | 29          | 13            | 2             | 2             | 3     |
|         | 40-49   | 1018                  | 475  | 215         | 52          | 77          | 93          | 54          | 35            | 10            | 1             | 4     |
|         | 50+     | 1328                  | 613  | 324         | 79          | 89          | 113         | 75          | 22            | 9             | 2             | 2     |
| 1976-80 | Total   | 3057                  | 1401 | 717         | 181         | 246         | 242         | 148         | 78            | 27            | 6             | 11    |
|         | 0-9     | 56                    | 29   | 10          | 3           | 5           | 7           | 0           | 1             | 0             | 1             | 0     |
|         | 10-19   | 117                   | 60   | 28          | 8           | 5           | 4           | 6           | 3             | 1             | 0             | 2     |
|         | 20-29   | 173                   | 78   | 44          | 10          | 11          | 11          | 9           | 4             | 4             | 0             | 2     |
|         | 30-39   | 514                   | 233  | 137         | 37          | 34          | 27          | 20          | 14            | 9             | 1             | 2     |
|         | 40-49   | 1275                  | 581  | 285         | 69          | 117         | 108         | 71          | 31            | 8             | 3             | 2     |
|         | 50+     | 922                   | 420  | 213         | 54          | 74          | 85          | 42          | 25            | 5             | 1             | 3     |
| 1981-85 | Total   | 2905                  | 1245 | 756         | 173         | 187         | 274         | 159         | 68            | 23            | 7             | 13    |
|         | 0-9     | 61                    | 24   | 21          | 1           | 6           | 4           | 2           | 1             | 1             | 0             | 1     |
|         | 10-19   | 151                   | 71   | 30          | 15          | 8           | 12          | 9           | 1             | 0             | 1             | 4     |
|         | 20-29   | 188                   | 93   | 47          | 11          | 4           | 17          | 5           | 7             | 2             | 1             | 1     |
|         | 30-39   | 690                   | 290  | 168         | 43          | 47          | 69          | 42          | 20            | 6             | 2             | 3     |
|         | 40-49   | 1335                  | 546  | 360         | 78          | 96          | 123         | 79          | 32            | 14            | 3             | 4     |
|         | 50+     | 480                   | 221  | 130         | 25          | 26          | 49          | 22          | 7             | 0             | 0             | 0     |

**Appendix Table 3B. Number of deaths from all diseases except neoplasm and blood disease, males**

| Period  | Age ATB | Radiation Dose (Gray) |      |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 9344                  | 4469 | 2085        | 504         | 626         | 773         | 463         | 272           | 69            | 29            | 54    |
|         | 0-9     | 189                   | 97   | 54          | 8           | 12          | 21          | 3           | 2             | 1             | 1             | 0     |
|         | 10-19   | 459                   | 235  | 105         | 24          | 15          | 28          | 26          | 11            | 5             | 2             | 8     |
|         | 20-29   | 349                   | 163  | 69          | 20          | 30          | 29          | 19          | 13            | 2             | 0             | 4     |
|         | 30-39   | 1029                  | 486  | 233         | 53          | 73          | 70          | 60          | 30            | 10            | 5             | 9     |
|         | 40-49   | 2796                  | 1330 | 597         | 153         | 195         | 242         | 147         | 88            | 25            | 5             | 14    |
|         | 50+     | 4512                  | 2158 | 1027        | 246         | 301         | 383         | 208         | 128           | 26            | 16            | 19    |
| 1950-55 | Total   | 1413                  | 704  | 331         | 85          | 87          | 112         | 66          | 29            | 7             | 5             | 7     |
|         | 0-9     | 30                    | 12   | 9           | 0           | 2           | 6           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 65                    | 41   | 13          | 2           | 1           | 4           | 1           | 3             | 0             | 0             | 0     |
|         | 20-29   | 51                    | 25   | 6           | 2           | 5           | 5           | 7           | 1             | 0             | 0             | 0     |
|         | 30-39   | 79                    | 42   | 16          | 4           | 2           | 6           | 4           | 2             | 1             | 1             | 1     |
|         | 40-49   | 221                   | 107  | 45          | 11          | 14          | 23          | 13          | 3             | 4             | 0             | 1     |
|         | 50+     | 967                   | 477  | 242         | 46          | 63          | 68          | 40          | 20            | 2             | 4             | 5     |
| 1956-60 | Total   | 1468                  | 723  | 318         | 71          | 91          | 146         | 50          | 46            | 11            | 4             | 8     |
|         | 0-9     | 26                    | 13   | 7           | 1           | 1           | 3           | 0           | 0             | 1             | 0             | 0     |
|         | 10-19   | 50                    | 25   | 9           | 1           | 0           | 6           | 5           | 2             | 1             | 1             | 0     |
|         | 20-29   | 34                    | 15   | 12          | 1           | 1           | 4           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 83                    | 36   | 14          | 4           | 8           | 9           | 4           | 3             | 1             | 1             | 3     |
|         | 40-49   | 284                   | 137  | 54          | 17          | 20          | 32          | 12          | 11            | 1             | 0             | 0     |
|         | 50+     | 991                   | 497  | 222         | 47          | 61          | 92          | 28          | 30            | 7             | 2             | 5     |
| 1961-65 | Total   | 1425                  | 662  | 329         | 77          | 93          | 114         | 86          | 38            | 12            | 6             | 8     |
|         | 0-9     | 17                    | 13   | 3           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 40                    | 13   | 16          | 2           | 4           | 2           | 1           | 1             | 1             | 0             | 0     |
|         | 20-29   | 29                    | 13   | 6           | 1           | 4           | 2           | 2           | 1             | 0             | 0             | 0     |
|         | 30-39   | 99                    | 41   | 28          | 9           | 5           | 7           | 9           | 2             | 0             | 0             | 0     |
|         | 40-49   | 350                   | 170  | 77          | 13          | 19          | 27          | 26          | 10            | 4             | 1             | 3     |
|         | 50+     | 890                   | 412  | 201         | 52          | 60          | 76          | 48          | 24            | 7             | 5             | 5     |
| 1966-70 | Total   | 1366                  | 652  | 308         | 65          | 90          | 116         | 63          | 52            | 10            | 3             | 7     |
|         | 0-9     | 17                    | 8    | 2           | 2           | 3           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 55                    | 27   | 14          | 1           | 3           | 4           | 2           | 2             | 2             | 0             | 0     |
|         | 20-29   | 40                    | 18   | 7           | 1           | 6           | 2           | 1           | 4             | 0             | 0             | 1     |
|         | 30-39   | 148                   | 73   | 39          | 2           | 12          | 10          | 6           | 2             | 3             | 0             | 1     |
|         | 40-49   | 421                   | 207  | 98          | 19          | 21          | 34          | 19          | 15            | 3             | 1             | 4     |
|         | 50+     | 685                   | 319  | 148         | 40          | 45          | 64          | 35          | 29            | 2             | 2             | 1     |
| 1971-75 | Total   | 1299                  | 617  | 278         | 70          | 88          | 106         | 80          | 39            | 8             | 3             | 10    |
|         | 0-9     | 28                    | 13   | 8           | 3           | 0           | 3           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 80                    | 39   | 21          | 4           | 0           | 4           | 7           | 2             | 0             | 0             | 3     |
|         | 20-29   | 54                    | 24   | 10          | 4           | 6           | 5           | 3           | 2             | 0             | 0             | 0     |
|         | 30-39   | 173                   | 85   | 37          | 7           | 10          | 11          | 14          | 6             | 0             | 1             | 2     |
|         | 40-49   | 452                   | 220  | 91          | 22          | 34          | 42          | 20          | 18            | 2             | 0             | 3     |
|         | 50+     | 512                   | 236  | 111         | 30          | 38          | 41          | 35          | 11            | 6             | 2             | 2     |
| 1976-80 | Total   | 1275                  | 622  | 268         | 82          | 96          | 93          | 57          | 35            | 14            | 4             | 6     |
|         | 0-9     | 37                    | 18   | 8           | 1           | 3           | 5           | 0           | 1             | 0             | 1             | 0     |
|         | 10-19   | 75                    | 46   | 19          | 3           | 2           | 1           | 2           | 0             | 1             | 0             | 1     |
|         | 20-29   | 76                    | 38   | 12          | 6           | 6           | 4           | 3           | 3             | 2             | 0             | 2     |
|         | 30-39   | 209                   | 101  | 48          | 15          | 15          | 9           | 9           | 6             | 4             | 1             | 1     |
|         | 40-49   | 542                   | 260  | 108         | 35          | 45          | 43          | 28          | 16            | 5             | 1             | 1     |
|         | 50+     | 336                   | 159  | 71          | 22          | 25          | 31          | 15          | 9             | 2             | 1             | 1     |
| 1981-85 | Total   | 1098                  | 489  | 255         | 74          | 81          | 86          | 61          | 33            | 7             | 4             | 8     |
|         | 0-9     | 44                    | 20   | 17          | 1           | 2           | 2           | 1           | 1             | 0             | 0             | 0     |
|         | 10-19   | 94                    | 44   | 13          | 11          | 5           | 7           | 8           | 1             | 0             | 1             | 4     |
|         | 20-29   | 65                    | 30   | 16          | 5           | 2           | 7           | 2           | 2             | 0             | 0             | 1     |
|         | 30-39   | 238                   | 108  | 53          | 12          | 21          | 18          | 14          | 9             | 1             | 1             | 1     |
|         | 40-49   | 526                   | 229  | 124         | 36          | 42          | 41          | 29          | 15            | 6             | 2             | 2     |
|         | 50+     | 131                   | 58   | 32          | 9           | 9           | 11          | 7           | 5             | 0             | 0             | 0     |



**Appendix Table 3C. Number of deaths from all diseases except neoplasm and blood disease, females**

| Period  | Age ATB | Radiation Dose (Gray) |      |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 11433                 | 5021 | 3074        | 605         | 785         | 1023        | 569         | 234           | 80            | 16            | 26    |
|         | 0-9     | 125                   | 61   | 24          | 5           | 14          | 11          | 6           | 1             | 2             | 0             | 1     |
|         | 10-19   | 355                   | 167  | 84          | 20          | 19          | 33          | 16          | 13            | 1             | 1             | 1     |
|         | 20-29   | 580                   | 272  | 181         | 22          | 29          | 49          | 17          | 18            | 7             | 2             | 3     |
|         | 30-39   | 1412                  | 573  | 397         | 91          | 95          | 117         | 82          | 31            | 20            | 2             | 4     |
|         | 40-49   | 3199                  | 1346 | 844         | 157         | 253         | 298         | 179         | 79            | 27            | 8             | 8     |
|         | 50+     | 5762                  | 2602 | 1584        | 310         | 375         | 515         | 289         | 92            | 23            | 3             | 9     |
| 1950-55 | Total   | 1488                  | 656  | 437         | 78          | 87          | 115         | 69          | 25            | 11            | 4             | 6     |
|         | 0-9     | 23                    | 10   | 4           | 1           | 2           | 3           | 2           | 0             | 1             | 0             | 0     |
|         | 10-19   | 84                    | 42   | 28          | 2           | 4           | 5           | 1           | 3             | 0             | 1             | 0     |
|         | 20-29   | 92                    | 38   | 29          | 4           | 9           | 7           | 0           | 3             | 0             | 0             | 2     |
|         | 30-39   | 117                   | 42   | 36          | 9           | 5           | 10          | 10          | 3             | 2             | 0             | 0     |
|         | 40-49   | 217                   | 94   | 68          | 13          | 10          | 19          | 7           | 4             | 2             | 0             | 0     |
|         | 50+     | 955                   | 430  | 274         | 49          | 57          | 71          | 49          | 12            | 6             | 3             | 4     |
| 1956-80 | Total   | 1531                  | 707  | 407         | 83          | 103         | 137         | 55          | 29            | 6             | 2             | 2     |
|         | 0-9     | 19                    | 10   | 4           | 0           | 3           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 58                    | 35   | 7           | 2           | 1           | 7           | 4           | 1             | 1             | 0             | 0     |
|         | 20-29   | 74                    | 32   | 19          | 2           | 4           | 9           | 2           | 5             | 1             | 0             | 0     |
|         | 30-39   | 100                   | 42   | 29          | 6           | 10          | 7           | 4           | 0             | 2             | 0             | 0     |
|         | 40-49   | 231                   | 102  | 64          | 14          | 18          | 16          | 8           | 6             | 0             | 2             | 1     |
|         | 50+     | 1049                  | 486  | 284         | 59          | 67          | 96          | 37          | 17            | 2             | 0             | 1     |
| 1961-85 | Total   | 1544                  | 657  | 447         | 74          | 104         | 138         | 85          | 28            | 7             | 0             | 4     |
|         | 0-9     | 11                    | 7    | 1           | 1           | 1           | 0           | 0           | 1             | 0             | 0             | 0     |
|         | 10-19   | 44                    | 15   | 10          | 5           | 1           | 8           | 1           | 4             | 0             | 0             | 0     |
|         | 20-29   | 61                    | 31   | 18          | 2           | 1           | 8           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 113                   | 44   | 36          | 8           | 5           | 8           | 8           | 2             | 2             | 0             | 0     |
|         | 40-49   | 255                   | 103  | 79          | 7           | 22          | 20          | 16          | 5             | 1             | 0             | 2     |
|         | 50+     | 1080                  | 457  | 303         | 51          | 74          | 94          | 59          | 18            | 4             | 0             | 2     |
| 1966-70 | Total   | 1592                  | 705  | 417         | 78          | 111         | 152         | 76          | 36            | 13            | 2             | 2     |
|         | 0-9     | 24                    | 15   | 5           | 0           | 1           | 1           | 2           | 0             | 0             | 0             | 0     |
|         | 10-19   | 31                    | 13   | 8           | 0           | 4           | 3           | 2           | 1             | 0             | 0             | 0     |
|         | 20-29   | 63                    | 32   | 16          | 0           | 3           | 5           | 3           | 2             | 1             | 0             | 1     |
|         | 30-39   | 137                   | 63   | 42          | 7           | 9           | 8           | 6           | 0             | 2             | 0             | 0     |
|         | 40-49   | 390                   | 154  | 98          | 17          | 34          | 45          | 21          | 15            | 5             | 2             | 1     |
|         | 50+     | 947                   | 428  | 250         | 54          | 60          | 90          | 42          | 18            | 5             | 0             | 0     |
| 1971-75 | Total   | 1689                  | 761  | 414         | 94          | 124         | 144         | 95          | 38            | 14            | 3             | 2     |
|         | 0-9     | 12                    | 4    | 4           | 1           | 1           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 39                    | 21   | 7           | 2           | 3           | 2           | 3           | 1             | 0             | 0             | 0     |
|         | 20-29   | 70                    | 36   | 16          | 4           | 5           | 3           | 2           | 2             | 1             | 1             | 0     |
|         | 30-39   | 188                   | 88   | 50          | 8           | 21          | 15          | 15          | 7             | 2             | 1             | 1     |
|         | 40-49   | 564                   | 255  | 124         | 30          | 43          | 51          | 34          | 17            | 8             | 1             | 1     |
|         | 50+     | 816                   | 377  | 213         | 49          | 51          | 72          | 40          | 11            | 3             | 0             | 0     |
| 1976-80 | Total   | 1782                  | 779  | 451         | 99          | 150         | 149         | 91          | 43            | 13            | 2             | 5     |
|         | 0-9     | 19                    | 11   | 2           | 2           | 2           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 42                    | 14   | 9           | 5           | 3           | 3           | 4           | 3             | 0             | 0             | 1     |
|         | 20-29   | 97                    | 40   | 32          | 4           | 5           | 7           | 6           | 1             | 2             | 0             | 0     |
|         | 30-39   | 305                   | 132  | 89          | 22          | 19          | 18          | 11          | 8             | 5             | 0             | 1     |
|         | 40-49   | 733                   | 321  | 177         | 34          | 72          | 65          | 43          | 15            | 3             | 2             | 1     |
|         | 50+     | 586                   | 261  | 142         | 32          | 49          | 54          | 27          | 16            | 3             | 0             | 2     |
| 1981-85 | Total   | 1807                  | 756  | 501         | 99          | 106         | 188         | 98          | 35            | 16            | 3             | 5     |
|         | 0-9     | 17                    | 4    | 4           | 0           | 4           | 2           | 1           | 0             | 1             | 0             | 1     |
|         | 10-19   | 57                    | 27   | 17          | 4           | 3           | 5           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 123                   | 63   | 31          | 6           | 2           | 10          | 3           | 5             | 2             | 1             | 0     |
|         | 30-39   | 452                   | 182  | 115         | 31          | 26          | 51          | 28          | 11            | 5             | 1             | 2     |
|         | 40-49   | 809                   | 317  | 236         | 42          | 54          | 82          | 50          | 17            | 8             | 1             | 2     |
|         | 50+     | 349                   | 163  | 98          | 16          | 17          | 38          | 15          | 2             | 0             | 0             | 0     |

Appendix Table 4A. Number of deaths from infectious disease, sexes combined

| Period  | Age ATB | Radiation Dose (Gray) |     |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.13 | .20<br>-.43 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 1413                  | 651 | 367         | 64          | 85          | 126         | 64          | 38            | 10            | 5             | 3     |
|         | 0-9     | 51                    | 19  | 16          | 1           | 8           | 5           | 3           | 0             | 0             | 1             | 0     |
|         | 10-19   | 197                   | 105 | 47          | 6           | 10          | 11          | 8           | 6             | 2             | 2             | 0     |
|         | 20-29   | 184                   | 78  | 52          | 7           | 12          | 19          | 8           | 7             | 1             | 0             | 0     |
|         | 30-39   | 219                   | 101 | 59          | 10          | 12          | 18          | 6           | 6             | 6             | 0             | 1     |
|         | 40-49   | 388                   | 162 | 104         | 20          | 20          | 34          | 16          | 9             | 0             | 1             | 2     |
|         | 50+     | 394                   | 186 | 89          | 20          | 25          | 39          | 23          | 10            | 1             | 1             | 0     |
| 1950-55 | Total   | 504                   | 226 | 139         | 22          | 28          | 47          | 24          | 13            | 2             | 2             | 1     |
|         | 0-9     | 14                    | 3   | 4           | 1           | 3           | 1           | 2           | 0             | 0             | 0             | 0     |
|         | 10-19   | 87                    | 47  | 26          | 1           | 3           | 3           | 1           | 5             | 0             | 1             | 0     |
|         | 20-29   | 82                    | 38  | 21          | 2           | 7           | 7           | 5           | 2             | 0             | 0             | 0     |
|         | 30-39   | 77                    | 33  | 22          | 6           | 3           | 7           | 2           | 1             | 2             | 0             | 1     |
|         | 40-49   | 107                   | 44  | 34          | 4           | 6           | 15          | 3           | 1             | 0             | 0             | 0     |
|         | 50+     | 137                   | 61  | 32          | 8           | 8           | 14          | 11          | 4             | 0             | 1             | 0     |
| 1956-60 | Total   | 333                   | 152 | 79          | 15          | 24          | 33          | 13          | 10            | 6             | 1             | 0     |
|         | 0-9     | 14                    | 5   | 6           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 47                    | 26  | 7           | 1           | 1           | 4           | 1           | 2             | 1             | 0             | 0     |
|         | 20-29   | 48                    | 18  | 15          | 3           | 2           | 7           | 1           | 1             | 1             | 0             | 0     |
|         | 30-39   | 42                    | 13  | 11          | 1           | 6           | 4           | 2           | 2             | 3             | 0             | 0     |
|         | 40-49   | 90                    | 44  | 20          | 6           | 4           | 8           | 4           | 4             | 0             | 0             | 0     |
|         | 50+     | 92                    | 46  | 20          | 4           | 9           | 9           | 2           | 2             | 0             | 0             | 0     |
| 1961-65 | Total   | 197                   | 84  | 55          | 9           | 16          | 18          | 10          | 4             | 1             | 0             | 0     |
|         | 0-9     | 6                     | 4   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 25                    | 13  | 3           | 3           | 3           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 22                    | 9   | 7           | 0           | 2           | 3           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 29                    | 13  | 9           | 1           | 0           | 3           | 2           | 1             | 0             | 0             | 0     |
|         | 40-49   | 53                    | 18  | 20          | 2           | 6           | 3           | 2           | 2             | 0             | 0             | 0     |
|         | 50+     | 62                    | 27  | 15          | 3           | 4           | 7           | 5           | 0             | 1             | 0             | 0     |
| 1966-70 | Total   | 139                   | 78  | 29          | 4           | 5           | 13          | 5           | 3             | 0             | 1             | 1     |
|         | 0-9     | 8                     | 5   | 0           | 0           | 0           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 14                    | 8   | 4           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 7                     | 4   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 23                    | 14  | 6           | 0           | 1           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 41                    | 22  | 8           | 2           | 2           | 4           | 1           | 0             | 0             | 1             | 1     |
|         | 50+     | 46                    | 25  | 10          | 2           | 2           | 4           | 1           | 2             | 0             | 0             | 0     |
| 1971-75 | Total   | 114                   | 47  | 33          | 6           | 9           | 9           | 6           | 3             | 0             | 0             | 1     |
|         | 0-9     | 6                     | 1   | 4           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 8                     | 2   | 2           | 0           | 2           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 11                    | 2   | 5           | 1           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 18                    | 12  | 5           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 32                    | 16  | 8           | 2           | 2           | 2           | 1           | 0             | 0             | 0             | 1     |
|         | 50+     | 39                    | 14  | 9           | 3           | 4           | 4           | 3           | 2             | 0             | 0             | 0     |
| 1976-80 | Total   | 66                    | 37  | 17          | 3           | 2           | 2           | 3           | 0             | 1             | 1             | 0     |
|         | 0-9     | 1                     | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 1             | 0     |
|         | 10-19   | 6                     | 3   | 3           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 3                     | 2   | 0           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 18                    | 12  | 2           | 1           | 1           | 1           | 0           | 0             | 1             | 0             | 0     |
|         | 40-49   | 29                    | 13  | 10          | 2           | 0           | 1           | 3           | 0             | 0             | 0             | 0     |
|         | 50+     | 9                     | 7   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
| 1981-85 | Total   | 60                    | 27  | 15          | 5           | 1           | 4           | 3           | 5             | 0             | 0             | 0     |
|         | 0-9     | 2                     | 1   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 10                    | 6   | 2           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 11                    | 5   | 3           | 1           | 0           | 1           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 12                    | 4   | 4           | 1           | 0           | 1           | 0           | 2             | 0             | 0             | 0     |
|         | 40-49   | 16                    | 5   | 4           | 2           | 0           | 1           | 2           | 2             | 0             | 0             | 0     |
|         | 50+     | 9                     | 6   | 1           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |

Appendix Table 4B. Number of deaths from infectious disease, males

| Period  | Age ATB | Radiation Dose (Gray) |     |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 774                   | 370 | 183         | 37          | 38          | 71          | 38          | 27            | 3             | 4             | 3     |
|         | 0-9     | 28                    | 13  | 9           | 0           | 2           | 3           | 0           | 0             | 0             | 1             | 0     |
|         | 10-19   | 98                    | 52  | 22          | 3           | 4           | 4           | 5           | 4             | 1             | 1             | 0     |
|         | 20-29   | 66                    | 27  | 13          | 4           | 3           | 8           | 6           | 5             | 0             | 0             | 0     |
|         | 30-39   | 110                   | 54  | 26          | 7           | 4           | 7           | 3           | 6             | 2             | 0             | 1     |
|         | 40-49   | 230                   | 103 | 60          | 12          | 10          | 25          | 12          | 5             | 0             | 1             | 2     |
|         | 50+     | 244                   | 121 | 53          | 11          | 15          | 24          | 12          | 7             | 0             | 1             | 0     |
| 1950-55 | Total   | 285                   | 125 | 63          | 13          | 9           | 27          | 16          | 9             | 1             | 1             | 1     |
|         | 0-9     | 6                     | 2   | 2           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 39                    | 23  | 10          | 1           | 0           | 1           | 1           | 3             | 0             | 0             | 0     |
|         | 20-29   | 33                    | 18  | 4           | 1           | 1           | 3           | 5           | 1             | 0             | 0             | 0     |
|         | 30-39   | 32                    | 14  | 9           | 3           | 0           | 2           | 1           | 1             | 1             | 0             | 1     |
|         | 40-49   | 60                    | 24  | 16          | 3           | 3           | 10          | 3           | 1             | 0             | 0             | 0     |
|         | 50+     | 95                    | 44  | 22          | 5           | 4           | 10          | 6           | 3             | 0             | 1             | 0     |
| 1956-60 | Total   | 178                   | 81  | 42          | 9           | 13          | 17          | 7           | 6             | 2             | 1             | 0     |
|         | 0-9     | 9                     | 4   | 4           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 22                    | 10  | 4           | 1           | 0           | 2           | 2           | 1             | 1             | 1             | 0     |
|         | 20-29   | 10                    | 3   | 4           | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 19                    | 7   | 3           | 1           | 3           | 1           | 1           | 2             | 1             | 0             | 0     |
|         | 40-49   | 60                    | 28  | 14          | 4           | 3           | 6           | 3           | 2             | 0             | 0             | 0     |
|         | 50+     | 58                    | 29  | 13          | 2           | 6           | 6           | 1           | 1             | 0             | 0             | 0     |
| 1961-65 | Total   | 109                   | 46  | 29          | 5           | 9           | 11          | 7           | 2             | 0             | 0             | 0     |
|         | 0-9     | 4                     | 4   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 13                    | 6   | 2           | 0           | 3           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 5                     | 1   | 1           | 0           | 1           | 1           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 11                    | 4   | 3           | 1           | 0           | 1           | 1           | 1             | 0             | 0             | 0     |
|         | 40-49   | 32                    | 12  | 12          | 2           | 2           | 3           | 1           | 0             | 0             | 0             | 0     |
|         | 50+     | 44                    | 19  | 11          | 2           | 3           | 5           | 4           | 0             | 0             | 0             | 0     |
| 1966-70 | Total   | 84                    | 52  | 14          | 1           | 1           | 9           | 2           | 3             | 0             | 1             | 1     |
|         | 0-9     | 2                     | 1   | 0           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 8                     | 5   | 3           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 5                     | 2   | 1           | 0           | 0           | 0           | 1           | 1             | 0             | 0             | 0     |
|         | 30-39   | 15                    | 9   | 4           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 29                    | 18  | 3           | 0           | 1           | 4           | 1           | 0             | 0             | 1             | 1     |
|         | 50+     | 25                    | 17  | 3           | 1           | 0           | 2           | 0           | 2             | 0             | 0             | 0     |
| 1971-75 | Total   | 63                    | 29  | 18          | 4           | 3           | 4           | 2           | 2             | 0             | 0             | 1     |
|         | 0-9     | 4                     | 1   | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 4                     | 2   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 5                     | 1   | 1           | 1           | 0           | 1           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 11                    | 8   | 3           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 23                    | 10  | 8           | 2           | 1           | 1           | 0           | 0             | 0             | 0             | 1     |
|         | 50+     | 16                    | 7   | 3           | 1           | 2           | 1           | 1           | 1             | 0             | 0             | 0     |
| 1976-80 | Total   | 41                    | 24  | 9           | 2           | 2           | 1           | 2           | 0             | 0             | 1             | 0     |
|         | 0-9     | 1                     | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 1             | 0     |
|         | 10-19   | 5                     | 3   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 1                     | 0   | 0           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 14                    | 9   | 2           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 17                    | 9   | 5           | 1           | 0           | 0           | 2           | 0             | 0             | 0             | 0     |
|         | 50+     | 3                     | 3   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
| 1981-85 | Total   | 34                    | 13  | 8           | 3           | 1           | 2           | 2           | 5             | 0             | 0             | 0     |
|         | 0-9     | 2                     | 1   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 5                     | 3   | 0           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 7                     | 2   | 2           | 1           | 0           | 1           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 8                     | 3   | 2           | 1           | 0           | 0           | 0           | 2             | 0             | 0             | 0     |
|         | 40-49   | 9                     | 2   | 2           | 0           | 0           | 1           | 2           | 2             | 0             | 0             | 0     |
|         | 50+     | 3                     | 2   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |

Appendix Table 4C. Number of deaths from infectious disease, females

| Period  | Age ATB | Radiation Dose (Gray) |     |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 639                   | 281 | 184         | 27          | 47          | 55          | 26          | 11            | 7             | 1             | 0     |
|         | 0-9     | 23                    | 6   | 7           | 1           | 4           | 2           | 3           | 0             | 0             | 0             | 0     |
|         | 10-19   | 101                   | 53  | 25          | 3           | 6           | 7           | 3           | 2             | 1             | 1             | 0     |
|         | 20-29   | 118                   | 51  | 39          | 3           | 9           | 11          | 2           | 2             | 1             | 0             | 0     |
|         | 30-39   | 109                   | 47  | 33          | 3           | 8           | 11          | 3           | 0             | 4             | 0             | 0     |
|         | 40-49   | 138                   | 59  | 44          | 8           | 10          | 9           | 4           | 4             | 0             | 0             | 0     |
|         | 50+     | 150                   | 85  | 36          | 9           | 10          | 15          | 11          | 3             | 1             | 0             | 0     |
| 1950-55 | Total   | 239                   | 101 | 76          | 9           | 19          | 20          | 8           | 4             | 1             | 1             | 0     |
|         | 0-9     | 8                     | 1   | 2           | 1           | 2           | 0           | 2           | 0             | 0             | 0             | 0     |
|         | 10-19   | 48                    | 24  | 16          | 0           | 3           | 2           | 0           | 2             | 0             | 1             | 0     |
|         | 20-29   | 49                    | 20  | 17          | 1           | 6           | 4           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 45                    | 19  | 13          | 3           | 3           | 5           | 1           | 0             | 1             | 0             | 0     |
|         | 40-49   | 47                    | 20  | 18          | 1           | 3           | 5           | 0           | 0             | 0             | 0             | 0     |
|         | 50+     | 42                    | 17  | 10          | 3           | 2           | 4           | 5           | 1             | 0             | 0             | 0     |
| 1956-60 | Total   | 155                   | 71  | 37          | 6           | 11          | 16          | 6           | 4             | 4             | 0             | 0     |
|         | 0-9     | 5                     | 1   | 2           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 25                    | 16  | 3           | 0           | 1           | 2           | 2           | 0             | 1             | 0             | 0     |
|         | 20-29   | 38                    | 15  | 11          | 2           | 2           | 5           | 1           | 1             | 1             | 0             | 0     |
|         | 30-39   | 23                    | 6   | 8           | 0           | 3           | 3           | 1           | 0             | 2             | 0             | 0     |
|         | 40-49   | 30                    | 16  | 6           | 2           | 1           | 2           | 1           | 2             | 0             | 0             | 0     |
|         | 50+     | 34                    | 17  | 7           | 2           | 3           | 3           | 1           | 1             | 0             | 0             | 0     |
| 1961-65 | Total   | 88                    | 38  | 26          | 4           | 7           | 7           | 3           | 2             | 1             | 0             | 0     |
|         | 0-9     | 2                     | 0   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 12                    | 7   | 1           | 3           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 17                    | 8   | 6           | 0           | 1           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 18                    | 9   | 6           | 0           | 0           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 21                    | 6   | 8           | 0           | 4           | 0           | 1           | 2             | 0             | 0             | 0     |
|         | 50+     | 18                    | 8   | 4           | 1           | 1           | 2           | 1           | 0             | 1             | 0             | 0     |
| 1966-70 | Total   | 55                    | 26  | 15          | 3           | 4           | 4           | 3           | 0             | 0             | 0             | 0     |
|         | 0-9     | 6                     | 4   | 0           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 6                     | 3   | 1           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 2                     | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 8                     | 5   | 2           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 12                    | 4   | 5           | 2           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 50+     | 21                    | 8   | 7           | 1           | 2           | 2           | 1           | 0             | 0             | 0             | 0     |
| 1971-75 | Total   | 51                    | 18  | 15          | 2           | 6           | 5           | 4           | 1             | 0             | 0             | 0     |
|         | 0-9     | 2                     | 0   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 4                     | 0   | 1           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 6                     | 1   | 4           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 7                     | 4   | 2           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 9                     | 6   | 0           | 0           | 1           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 50+     | 23                    | 7   | 6           | 2           | 2           | 3           | 2           | 1             | 0             | 0             | 0     |
| 1976-80 | Total   | 25                    | 13  | 8           | 1           | 0           | 1           | 1           | 0             | 1             | 0             | 0     |
|         | 0-9     | 0                     | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 1                     | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 2                     | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 4                     | 3   | 0           | 0           | 0           | 0           | 0           | 0             | 1             | 0             | 0     |
|         | 40-49   | 12                    | 4   | 5           | 1           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 50+     | 6                     | 4   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
| 1981-85 | Total   | 26                    | 14  | 7           | 2           | 0           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 0-9     | 0                     | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 5                     | 3   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 4                     | 3   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 4                     | 1   | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 7                     | 3   | 2           | 2           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 50+     | 6                     | 4   | 0           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |

Appendix Table 5A. Number of deaths from circulatory disease, sexes combined

| Period  | Age ATB | Radiation Dose (Gray) |      |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0    | .01<br>-.05 | .05<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 11164                 | 5025 | 2767        | 605         | 775         | 981         | 590         | 273           | 85            | 20            | 43    |
|         | 0-9     | 105                   | 52   | 24          | 3           | 10          | 10          | 1           | 2             | 2             | 0             | 1     |
|         | 10-19   | 247                   | 116  | 52          | 18          | 19          | 23          | 9           | 5             | 1             | 0             | 3     |
|         | 20-29   | 396                   | 186  | 102         | 12          | 28          | 28          | 18          | 14            | 5             | 0             | 3     |
|         | 30-39   | 1379                  | 588  | 368         | 80          | 98          | 85          | 86          | 33            | 19            | 6             | 8     |
|         | 40-49   | 3574                  | 1577 | 858         | 177         | 276         | 335         | 205         | 95            | 34            | 6             | 11    |
|         | 50+     | 5463                  | 2508 | 1363        | 314         | 346         | 490         | 271         | 124           | 24            | 8             | 17    |
| 1950-55 | Total   | 1046                  | 485  | 286         | 55          | 65          | 76          | 48          | 14            | 8             | 3             | 6     |
|         | 0-9     | 12                    | 6    | 4           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 14                    | 7    | 1           | 2           | 2           | 1           | 0           | 1             | 0             | 0             | 0     |
|         | 20-29   | 17                    | 6    | 5           | 0           | 2           | 2           | 1           | 1             | 0             | 0             | 0     |
|         | 30-39   | 51                    | 19   | 12          | 5           | 2           | 4           | 4           | 3             | 1             | 1             | 0     |
|         | 40-49   | 161                   | 73   | 40          | 11          | 11          | 14          | 7           | 1             | 4             | 0             | 0     |
|         | 50+     | 791                   | 374  | 224         | 37          | 48          | 53          | 36          | 8             | 3             | 2             | 6     |
| 1956-60 | Total   | 1320                  | 635  | 299         | 76          | 84          | 128         | 52          | 34            | 8             | 1             | 5     |
|         | 0-9     | 12                    | 8    | 0           | 0           | 2           | 1           | 0           | 0             | 1             | 0             | 0     |
|         | 10-19   | 15                    | 9    | 1           | 1           | 0           | 3           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 17                    | 7    | 7           | 0           | 0           | 1           | 2           | 0             | 0             | 0             | 0     |
|         | 30-39   | 60                    | 25   | 16          | 2           | 7           | 5           | 4           | 0             | 0             | 0             | 1     |
|         | 40-49   | 261                   | 119  | 58          | 17          | 18          | 25          | 13          | 9             | 0             | 1             | 1     |
|         | 50+     | 855                   | 467  | 217         | 56          | 57          | 91          | 32          | 25            | 7             | 0             | 3     |
| 1961-65 | Total   | 1565                  | 680  | 403         | 77          | 101         | 142         | 108         | 33            | 11            | 3             | 7     |
|         | 0-9     | 4                     | 1    | 1           | 1           | 0           | 0           | 0           | 1             | 0             | 0             | 0     |
|         | 10-19   | 24                    | 6    | 9           | 0           | 2           | 6           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 25                    | 14   | 5           | 0           | 2           | 3           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 112                   | 45   | 32          | 7           | 5           | 8           | 11          | 2             | 2             | 0             | 0     |
|         | 40-49   | 365                   | 167  | 87          | 9           | 27          | 33          | 28          | 5             | 5             | 1             | 3     |
|         | 50+     | 1035                  | 447  | 263         | 60          | 65          | 92          | 67          | 25            | 4             | 2             | 4     |
| 1966-70 | Total   | 1752                  | 797  | 420         | 91          | 128         | 161         | 83          | 48            | 17            | 3             | 4     |
|         | 0-9     | 10                    | 5    | 2           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 28                    | 15   | 5           | 0           | 4           | 2           | 1           | 1             | 0             | 0             | 0     |
|         | 20-29   | 48                    | 19   | 9           | 1           | 7           | 3           | 2           | 5             | 1             | 0             | 1     |
|         | 30-39   | 170                   | 78   | 50          | 7           | 12          | 8           | 10          | 1             | 5             | 0             | 1     |
|         | 40-49   | 492                   | 230  | 116         | 20          | 33          | 46          | 26          | 13            | 6             | 1             | 1     |
|         | 50+     | 1004                  | 452  | 238         | 62          | 71          | 101         | 44          | 28            | 5             | 2             | 1     |
| 1971-75 | Total   | 1834                  | 857  | 425         | 89          | 134         | 157         | 105         | 50            | 8             | 3             | 6     |
|         | 0-9     | 13                    | 6    | 5           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 38                    | 25   | 5           | 2           | 1           | 1           | 2           | 1             | 0             | 0             | 1     |
|         | 20-29   | 65                    | 33   | 13          | 4           | 8           | 4           | 1           | 2             | 0             | 0             | 0     |
|         | 30-39   | 221                   | 92   | 58          | 8           | 21          | 14          | 14          | 7             | 2             | 2             | 3     |
|         | 40-49   | 665                   | 311  | 137         | 28          | 51          | 69          | 37          | 25            | 5             | 0             | 2     |
|         | 50+     | 832                   | 390  | 207         | 47          | 53          | 67          | 51          | 15            | 1             | 1             | 0     |
| 1976-80 | Total   | 1861                  | 829  | 444         | 112         | 146         | 151         | 93          | 53            | 21            | 3             | 9     |
|         | 0-9     | 21                    | 13   | 2           | 1           | 3           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 50                    | 21   | 13          | 3           | 5           | 3           | 1           | 2             | 1             | 0             | 1     |
|         | 20-29   | 107                   | 52   | 29          | 1           | 7           | 4           | 7           | 3             | 3             | 0             | 1     |
|         | 30-39   | 318                   | 140  | 86          | 26          | 19          | 16          | 15          | 7             | 6             | 1             | 2     |
|         | 40-49   | 818                   | 357  | 187         | 47          | 76          | 75          | 45          | 21            | 7             | 1             | 2     |
|         | 50+     | 547                   | 246  | 127         | 34          | 36          | 51          | 25          | 20            | 4             | 1             | 3     |
| 1981-85 | Total   | 1786                  | 742  | 490         | 105         | 117         | 168         | 101         | 41            | 12            | 4             | 6     |
|         | 0-9     | 33                    | 13   | 10          | 0           | 4           | 2           | 1           | 1             | 1             | 0             | 1     |
|         | 10-19   | 78                    | 33   | 18          | 11          | 5           | 7           | 3           | 0             | 0             | 0             | 1     |
|         | 20-29   | 117                   | 55   | 34          | 6           | 2           | 11          | 4           | 3             | 1             | 0             | 1     |
|         | 30-39   | 447                   | 191  | 114         | 25          | 30          | 40          | 28          | 13            | 3             | 2             | 1     |
|         | 40-49   | 812                   | 320  | 233         | 45          | 60          | 73          | 49          | 21            | 7             | 2             | 2     |
|         | 50+     | 299                   | 130  | 81          | 18          | 16          | 35          | 16          | 3             | 0             | 0             | 0     |

Appendix Table 5B. Number of deaths from circulatory disease, males

| Period  | Age ATB | Radiation Dose (Gray) |      |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 4797                  | 2278 | 1063        | 289         | 329         | 391         | 250         | 139           | 42            | 12            | 24    |
|         | 0-9     | 65                    | 34   | 18          | 1           | 4           | 5           | 1           | 1             | 1             | 0             | 0     |
|         | 10-19   | 143                   | 74   | 29          | 11          | 8           | 11          | 6           | 1             | 1             | 0             | 2     |
|         | 20-29   | 151                   | 69   | 33          | 5           | 17          | 9           | 7           | 7             | 2             | 0             | 2     |
|         | 30-39   | 527                   | 251  | 124         | 24          | 38          | 29          | 36          | 10            | 8             | 4             | 5     |
|         | 40-49   | 1606                  | 760  | 335         | 90          | 121         | 134         | 88          | 51            | 19            | 2             | 6     |
|         | 50+     | 2305                  | 1080 | 524         | 138         | 141         | 203         | 112         | 69            | 13            | 6             | 9     |
| 1950-55 | Total   | 498                   | 248  | 119         | 25          | 38          | 32          | 23          | 6             | 3             | 1             | 3     |
|         | 0-9     | 7                     | 3    | 4           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 7                     | 4    | 0           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 4                     | 1    | 0           | 0           | 2           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 20                    | 11   | 2           | 0           | 2           | 2           | 1           | 1             | 0             | 1             | 0     |
|         | 40-49   | 74                    | 38   | 12          | 5           | 7           | 6           | 3           | 1             | 2             | 0             | 0     |
|         | 50+     | 386                   | 191  | 101         | 19          | 26          | 23          | 18          | 4             | 1             | 0             | 3     |
| 1956-60 | Total   | 639                   | 318  | 129         | 34          | 38          | 63          | 23          | 24            | 7             | 0             | 3     |
|         | 0-9     | 4                     | 3    | 0           | 0           | 0           | 0           | 0           | 0             | 1             | 0             | 0     |
|         | 10-19   | 5                     | 4    | 0           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 8                     | 2    | 5           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 24                    | 9    | 5           | 1           | 3           | 3           | 2           | 0             | 0             | 0             | 1     |
|         | 40-49   | 136                   | 67   | 24          | 9           | 9           | 13          | 7           | 7             | 0             | 0             | 0     |
|         | 50+     | 462                   | 233  | 95          | 24          | 26          | 46          | 13          | 17            | 6             | 0             | 2     |
| 1961-65 | Total   | 767                   | 345  | 185         | 41          | 47          | 63          | 53          | 20            | 7             | 3             | 3     |
|         | 0-9     | 1                     | 0    | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 12                    | 4    | 6           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 11                    | 5    | 3           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 48                    | 22   | 13          | 2           | 2           | 2           | 6           | 1             | 0             | 0             | 0     |
|         | 40-49   | 214                   | 103  | 41          | 7           | 14          | 20          | 19          | 4             | 4             | 1             | 1     |
|         | 50+     | 481                   | 211  | 121         | 32          | 28          | 39          | 28          | 15            | 3             | 2             | 2     |
| 1966-70 | Total   | 788                   | 369  | 183         | 39          | 54          | 65          | 38          | 30            | 5             | 2             | 3     |
|         | 0-9     | 6                     | 3    | 0           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 21                    | 11   | 4           | 0           | 2           | 2           | 1           | 1             | 0             | 0             | 0     |
|         | 20-29   | 20                    | 8    | 2           | 1           | 5           | 1           | 0           | 3             | 0             | 0             | 0     |
|         | 30-39   | 79                    | 36   | 24          | 1           | 6           | 2           | 5           | 1             | 3             | 0             | 1     |
|         | 40-49   | 250                   | 127  | 62          | 9           | 12          | 17          | 13          | 7             | 2             | 0             | 1     |
|         | 50+     | 412                   | 184  | 91          | 27          | 28          | 42          | 19          | 18            | 0             | 2             | 1     |
| 1971-75 | Total   | 746                   | 368  | 156         | 36          | 48          | 64          | 43          | 22            | 2             | 2             | 5     |
|         | 0-9     | 10                    | 4    | 4           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 26                    | 17   | 4           | 1           | 0           | 1           | 2           | 0             | 0             | 0             | 1     |
|         | 20-29   | 30                    | 15   | 6           | 1           | 4           | 2           | 1           | 1             | 0             | 0             | 0     |
|         | 30-39   | 99                    | 47   | 28          | 3           | 7           | 6           | 5           | 2             | 0             | 1             | 2     |
|         | 40-49   | 279                   | 137  | 55          | 12          | 19          | 30          | 11          | 12            | 1             | 0             | 2     |
|         | 50+     | 302                   | 148  | 61          | 19          | 18          | 23          | 24          | 7             | 1             | 1             | 0     |
| 1976-80 | Total   | 731                   | 353  | 144         | 46          | 55          | 58          | 36          | 22            | 13            | 2             | 4     |
|         | 0-9     | 14                    | 10   | 1           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 29                    | 15   | 9           | 1           | 2           | 0           | 1           | 0             | 1             | 0             | 0     |
|         | 20-29   | 44                    | 23   | 7           | 1           | 4           | 1           | 2           | 3             | 2             | 0             | 1     |
|         | 30-39   | 118                   | 60   | 24          | 9           | 5           | 5           | 9           | 1             | 3             | 1             | 1     |
|         | 40-49   | 341                   | 155  | 66          | 24          | 32          | 28          | 18          | 12            | 5             | 0             | 1     |
|         | 50+     | 185                   | 90   | 37          | 11          | 10          | 21          | 6           | 6             | 2             | 1             | 1     |
| 1981-85 | Total   | 628                   | 277  | 147         | 48          | 49          | 48          | 34          | 15            | 5             | 2             | 3     |
|         | 0-9     | 23                    | 11   | 8           | 0           | 1           | 1           | 1           | 1             | 0             | 0             | 0     |
|         | 10-19   | 43                    | 19   | 6           | 8           | 2           | 5           | 2           | 0             | 0             | 0             | 1     |
|         | 20-29   | 34                    | 15   | 10          | 2           | 0           | 4           | 2           | 0             | 0             | 0             | 1     |
|         | 30-39   | 139                   | 66   | 30          | 8           | 13          | 9           | 8           | 4             | 0             | 1             | 0     |
|         | 40-49   | 312                   | 133  | 75          | 24          | 28          | 20          | 17          | 8             | 5             | 1             | 1     |
|         | 50+     | 77                    | 33   | 18          | 8           | 5           | 9           | 4           | 2             | 0             | 0             | 0     |



Appendix Table 5C. Number of deaths from circulatory disease, females

| Period  | Age ATB | Radiation Dose (Gray) |      |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.13 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 6367                  | 2747 | 1704        | 336         | 446         | 590         | 340         | 134           | 43            | 8             | 19    |
|         | 0-9     | 40                    | 18   | 8           | 2           | 6           | 5           | 0           | 1             | 1             | 0             | 1     |
|         | 10-19   | 104                   | 42   | 23          | 8           | 11          | 12          | 3           | 4             | 0             | 0             | 1     |
|         | 20-29   | 245                   | 117  | 89          | 7           | 11          | 19          | 11          | 7             | 3             | 0             | 1     |
|         | 30-39   | 852                   | 337  | 244         | 56          | 58          | 66          | 50          | 23            | 13            | 2             | 3     |
|         | 40-49   | 1968                  | 817  | 523         | 87          | 155         | 201         | 117         | 44            | 15            | 4             | 5     |
|         | 50+     | 3158                  | 1416 | 839         | 176         | 205         | 287         | 159         | 55            | 11            | 2             | 8     |
| 1950-55 | Total   | 548                   | 237  | 167         | 30          | 27          | 44          | 25          | 8             | 5             | 2             | 3     |
|         | 0-9     | 5                     | 3    | 0           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 7                     | 3    | 1           | 1           | 1           | 0           | 0           | 1             | 0             | 0             | 0     |
|         | 20-29   | 13                    | 5    | 5           | 0           | 0           | 2           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 31                    | 8    | 10          | 5           | 0           | 2           | 3           | 2             | 1             | 0             | 0     |
|         | 40-49   | 87                    | 35   | 28          | 6           | 4           | 8           | 4           | 0             | 2             | 0             | 0     |
|         | 50+     | 405                   | 183  | 123         | 18          | 22          | 30          | 18          | 4             | 2             | 2             | 3     |
| 1956-60 | Total   | 681                   | 317  | 170         | 42          | 46          | 63          | 29          | 10            | 1             | 1             | 2     |
|         | 0-9     | 8                     | 5    | 0           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 10                    | 5    | 1           | 1           | 0           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 9                     | 5    | 2           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 36                    | 16   | 11          | 1           | 4           | 2           | 2           | 0             | 0             | 0             | 0     |
|         | 40-49   | 125                   | 52   | 34          | 8           | 9           | 12          | 6           | 2             | 0             | 1             | 1     |
|         | 50+     | 493                   | 234  | 122         | 32          | 31          | 45          | 19          | 8             | 1             | 0             | 1     |
| 1961-65 | Total   | 798                   | 335  | 218         | 36          | 54          | 79          | 55          | 13            | 4             | 0             | 4     |
|         | 0-9     | 3                     | 1    | 0           | 1           | 0           | 0           | 0           | 1             | 0             | 0             | 0     |
|         | 10-19   | 12                    | 2    | 3           | 0           | 1           | 5           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 14                    | 9    | 2           | 0           | 0           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 64                    | 23   | 19          | 5           | 3           | 6           | 5           | 1             | 2             | 0             | 0     |
|         | 40-49   | 151                   | 64   | 46          | 2           | 13          | 13          | 9           | 1             | 1             | 0             | 2     |
|         | 50+     | 554                   | 236  | 148         | 28          | 37          | 53          | 39          | 10            | 1             | 0             | 2     |
| 1966-70 | Total   | 964                   | 428  | 237         | 52          | 74          | 96          | 45          | 18            | 12            | 1             | 1     |
|         | 0-9     | 4                     | 2    | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 7                     | 4    | 1           | 0           | 2           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 28                    | 11   | 7           | 0           | 2           | 2           | 2           | 2             | 1             | 0             | 1     |
|         | 30-39   | 91                    | 40   | 26          | 6           | 6           | 6           | 5           | 0             | 2             | 0             | 0     |
|         | 40-49   | 242                   | 103  | 54          | 11          | 21          | 29          | 13          | 6             | 4             | 1             | 0     |
|         | 50+     | 592                   | 268  | 147         | 35          | 43          | 59          | 25          | 10            | 5             | 0             | 0     |
| 1971-75 | Total   | 1088                  | 489  | 269         | 53          | 86          | 93          | 82          | 28            | 6             | 1             | 1     |
|         | 0-9     | 3                     | 2    | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 12                    | 8    | 1           | 1           | 1           | 0           | 0           | 1             | 0             | 0             | 0     |
|         | 20-29   | 35                    | 18   | 7           | 3           | 4           | 2           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 122                   | 45   | 32          | 5           | 14          | 8           | 9           | 5             | 2             | 1             | 1     |
|         | 40-49   | 386                   | 174  | 82          | 16          | 32          | 39          | 26          | 13            | 4             | 0             | 0     |
|         | 50+     | 530                   | 242  | 146         | 28          | 35          | 44          | 27          | 8             | 0             | 0             | 0     |
| 1976-80 | Total   | 1130                  | 476  | 300         | 66          | 91          | 95          | 57          | 31            | 8             | 1             | 5     |
|         | 0-9     | 7                     | 3    | 1           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 21                    | 6    | 4           | 2           | 3           | 3           | 0           | 2             | 0             | 0             | 1     |
|         | 20-29   | 63                    | 29   | 22          | 0           | 3           | 3           | 5           | 0             | 1             | 0             | 0     |
|         | 30-39   | 200                   | 80   | 62          | 17          | 14          | 11          | 6           | 6             | 3             | 0             | 1     |
|         | 40-49   | 477                   | 202  | 121         | 23          | 44          | 47          | 27          | 9             | 2             | 1             | 1     |
|         | 50+     | 362                   | 156  | 90          | 23          | 26          | 30          | 19          | 14            | 2             | 0             | 2     |
| 1981-85 | Total   | 1158                  | 465  | 343         | 57          | 88          | 120         | 67          | 26            | 7             | 2             | 3     |
|         | 0-9     | 10                    | 2    | 2           | 0           | 3           | 1           | 0           | 0             | 1             | 0             | 1     |
|         | 10-19   | 35                    | 14   | 12          | 3           | 3           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 83                    | 40   | 24          | 4           | 2           | 7           | 2           | 3             | 1             | 0             | 0     |
|         | 30-39   | 308                   | 125  | 84          | 17          | 17          | 31          | 20          | 9             | 3             | 1             | 1     |
|         | 40-49   | 500                   | 187  | 158         | 21          | 32          | 53          | 32          | 13            | 2             | 1             | 1     |
|         | 50+     | 222                   | 97   | 63          | 12          | 11          | 28          | 12          | 1             | 0             | 0             | 0     |

Appendix Table 6A. Number of deaths from respiratory disease, sexes combined

| Period  | Age ATB | Radiation Dose (Gray) |     |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0   | .01<br>-.05 | .08<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.89 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 2038                  | 888 | 528         | 135         | 162         | 150         | 95          | 45            | 17            | 4             | 12    |
|         | 0-9     | 25                    | 11  | 9           | 2           | 3           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 41                    | 23  | 8           | 1           | 0           | 4           | 5           | 1             | 0             | 0             | 1     |
|         | 20-29   | 69                    | 27  | 20          | 7           | 5           | 4           | 3           | 1             | 1             | 0             | 1     |
|         | 30-39   | 221                   | 80  | 56          | 21          | 20          | 23          | 14          | 3             | 1             | 1             | 2     |
|         | 40-49   | 667                   | 308 | 160         | 39          | 54          | 47          | 29          | 18            | 8             | 1             | 5     |
|         | 50+     | 1013                  | 441 | 277         | 65          | 80          | 72          | 44          | 22            | 7             | 2             | 3     |
| 1950-55 | Total   | 167                   | 70  | 48          | 11          | 14          | 11          | 7           | 4             | 1             | 0             | 1     |
|         | 0-9     | 2                     | 1   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 7                     | 5   | 0           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 4                     | 3   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 8                     | 3   | 3           | 1           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 17                    | 6   | 5           | 2           | 0           | 2           | 1           | 0             | 0             | 0             | 1     |
|         | 50+     | 129                   | 52  | 38          | 8           | 14          | 7           | 5           | 4             | 1             | 0             | 0     |
| 1956-60 | Total   | 216                   | 92  | 64          | 9           | 16          | 18          | 7           | 7             | 1             | 1             | 1     |
|         | 0-9     | 6                     | 5   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 7                     | 2   | 2           | 0           | 0           | 1           | 1           | 1             | 0             | 0             | 0     |
|         | 20-29   | 7                     | 3   | 3           | 0           | 0           | 0           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 16                    | 7   | 2           | 2           | 1           | 0           | 1           | 1             | 0             | 1             | 1     |
|         | 40-49   | 26                    | 12  | 7           | 0           | 4           | 3           | 0           | 0             | 0             | 0             | 0     |
|         | 50+     | 154                   | 63  | 49          | 7           | 11          | 14          | 5           | 4             | 1             | 0             | 0     |
| 1961-65 | Total   | 249                   | 117 | 64          | 19          | 13          | 13          | 13          | 5             | 1             | 1             | 3     |
|         | 0-9     | 1                     | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 2                     | 1   | 0           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 8                     | 3   | 3           | 1           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 12                    | 3   | 5           | 2           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 40                    | 20  | 10          | 1           | 1           | 2           | 3           | 2             | 0             | 0             | 1     |
|         | 50+     | 186                   | 90  | 45          | 14          | 12          | 9           | 9           | 3             | 1             | 1             | 2     |
| 1966-70 | Total   | 271                   | 114 | 80          | 14          | 18          | 21          | 14          | 8             | 1             | 0             | 1     |
|         | 0-9     | 1                     | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 2                     | 0   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 13                    | 5   | 5           | 0           | 1           | 0           | 1           | 0             | 0             | 0             | 1     |
|         | 30-39   | 21                    | 10  | 5           | 0           | 2           | 2           | 2           | 0             | 0             | 0             | 0     |
|         | 40-49   | 73                    | 28  | 27          | 2           | 6           | 5           | 1           | 3             | 1             | 0             | 0     |
|         | 50+     | 161                   | 71  | 41          | 12          | 9           | 14          | 9           | 5             | 0             | 0             | 0     |
| 1971-75 | Total   | 321                   | 142 | 74          | 24          | 25          | 20          | 17          | 9             | 6             | 1             | 3     |
|         | 0-9     | 5                     | 3   | 0           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 9                     | 5   | 2           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 1     |
|         | 20-29   | 9                     | 3   | 1           | 1           | 2           | 0           | 1           | 0             | 1             | 0             | 0     |
|         | 30-39   | 24                    | 7   | 5           | 1           | 2           | 5           | 3           | 1             | 0             | 0             | 0     |
|         | 40-49   | 115                   | 57  | 23          | 9           | 9           | 4           | 4           | 7             | 1             | 0             | 1     |
|         | 50+     | 159                   | 67  | 43          | 12          | 11          | 11          | 8           | 1             | 4             | 1             | 1     |
| 1976-80 | Total   | 402                   | 178 | 93          | 31          | 41          | 30          | 22          | 5             | 2             | 0             | 0     |
|         | 0-9     | 6                     | 2   | 2           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 11                    | 8   | 0           | 0           | 0           | 1           | 2           | 0             | 0             | 0             | 0     |
|         | 20-29   | 10                    | 2   | 4           | 3           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 54                    | 19  | 16          | 7           | 7           | 2           | 2           | 0             | 1             | 0             | 0     |
|         | 40-49   | 172                   | 84  | 32          | 10          | 16          | 15          | 12          | 2             | 1             | 0             | 0     |
|         | 50+     | 149                   | 63  | 39          | 10          | 17          | 11          | 6           | 3             | 0             | 0             | 0     |
| 1981-85 | Total   | 410                   | 175 | 105         | 27          | 35          | 37          | 15          | 7             | 5             | 1             | 3     |
|         | 0-9     | 4                     | 0   | 3           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 3                     | 2   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 18                    | 8   | 3           | 2           | 2           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 86                    | 31  | 20          | 8           | 8           | 13          | 4           | 1             | 0             | 0             | 1     |
|         | 40-49   | 224                   | 99  | 56          | 15          | 18          | 16          | 8           | 4             | 5             | 1             | 2     |
|         | 50+     | 75                    | 35  | 22          | 2           | 6           | 6           | 2           | 2             | 0             | 0             | 0     |

Appendix Table 6B. Number of deaths from respiratory disease, males

| Period  | Age ATB | Radiation Dose (Gray) |     |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 1025                  | 454 | 246         | 83          | 98          | 70          | 49          | 25            | 8             | 4             | 10    |
|         | 0-9     | 14                    | 5   | 7           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 25                    | 13  | 4           | 0           | 0           | 2           | 4           | 1             | 0             | 0             | 1     |
|         | 20-29   | 29                    | 12  | 9           | 3           | 3           | 1           | 0           | 0             | 0             | 0             | 1     |
|         | 30-39   | 108                   | 43  | 25          | 9           | 15          | 6           | 5           | 2             | 0             | 1             | 2     |
|         | 40-49   | 361                   | 177 | 75          | 19          | 29          | 28          | 16          | 10            | 3             | 1             | 3     |
|         | 50+     | 488                   | 204 | 126         | 31          | 48          | 33          | 24          | 12            | 5             | 2             | 3     |
| 1950-55 | Total   | 88                    | 33  | 23          | 8           | 10          | 6           | 5           | 2             | 0             | 0             | 1     |
|         | 0-9     | 1                     | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 2                     | 1   | 0           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 4                     | 3   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 3                     | 1   | 1           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 9                     | 3   | 1           | 1           | 0           | 2           | 1           | 0             | 0             | 0             | 1     |
|         | 50+     | 69                    | 25  | 19          | 6           | 10          | 3           | 4           | 2             | 0             | 0             | 0     |
| 1956-60 | Total   | 118                   | 47  | 31          | 4           | 14          | 11          | 4           | 4             | 1             | 1             | 1     |
|         | 0-9     | 2                     | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 6                     | 2   | 2           | 0           | 0           | 0           | 1           | 1             | 0             | 0             | 0     |
|         | 20-29   | 2                     | 1   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 6                     | 2   | 0           | 0           | 1           | 0           | 0           | 1             | 0             | 1             | 1     |
|         | 40-49   | 17                    | 9   | 2           | 0           | 3           | 3           | 0           | 0             | 0             | 0             | 0     |
|         | 50+     | 85                    | 31  | 26          | 4           | 10          | 8           | 3           | 2             | 1             | 0             | 0     |
| 1961-65 | Total   | 122                   | 64  | 27          | 7           | 5           | 7           | 4           | 3             | 1             | 1             | 3     |
|         | 0-9     | 1                     | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 1                     | 1   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 4                     | 2   | 1           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 6                     | 1   | 3           | 1           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 27                    | 16  | 7           | 0           | 0           | 0           | 1           | 2             | 0             | 0             | 1     |
|         | 50+     | 83                    | 44  | 15          | 5           | 5           | 6           | 3           | 1             | 1             | 1             | 2     |
| 1966-70 | Total   | 146                   | 67  | 37          | 7           | 11          | 12          | 6           | 4             | 1             | 0             | 1     |
|         | 0-9     | 1                     | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 1                     | 0   | 0           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 3                     | 0   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 1     |
|         | 30-39   | 16                    | 9   | 2           | 0           | 2           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 41                    | 19  | 14          | 2           | 3           | 2           | 0           | 0             | 1             | 0             | 0     |
|         | 50+     | 84                    | 39  | 18          | 5           | 6           | 8           | 4           | 4             | 0             | 0             | 0     |
| 1971-75 | Total   | 189                   | 70  | 38          | 12          | 15          | 8           | 12          | 7             | 4             | 1             | 2     |
|         | 0-9     | 3                     | 2   | 0           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 6                     | 3   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 1     |
|         | 20-29   | 3                     | 2   | 0           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 13                    | 6   | 3           | 1           | 0           | 0           | 2           | 1             | 0             | 0             | 0     |
|         | 40-49   | 88                    | 30  | 13          | 5           | 7           | 3           | 3           | 6             | 1             | 0             | 0     |
|         | 50+     | 76                    | 27  | 21          | 5           | 7           | 5           | 6           | 0             | 3             | 1             | 1     |
| 1976-80 | Total   | 191                   | 88  | 42          | 16          | 21          | 12          | 10          | 2             | 0             | 0             | 0     |
|         | 0-9     | 4                     | 1   | 2           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 8                     | 6   | 0           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 4                     | 1   | 2           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 23                    | 7   | 6           | 4           | 6           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 86                    | 47  | 12          | 5           | 7           | 9           | 6           | 0             | 0             | 0             | 0     |
|         | 50+     | 66                    | 28  | 20          | 6           | 7           | 2           | 3           | 2             | 0             | 0             | 0     |
| 1981-85 | Total   | 191                   | 85  | 48          | 9           | 20          | 14          | 8           | 3             | 1             | 1             | 2     |
|         | 0-9     | 2                     | 0   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 1                     | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 9                     | 3   | 2           | 1           | 2           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 41                    | 17  | 10          | 2           | 6           | 3           | 2           | 0             | 0             | 0             | 1     |
|         | 40-49   | 113                   | 53  | 26          | 6           | 9           | 9           | 5           | 2             | 1             | 1             | 1     |
|         | 50+     | 25                    | 12  | 7           | 0           | 3           | 1           | 1           | 1             | 0             | 0             | 0     |

Appendix Table 6C. Number of deaths from respiratory disease, females

| Period  | Age ATB | Radiation Dose (Gray) |     |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.89 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 1011                  | 434 | 282         | 72          | 66          | 80          | 46          | 20            | 9             | 0             | 2     |
|         | 0-9     | 11                    | 6   | 2           | 1           | 2           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 18                    | 10  | 2           | 1           | 0           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 40                    | 15  | 11          | 4           | 2           | 3           | 3           | 1             | 1             | 0             | 0     |
|         | 30-39   | 113                   | 37  | 31          | 12          | 5           | 17          | 9           | 1             | 1             | 0             | 0     |
|         | 40-49   | 306                   | 129 | 85          | 20          | 25          | 19          | 13          | 8             | 5             | 0             | 2     |
|         | 50+     | 525                   | 237 | 151         | 34          | 32          | 39          | 20          | 10            | 2             | 0             | 0     |
| 1950-55 | Total   | 79                    | 37  | 25          | 3           | 4           | 5           | 2           | 2             | 1             | 0             | 0     |
|         | 0-9     | 1                     | 1   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 5                     | 4   | 0           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 0                     | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 5                     | 2   | 2           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 8                     | 3   | 4           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 50+     | 60                    | 27  | 19          | 2           | 4           | 4           | 1           | 2             | 1             | 0             | 0     |
| 1956-60 | Total   | 98                    | 45  | 33          | 5           | 2           | 7           | 3           | 3             | 0             | 0             | 0     |
|         | 0-9     | 4                     | 3   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 1                     | 0   | 0           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 5                     | 2   | 2           | 0           | 0           | 0           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 10                    | 5   | 2           | 2           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 9                     | 3   | 5           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 50+     | 69                    | 32  | 23          | 3           | 1           | 6           | 2           | 2             | 0             | 0             | 0     |
| 1961-65 | Total   | 127                   | 53  | 37          | 12          | 8           | 6           | 9           | 2             | 0             | 0             | 0     |
|         | 0-9     | 0                     | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 1                     | 0   | 0           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 4                     | 1   | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 6                     | 2   | 2           | 1           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 13                    | 4   | 3           | 1           | 1           | 2           | 2           | 0             | 0             | 0             | 0     |
|         | 50+     | 103                   | 46  | 30          | 9           | 7           | 3           | 6           | 2             | 0             | 0             | 0     |
| 1966-70 | Total   | 125                   | 47  | 43          | 7           | 7           | 9           | 8           | 4             | 0             | 0             | 0     |
|         | 0-9     | 0                     | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 1                     | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 10                    | 5   | 3           | 0           | 1           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 5                     | 1   | 3           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 32                    | 9   | 13          | 0           | 3           | 3           | 1           | 3             | 0             | 0             | 0     |
|         | 50+     | 77                    | 32  | 23          | 7           | 3           | 6           | 5           | 1             | 0             | 0             | 0     |
| 1971-75 | Total   | 152                   | 72  | 36          | 12          | 10          | 12          | 5           | 2             | 2             | 0             | 1     |
|         | 0-9     | 2                     | 1   | 0           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 3                     | 2   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 6                     | 1   | 1           | 1           | 1           | 0           | 1           | 0             | 1             | 0             | 0     |
|         | 30-39   | 11                    | 1   | 2           | 0           | 2           | 5           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 47                    | 27  | 10          | 4           | 2           | 1           | 1           | 1             | 0             | 0             | 1     |
|         | 50+     | 83                    | 40  | 22          | 7           | 4           | 6           | 2           | 1             | 1             | 0             | 0     |
| 1976-80 | Total   | 211                   | 90  | 51          | 15          | 20          | 18          | 12          | 3             | 2             | 0             | 0     |
|         | 0-9     | 2                     | 1   | 0           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 3                     | 2   | 0           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 6                     | 1   | 2           | 2           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 31                    | 12  | 10          | 3           | 1           | 2           | 2           | 0             | 1             | 0             | 0     |
|         | 40-49   | 86                    | 37  | 20          | 5           | 9           | 8           | 6           | 2             | 1             | 0             | 0     |
|         | 50+     | 83                    | 37  | 19          | 4           | 10          | 9           | 3           | 1             | 0             | 0             | 0     |
| 1981-85 | Total   | 219                   | 90  | 57          | 18          | 15          | 23          | 7           | 4             | 4             | 0             | 1     |
|         | 0-9     | 2                     | 0   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 2                     | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 9                     | 5   | 1           | 1           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 45                    | 14  | 10          | 6           | 2           | 10          | 2           | 1             | 0             | 0             | 0     |
|         | 40-49   | 111                   | 46  | 30          | 9           | 9           | 7           | 3           | 2             | 4             | 0             | 1     |
|         | 50+     | 50                    | 23  | 15          | 2           | 3           | 5           | 1           | 1             | 0             | 0             | 0     |

Appendix Table 7A. Number of deaths from digestive disease, sexes combined

| Period  | Age ATB | Radiation Dose (Gray) |      |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0    | .01<br>-.05 | .05<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 2148                  | 1002 | 510         | 105         | 142         | 194         | 98          | 63            | 14            | 8             | 13    |
|         | 0-9     | 55                    | 26   | 13          | 1           | 2           | 9           | 3           | 1             | 0             | 0             | 0     |
|         | 10-19   | 157                   | 70   | 38          | 11          | 1           | 11          | 14          | 4             | 2             | 1             | 5     |
|         | 20-29   | 127                   | 68   | 18          | 7           | 8           | 14          | 6           | 3             | 0             | 2             | 1     |
|         | 30-39   | 282                   | 119  | 76          | 9           | 22          | 26          | 14          | 13            | 1             | 0             | 2     |
|         | 40-49   | 587                   | 270  | 130         | 35          | 44          | 48          | 29          | 21            | 5             | 3             | 2     |
|         | 50+     | 941                   | 449  | 235         | 42          | 65          | 86          | 32          | 21            | 6             | 2             | 3     |
| 1950-55 | Total   | 393                   | 187  | 99          | 14          | 28          | 32          | 21          | 10            | 2             | 0             | 0     |
|         | 0-9     | 10                    | 5    | 1           | 0           | 0           | 3           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 6                     | 3    | 1           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 8                     | 2    | 1           | 0           | 2           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 26                    | 11   | 9           | 0           | 2           | 1           | 3           | 0             | 0             | 0             | 0     |
|         | 40-49   | 79                    | 41   | 18          | 3           | 6           | 3           | 3           | 4             | 1             | 0             | 0     |
|         | 50+     | 284                   | 125  | 69          | 11          | 18          | 22          | 12          | 6             | 1             | 0             | 0     |
| 1956-60 | Total   | 327                   | 160  | 73          | 14          | 23          | 33          | 9           | 10            | 1             | 2             | 2     |
|         | 0-9     | 5                     | 2    | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 13                    | 9    | 2           | 1           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 13                    | 8    | 1           | 0           | 0           | 2           | 0           | 2             | 0             | 0             | 0     |
|         | 30-39   | 29                    | 12   | 7           | 1           | 3           | 5           | 0           | 0             | 0             | 0             | 1     |
|         | 40-49   | 57                    | 25   | 11          | 4           | 6           | 5           | 2           | 2             | 1             | 1             | 0     |
|         | 50+     | 210                   | 104  | 50          | 8           | 14          | 20          | 6           | 6             | 0             | 1             | 1     |
| 1961-65 | Total   | 310                   | 145  | 77          | 18          | 23          | 24          | 13          | 6             | 2             | 1             | 1     |
|         | 0-9     | 2                     | 2    | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 8                     | 0    | 4           | 1           | 0           | 1           | 0           | 2             | 0             | 0             | 0     |
|         | 20-29   | 15                    | 9    | 2           | 0           | 1           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 31                    | 12   | 9           | 3           | 3           | 1           | 2           | 1             | 0             | 0             | 0     |
|         | 40-49   | 80                    | 38   | 23          | 5           | 2           | 4           | 5           | 3             | 0             | 0             | 0     |
|         | 50+     | 174                   | 84   | 39          | 9           | 17          | 18          | 5           | 0             | 2             | 1             | 1     |
| 1966-70 | Total   | 299                   | 130  | 77          | 14          | 18          | 32          | 11          | 12            | 4             | 1             | 2     |
|         | 0-9     | 6                     | 2    | 2           | 0           | 1           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 18                    | 6    | 6           | 0           | 0           | 3           | 0           | 1             | 2             | 0             | 0     |
|         | 20-29   | 17                    | 10   | 3           | 0           | 1           | 3           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 36                    | 19   | 12          | 0           | 3           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 95                    | 35   | 16          | 8           | 6           | 13          | 8           | 5             | 1             | 1             | 2     |
|         | 50+     | 127                   | 58   | 38          | 8           | 5           | 11          | 2           | 6             | 1             | 0             | 0     |
| 1971-75 | Total   | 288                   | 110  | 85          | 20          | 18          | 21          | 20          | 8             | 3             | 1             | 2     |
|         | 0-9     | 4                     | 2    | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 33                    | 14   | 10          | 2           | 0           | 2           | 4           | 0             | 0             | 0             | 1     |
|         | 20-29   | 19                    | 9    | 3           | 2           | 1           | 0           | 2           | 1             | 0             | 1             | 0     |
|         | 30-39   | 38                    | 15   | 6           | 4           | 3           | 3           | 3           | 4             | 0             | 0             | 0     |
|         | 40-49   | 93                    | 36   | 27          | 5           | 8           | 7           | 6           | 2             | 1             | 0             | 0     |
|         | 50+     | 81                    | 34   | 18          | 8           | 6           | 9           | 4           | 1             | 2             | 0             | 1     |
| 1976-80 | Total   | 300                   | 150  | 88          | 13          | 24          | 21          | 10          | 10            | 1             | 1             | 2     |
|         | 0-9     | 15                    | 7    | 4           | 0           | 0           | 3           | 0           | 1             | 0             | 0             | 0     |
|         | 10-19   | 35                    | 20   | 8           | 4           | 0           | 0           | 2           | 0             | 0             | 0             | 1     |
|         | 20-29   | 33                    | 16   | 5           | 4           | 3           | 2           | 2           | 0             | 0             | 0             | 1     |
|         | 30-39   | 56                    | 20   | 19          | 0           | 4           | 4           | 3           | 5             | 1             | 0             | 0     |
|         | 40-49   | 97                    | 55   | 17          | 3           | 12          | 5           | 1           | 3             | 0             | 1             | 0     |
|         | 50+     | 64                    | 32   | 15          | 2           | 5           | 7           | 2           | 1             | 0             | 0             | 0     |
| 1981-85 | Total   | 252                   | 120  | 51          | 12          | 10          | 31          | 14          | 7             | 1             | 2             | 4     |
|         | 0-9     | 13                    | 6    | 3           | 1           | 1           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 44                    | 18   | 7           | 3           | 1           | 4           | 6           | 1             | 0             | 1             | 3     |
|         | 20-29   | 22                    | 14   | 3           | 1           | 0           | 3           | 0           | 0             | 0             | 1             | 0     |
|         | 30-39   | 66                    | 30   | 14          | 1           | 4           | 10          | 3           | 3             | 0             | 0             | 1     |
|         | 40-49   | 86                    | 40   | 18          | 6           | 4           | 11          | 4           | 2             | 1             | 0             | 0     |
|         | 50+     | 21                    | 12   | 6           | 0           | 0           | 1           | 1           | 1             | 0             | 0             | 0     |

Appendix Table 7B. Number of deaths from digestive disease, males

| Period  | Age ATB | Radiation Dose (Gray) |     |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 1108                  | 543 | 234         | 51          | 88          | 105         | 54          | 33            | 8             | 3             | 11    |
|         | 0-9     | 44                    | 20  | 10          | 1           | 2           | 8           | 2           | 1             | 0             | 0             | 0     |
|         | 10-19   | 119                   | 56  | 29          | 5           | 1           | 7           | 10          | 2             | 2             | 1             | 5     |
|         | 20-29   | 66                    | 36  | 9           | 4           | 4           | 7           | 5           | 0             | 0             | 0             | 1     |
|         | 30-39   | 139                   | 60  | 32          | 5           | 11          | 15          | 6           | 8             | 1             | 0             | 1     |
|         | 40-49   | 280                   | 141 | 54          | 17          | 18          | 22          | 15          | 10            | 2             | 0             | 1     |
|         | 50+     | 460                   | 230 | 100         | 18          | 30          | 46          | 16          | 12            | 3             | 2             | 3     |
| 1950-55 | Total   | 208                   | 107 | 43          | 8           | 13          | 23          | 9           | 6             | 1             | 0             | 0     |
|         | 0-9     | 7                     | 3   | 0           | 0           | 0           | 3           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 4                     | 2   | 1           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 4                     | 0   | 1           | 0           | 0           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 12                    | 8   | 2           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 43                    | 23  | 9           | 1           | 4           | 2           | 2           | 1             | 1             | 0             | 0     |
|         | 50+     | 138                   | 71  | 30          | 5           | 9           | 14          | 4           | 5             | 0             | 0             | 0     |
| 1956-60 | Total   | 181                   | 92  | 38          | 7           | 8           | 19          | 7           | 6             | 1             | 1             | 2     |
|         | 0-9     | 5                     | 2   | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 8                     | 8   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 6                     | 4   | 1           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 17                    | 6   | 4           | 1           | 1           | 4           | 0           | 0             | 0             | 0             | 1     |
|         | 40-49   | 30                    | 14  | 3           | 3           | 2           | 4           | 1           | 2             | 1             | 0             | 0     |
|         | 50+     | 115                   | 60  | 27          | 3           | 5           | 9           | 5           | 4             | 0             | 1             | 1     |
| 1961-65 | Total   | 159                   | 77  | 32          | 11          | 12          | 13          | 8           | 3             | 1             | 1             | 1     |
|         | 0-9     | 2                     | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 3                     | 0   | 3           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 5                     | 3   | 0           | 0           | 1           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 18                    | 7   | 4           | 2           | 2           | 1           | 2           | 0             | 0             | 0             | 0     |
|         | 40-49   | 47                    | 24  | 12          | 3           | 1           | 1           | 3           | 3             | 0             | 0             | 0     |
|         | 50+     | 84                    | 41  | 13          | 8           | 8           | 11          | 2           | 0             | 1             | 1             | 1     |
| 1966-70 | Total   | 142                   | 66  | 29          | 7           | 11          | 14          | 5           | 6             | 3             | 0             | 1     |
|         | 0-9     | 3                     | 1   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 14                    | 6   | 3           | 0           | 0           | 2           | 0           | 1             | 2             | 0             | 0     |
|         | 20-29   | 7                     | 4   | 1           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 16                    | 10  | 3           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 52                    | 23  | 7           | 5           | 3           | 6           | 3           | 4             | 0             | 0             | 1     |
|         | 50+     | 50                    | 22  | 14          | 2           | 4           | 4           | 2           | 1             | 1             | 0             | 0     |
| 1971-75 | Total   | 136                   | 63  | 30          | 8           | 8           | 9           | 13          | 2             | 1             | 0             | 2     |
|         | 0-9     | 4                     | 2   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 28                    | 11  | 9           | 2           | 0           | 2           | 3           | 0             | 0             | 0             | 1     |
|         | 20-29   | 11                    | 4   | 2           | 2           | 1           | 0           | 2           | 0             | 0             | 0             | 0     |
|         | 30-39   | 22                    | 11  | 1           | 2           | 2           | 2           | 2           | 2             | 0             | 0             | 0     |
|         | 40-49   | 35                    | 17  | 8           | 1           | 3           | 2           | 4           | 0             | 0             | 0             | 0     |
|         | 50+     | 36                    | 18  | 9           | 1           | 2           | 3           | 1           | 0             | 1             | 0             | 1     |
| 1976-80 | Total   | 160                   | 81  | 36          | 7           | 9           | 15          | 3           | 6             | 1             | 0             | 2     |
|         | 0-9     | 13                    | 5   | 4           | 0           | 0           | 3           | 0           | 1             | 0             | 0             | 0     |
|         | 10-19   | 26                    | 16  | 7           | 2           | 0           | 0           | 0           | 0             | 0             | 0             | 1     |
|         | 20-29   | 22                    | 13  | 2           | 2           | 1           | 2           | 1           | 0             | 0             | 0             | 1     |
|         | 30-39   | 29                    | 8   | 11          | 0           | 3           | 2           | 0           | 4             | 1             | 0             | 0     |
|         | 40-49   | 39                    | 24  | 6           | 2           | 3           | 3           | 1           | 0             | 0             | 0             | 0     |
|         | 50+     | 31                    | 15  | 6           | 1           | 2           | 5           | 1           | 1             | 0             | 0             | 0     |
| 1981-85 | Total   | 122                   | 57  | 26          | 5           | 5           | 12          | 9           | 4             | 0             | 1             | 3     |
|         | 0-9     | 10                    | 5   | 2           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 36                    | 15  | 5           | 2           | 1           | 2           | 6           | 1             | 0             | 1             | 3     |
|         | 20-29   | 11                    | 8   | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 25                    | 10  | 7           | 0           | 1           | 4           | 1           | 2             | 0             | 0             | 0     |
|         | 40-49   | 34                    | 16  | 9           | 2           | 2           | 4           | 1           | 0             | 0             | 0             | 0     |
|         | 50+     | 6                     | 3   | 1           | 0           | 0           | 0           | 1           | 1             | 0             | 0             | 0     |



Appendix Table 7C. Number of deaths from digestive disease, females

| Period  | Age ATB | Radiation Dose (Gray) |     |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0   | .01<br>-.05 | .08<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 1041                  | 459 | 276         | 54          | 76          | 89          | 44          | 30            | 6             | 5             | 2     |
|         | 0-9     | 11                    | 6   | 3           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 38                    | 14  | 9           | 5           | 0           | 4           | 4           | 2             | 0             | 0             | 0     |
|         | 20-29   | 61                    | 32  | 9           | 3           | 4           | 7           | 1           | 3             | 0             | 2             | 0     |
|         | 30-39   | 143                   | 59  | 44          | 4           | 11          | 11          | 8           | 5             | 0             | 0             | 1     |
|         | 40-49   | 307                   | 129 | 76          | 18          | 26          | 26          | 14          | 11            | 3             | 3             | 1     |
|         | 50+     | 481                   | 219 | 135         | 24          | 35          | 40          | 16          | 9             | 3             | 0             | 0     |
| 1950-55 | Total   | 185                   | 80  | 56          | 8           | 15          | 9           | 12          | 4             | 1             | 0             | 0     |
|         | 0-9     | 3                     | 2   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 2                     | 1   | 0           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 4                     | 2   | 0           | 0           | 2           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 14                    | 3   | 7           | 0           | 2           | 0           | 2           | 0             | 0             | 0             | 0     |
|         | 40-49   | 36                    | 18  | 9           | 2           | 2           | 1           | 1           | 3             | 0             | 0             | 0     |
|         | 50+     | 126                   | 54  | 39          | 6           | 9           | 8           | 8           | 1             | 1             | 0             | 0     |
| 1956-60 | Total   | 146                   | 68  | 35          | 7           | 15          | 14          | 2           | 4             | 0             | 1             | 0     |
|         | 0-9     | 0                     | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 5                     | 3   | 1           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 7                     | 4   | 0           | 0           | 0           | 1           | 0           | 2             | 0             | 0             | 0     |
|         | 30-39   | 12                    | 6   | 3           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 27                    | 11  | 8           | 1           | 4           | 1           | 1           | 0             | 0             | 1             | 0     |
|         | 50+     | 95                    | 44  | 23          | 5           | 9           | 11          | 1           | 2             | 0             | 0             | 0     |
| 1961-65 | Total   | 151                   | 68  | 45          | 7           | 11          | 11          | 5           | 3             | 1             | 0             | 0     |
|         | 0-9     | 0                     | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 5                     | 0   | 1           | 1           | 0           | 1           | 0           | 2             | 0             | 0             | 0     |
|         | 20-29   | 10                    | 6   | 2           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 13                    | 5   | 5           | 1           | 1           | 0           | 0           | 1             | 0             | 0             | 0     |
|         | 40-49   | 33                    | 14  | 11          | 2           | 1           | 3           | 2           | 0             | 0             | 0             | 0     |
|         | 50+     | 90                    | 43  | 26          | 3           | 9           | 5           | 3           | 0             | 1             | 0             | 0     |
| 1966-70 | Total   | 157                   | 64  | 48          | 7           | 5           | 18          | 6           | 6             | 1             | 1             | 1     |
|         | 0-9     | 3                     | 1   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 4                     | 0   | 3           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 10                    | 6   | 2           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 20                    | 9   | 9           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 43                    | 12  | 9           | 3           | 3           | 7           | 5           | 1             | 1             | 1             | 1     |
|         | 50+     | 77                    | 36  | 24          | 4           | 1           | 7           | 0           | 5             | 0             | 0             | 0     |
| 1971-75 | Total   | 132                   | 47  | 35          | 12          | 10          | 12          | 7           | 6             | 2             | 1             | 0     |
|         | 0-9     | 0                     | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 5                     | 3   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 8                     | 5   | 1           | 0           | 0           | 0           | 0           | 1             | 0             | 1             | 0     |
|         | 30-39   | 16                    | 4   | 5           | 2           | 1           | 1           | 1           | 2             | 0             | 0             | 0     |
|         | 40-49   | 58                    | 19  | 19          | 5           | 5           | 5           | 2           | 2             | 1             | 0             | 0     |
|         | 50+     | 45                    | 16  | 9           | 5           | 4           | 6           | 3           | 1             | 1             | 0             | 0     |
| 1976-80 | Total   | 140                   | 69  | 32          | 6           | 15          | 6           | 7           | 4             | 0             | 1             | 0     |
|         | 0-9     | 2                     | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 9                     | 4   | 1           | 2           | 0           | 0           | 2           | 0             | 0             | 0             | 0     |
|         | 20-29   | 11                    | 3   | 3           | 2           | 2           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 27                    | 12  | 8           | 0           | 1           | 2           | 3           | 1             | 0             | 0             | 0     |
|         | 40-49   | 58                    | 31  | 11          | 1           | 9           | 2           | 0           | 3             | 0             | 1             | 0     |
|         | 50+     | 33                    | 17  | 9           | 1           | 3           | 2           | 1           | 0             | 0             | 0             | 0     |
| 1981-85 | Total   | 130                   | 63  | 25          | 7           | 5           | 19          | 5           | 3             | 1             | 1             | 1     |
|         | 0-9     | 3                     | 1   | 1           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 8                     | 3   | 2           | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 11                    | 6   | 1           | 1           | 0           | 2           | 0           | 0             | 0             | 1             | 0     |
|         | 30-39   | 41                    | 20  | 7           | 1           | 3           | 6           | 2           | 1             | 0             | 0             | 1     |
|         | 40-49   | 52                    | 24  | 9           | 4           | 2           | 7           | 3           | 2             | 1             | 0             | 0     |
|         | 50+     | 15                    | 9   | 5           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |

Appendix Table 8A. Number of deaths from other disease, sexes combined

| Period  | Age ATB | Radiation Dose (Gray) |      |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 4015                  | 1924 | 987         | 200         | 247         | 345         | 185         | 87            | 23            | 8             | 9     |
|         | 0-9     | 88                    | 50   | 16          | 6           | 5           | 8           | 2           | 0             | 1             | 0             | 0     |
|         | 10-19   | 172                   | 88   | 48          | 7           | 4           | 12          | 6           | 8             | 1             | 0             | 0     |
|         | 20-29   | 153                   | 76   | 38          | 9           | 6           | 13          | 1           | 6             | 2             | 0             | 2     |
|         | 30-39   | 340                   | 171  | 71          | 24          | 18          | 25          | 22          | 6             | 3             | 0             | 0     |
|         | 40-49   | 799                   | 361  | 189         | 39          | 54          | 76          | 47          | 24            | 5             | 2             | 2     |
|         | 50+     | 2463                  | 1178 | 627         | 115         | 160         | 211         | 107         | 43            | 11            | 6             | 5     |
| 1950-55 | Total   | 791                   | 392  | 198         | 41          | 39          | 61          | 35          | 13            | 5             | 4             | 5     |
|         | 0-9     | 15                    | 7    | 3           | 0           | 1           | 3           | 0           | 0             | 1             | 0             | 0     |
|         | 10-19   | 35                    | 21   | 11          | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 32                    | 14   | 7           | 4           | 3           | 1           | 0           | 1             | 0             | 0             | 2     |
|         | 30-39   | 34                    | 18   | 6           | 1           | 0           | 4           | 4           | 1             | 0             | 0             | 0     |
|         | 40-49   | 74                    | 37   | 18          | 4           | 1           | 8           | 6           | 1             | 1             | 0             | 0     |
|         | 50+     | 601                   | 295  | 153         | 31          | 34          | 43          | 25          | 10            | 3             | 4             | 3     |
| 1956-60 | Total   | 803                   | 391  | 210         | 40          | 47          | 73          | 24          | 14            | 1             | 1             | 2     |
|         | 0-9     | 8                     | 3    | 2           | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 26                    | 14   | 4           | 0           | 0           | 5           | 2           | 1             | 0             | 0             | 0     |
|         | 20-29   | 23                    | 11   | 5           | 0           | 3           | 3           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 36                    | 21   | 7           | 4           | 1           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 81                    | 39   | 22          | 4           | 6           | 7           | 1           | 2             | 0             | 0             | 0     |
|         | 50+     | 629                   | 303  | 170         | 31          | 37          | 54          | 20          | 10            | 1             | 1             | 2     |
| 1961-65 | Total   | 648                   | 293  | 177         | 28          | 44          | 55          | 27          | 18            | 4             | 1             | 1     |
|         | 0-9     | 15                    | 13   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 25                    | 8    | 10          | 2           | 0           | 1           | 0           | 3             | 1             | 0             | 0     |
|         | 20-29   | 20                    | 9    | 7           | 2           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 28                    | 12   | 7           | 4           | 2           | 2           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 67                    | 30   | 16          | 3           | 5           | 5           | 4           | 3             | 0             | 0             | 1     |
|         | 50+     | 493                   | 221  | 136         | 17          | 36          | 46          | 21          | 12            | 3             | 1             | 0     |
| 1966-70 | Total   | 497                   | 238  | 119         | 20          | 34          | 41          | 26          | 17            | 1             | 0             | 1     |
|         | 0-9     | 16                    | 11   | 2           | 1           | 2           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 24                    | 11   | 6           | 1           | 3           | 1           | 1           | 1             | 0             | 0             | 0     |
|         | 20-29   | 18                    | 12   | 5           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 35                    | 17   | 8           | 2           | 3           | 4           | 0           | 1             | 0             | 0             | 0     |
|         | 40-49   | 110                   | 46   | 27          | 4           | 8           | 11          | 4           | 9             | 0             | 0             | 1     |
|         | 50+     | 294                   | 141  | 71          | 12          | 18          | 24          | 21          | 6             | 1             | 0             | 0     |
| 1971-75 | Total   | 451                   | 222  | 95          | 25          | 26          | 43          | 27          | 7             | 5             | 1             | 0     |
|         | 0-9     | 12                    | 5    | 2           | 3           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 31                    | 14   | 9           | 2           | 0           | 2           | 2           | 2             | 0             | 0             | 0     |
|         | 20-29   | 20                    | 13   | 4           | 0           | 0           | 3           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 60                    | 27   | 13          | 2           | 4           | 4           | 9           | 1             | 0             | 0             | 0     |
|         | 40-49   | 111                   | 55   | 20          | 7           | 7           | 11          | 8           | 1             | 3             | 1             | 0     |
|         | 50+     | 217                   | 108  | 47          | 11          | 15          | 22          | 9           | 3             | 2             | 0             | 0     |
| 1976-80 | Total   | 428                   | 207  | 95          | 22          | 33          | 38          | 20          | 10            | 2             | 1             | 0     |
|         | 0-9     | 13                    | 7    | 2           | 1           | 1           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 15                    | 8    | 4           | 1           | 0           | 0           | 1           | 1             | 0             | 0             | 0     |
|         | 20-29   | 20                    | 6    | 6           | 2           | 0           | 4           | 0           | 1             | 1             | 0             | 0     |
|         | 30-39   | 68                    | 42   | 14          | 3           | 3           | 4           | 0           | 2             | 0             | 0             | 0     |
|         | 40-49   | 159                   | 72   | 39          | 7           | 13          | 12          | 10          | 5             | 0             | 1             | 0     |
|         | 50+     | 153                   | 72   | 30          | 8           | 16          | 16          | 9           | 1             | 1             | 0             | 0     |
| 1981-85 | Total   | 397                   | 181  | 95          | 24          | 24          | 34          | 26          | 8             | 5             | 0             | 0     |
|         | 0-9     | 9                     | 4    | 4           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 16                    | 12   | 2           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 20                    | 11   | 4           | 1           | 0           | 0           | 0           | 3             | 1             | 0             | 0     |
|         | 30-39   | 79                    | 34   | 16          | 8           | 5           | 5           | 7           | 1             | 3             | 0             | 0     |
|         | 40-49   | 197                   | 82   | 49          | 10          | 14          | 22          | 16          | 3             | 1             | 0             | 0     |
|         | 50+     | 76                    | 38   | 20          | 5           | 4           | 6           | 2           | 1             | 0             | 0             | 0     |

Appendix Table 8B. Number of deaths from other disease, males

| Period  | Age ATB | Radiation Dose (Gray) |     |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 1840                  | 824 | 359         | 84          | 87          | 136         | 72          | 48            | 8             | 6             | 6     |
|         | 0-9     | 48                    | 25  | 10          | 5           | 3           | 5           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 76                    | 40  | 21          | 4           | 2           | 4           | 1           | 3             | 1             | 0             | 0     |
|         | 20-29   | 37                    | 19  | 5           | 4           | 3           | 4           | 1           | 1             | 0             | 0             | 0     |
|         | 30-39   | 145                   | 78  | 26          | 8           | 5           | 13          | 10          | 4             | 1             | 0             | 0     |
|         | 40-49   | 319                   | 149 | 73          | 15          | 17          | 33          | 16          | 12            | 1             | 1             | 2     |
|         | 50+     | 1015                  | 513 | 224         | 48          | 67          | 77          | 44          | 28            | 5             | 5             | 4     |
| 1950-55 | Total   | 354                   | 191 | 83          | 13          | 17          | 24          | 13          | 6             | 2             | 3             | 2     |
|         | 0-9     | 9                     | 4   | 2           | 0           | 1           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 13                    | 11  | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 6                     | 3   | 0           | 1           | 2           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 12                    | 8   | 2           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 35                    | 19  | 7           | 1           | 0           | 3           | 4           | 0             | 1             | 0             | 0     |
|         | 50+     | 279                   | 146 | 70          | 11          | 14          | 18          | 8           | 6             | 1             | 3             | 2     |
| 1956-60 | Total   | 352                   | 185 | 78          | 17          | 18          | 36          | 9           | 8             | 0             | 1             | 2     |
|         | 0-9     | 6                     | 2   | 1           | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 9                     | 3   | 2           | 0           | 0           | 3           | 1           | 0             | 0             | 0             | 0     |
|         | 20-29   | 8                     | 5   | 1           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 17                    | 12  | 2           | 1           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 41                    | 19  | 11          | 1           | 3           | 6           | 1           | 0             | 0             | 0             | 0     |
|         | 50+     | 271                   | 144 | 61          | 14          | 14          | 23          | 6           | 6             | 0             | 1             | 2     |
| 1961-65 | Total   | 268                   | 130 | 58          | 13          | 20          | 20          | 14          | 10            | 3             | 1             | 1     |
|         | 0-9     | 9                     | 7   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 11                    | 2   | 5           | 2           | 0           | 0           | 0           | 1             | 1             | 0             | 0     |
|         | 20-29   | 4                     | 2   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 30-39   | 16                    | 7   | 3           | 3           | 1           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 30                    | 15  | 5           | 1           | 2           | 3           | 2           | 1             | 0             | 0             | 1     |
|         | 50+     | 198                   | 97  | 41          | 7           | 16          | 15          | 11          | 8             | 2             | 1             | 0     |
| 1966-70 | Total   | 206                   | 98  | 45          | 11          | 13          | 16          | 12          | 9             | 1             | 0             | 1     |
|         | 0-9     | 5                     | 3   | 0           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 11                    | 5   | 4           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 5                     | 4   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 22                    | 9   | 6           | 1           | 2           | 3           | 0           | 1             | 0             | 0             | 0     |
|         | 40-49   | 49                    | 20  | 12          | 3           | 2           | 5           | 2           | 4             | 0             | 0             | 1     |
|         | 50+     | 114                   | 57  | 22          | 5           | 7           | 8           | 10          | 4             | 1             | 0             | 0     |
| 1971-75 | Total   | 185                   | 87  | 36          | 10          | 14          | 21          | 10          | 6             | 1             | 0             | 0     |
|         | 0-9     | 7                     | 4   | 1           | 2           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 16                    | 6   | 6           | 1           | 0           | 1           | 0           | 2             | 0             | 0             | 0     |
|         | 20-29   | 5                     | 2   | 1           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 28                    | 13  | 4           | 1           | 1           | 3           | 5           | 1             | 0             | 0             | 0     |
|         | 40-49   | 47                    | 28  | 7           | 2           | 4           | 6           | 2           | 0             | 0             | 0             | 0     |
|         | 50+     | 82                    | 36  | 17          | 4           | 9           | 9           | 3           | 3             | 1             | 0             | 0     |
| 1976-80 | Total   | 152                   | 76  | 35          | 11          | 9           | 9           | 6           | 5             | 0             | 1             | 0     |
|         | 0-9     | 5                     | 2   | 1           | 1           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 7                     | 6   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 5                     | 1   | 1           | 2           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 25                    | 17  | 5           | 1           | 0           | 1           | 0           | 1             | 0             | 0             | 0     |
|         | 40-49   | 59                    | 25  | 19          | 3           | 3           | 3           | 1           | 4             | 0             | 1             | 0     |
|         | 50+     | 51                    | 25  | 8           | 4           | 6           | 3           | 5           | 0             | 0             | 0             | 0     |
| 1981-85 | Total   | 123                   | 57  | 26          | 9           | 6           | 10          | 8           | 6             | 1             | 0             | 0     |
|         | 0-9     | 7                     | 3   | 4           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 9                     | 7   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 4                     | 2   | 0           | 1           | 0           | 0           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 25                    | 12  | 4           | 1           | 1           | 2           | 3           | 1             | 1             | 0             | 0     |
|         | 40-49   | 58                    | 25  | 12          | 4           | 3           | 7           | 4           | 3             | 0             | 0             | 0     |
|         | 50+     | 20                    | 8   | 5           | 3           | 1           | 1           | 1           | 1             | 0             | 0             | 0     |

Appendix Table 8C. Number of deaths from other disease, females

| Period  | Age ATB | Radiation Dose (Gray) |      |             |             |             |             |             |               |               |               |       |
|---------|---------|-----------------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|-------|
|         |         | Total                 | 0    | .01<br>-.05 | .08<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | 4.00+ |
| Total   | Total   | 2375                  | 1100 | 828         | 116         | 150         | 209         | 113         | 39            | 15            | 2             | 3     |
|         | 0-9     | 40                    | 25   | 6           | 1           | 2           | 3           | 2           | 0             | 1             | 0             | 0     |
|         | 10-19   | 96                    | 48   | 25          | 3           | 2           | 8           | 5           | 5             | 0             | 0             | 0     |
|         | 20-29   | 116                   | 57   | 33          | 5           | 3           | 9           | 0           | 5             | 2             | 0             | 2     |
|         | 30-39   | 195                   | 93   | 45          | 18          | 13          | 12          | 12          | 2             | 2             | 0             | 0     |
|         | 40-49   | 480                   | 212  | 116         | 24          | 37          | 43          | 31          | 12            | 4             | 1             | 0     |
|         | 50+     | 1440                  | 665  | 403         | 67          | 93          | 134         | 63          | 15            | 8             | 1             | 1     |
| 1950-55 | Total   | 437                   | 201  | 113         | 28          | 22          | 37          | 22          | 7             | 3             | 1             | 3     |
|         | 0-9     | 6                     | 3    | 1           | 0           | 0           | 1           | 0           | 0             | 1             | 0             | 0     |
|         | 10-19   | 22                    | 10   | 9           | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 26                    | 11   | 7           | 3           | 1           | 1           | 0           | 1             | 0             | 0             | 2     |
|         | 30-39   | 22                    | 10   | 4           | 1           | 0           | 3           | 3           | 1             | 0             | 0             | 0     |
|         | 40-49   | 39                    | 18   | 9           | 3           | 1           | 5           | 2           | 1             | 0             | 0             | 0     |
|         | 50+     | 322                   | 149  | 83          | 20          | 20          | 25          | 17          | 4             | 2             | 1             | 1     |
| 1956-60 | Total   | 451                   | 206  | 132         | 23          | 29          | 37          | 15          | 8             | 1             | 0             | 0     |
|         | 0-9     | 2                     | 1    | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 17                    | 11   | 2           | 0           | 0           | 2           | 1           | 1             | 0             | 0             | 0     |
|         | 20-29   | 15                    | 6    | 4           | 0           | 2           | 2           | 0           | 1             | 0             | 0             | 0     |
|         | 30-39   | 19                    | 9    | 5           | 3           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 40                    | 20   | 11          | 3           | 3           | 1           | 0           | 2             | 0             | 0             | 0     |
|         | 50+     | 358                   | 159  | 109         | 17          | 23          | 31          | 14          | 4             | 1             | 0             | 0     |
| 1961-65 | Total   | 380                   | 163  | 121         | 15          | 24          | 35          | 13          | 8             | 1             | 0             | 0     |
|         | 0-9     | 6                     | 6    | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 14                    | 6    | 5           | 0           | 0           | 1           | 0           | 2             | 0             | 0             | 0     |
|         | 20-29   | 16                    | 7    | 6           | 2           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 12                    | 5    | 4           | 1           | 1           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 40-49   | 37                    | 15   | 11          | 2           | 3           | 2           | 2           | 2             | 0             | 0             | 0     |
|         | 50+     | 295                   | 124  | 95          | 10          | 20          | 31          | 10          | 4             | 1             | 0             | 0     |
| 1966-70 | Total   | 291                   | 140  | 74          | 9           | 21          | 25          | 14          | 8             | 0             | 0             | 0     |
|         | 0-9     | 11                    | 8    | 2           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 13                    | 8    | 2           | 0           | 2           | 1           | 1           | 1             | 0             | 0             | 0     |
|         | 20-29   | 13                    | 8    | 4           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 13                    | 8    | 2           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 40-49   | 61                    | 28   | 15          | 1           | 6           | 6           | 2           | 5             | 0             | 0             | 0     |
|         | 50+     | 180                   | 84   | 49          | 7           | 11          | 16          | 11          | 2             | 0             | 0             | 0     |
| 1971-75 | Total   | 266                   | 135  | 59          | 15          | 12          | 22          | 17          | 1             | 4             | 1             | 0     |
|         | 0-9     | 5                     | 1    | 1           | 1           | 0           | 1           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 15                    | 8    | 3           | 1           | 0           | 1           | 2           | 0             | 0             | 0             | 0     |
|         | 20-29   | 15                    | 11   | 3           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 30-39   | 32                    | 14   | 9           | 1           | 3           | 1           | 4           | 0             | 0             | 0             | 0     |
|         | 40-49   | 64                    | 29   | 13          | 5           | 3           | 5           | 4           | 1             | 3             | 1             | 0     |
|         | 50+     | 135                   | 72   | 30          | 7           | 6           | 13          | 6           | 0             | 1             | 0             | 0     |
| 1976-80 | Total   | 276                   | 131  | 60          | 11          | 24          | 29          | 14          | 5             | 2             | 0             | 0     |
|         | 0-9     | 8                     | 5    | 1           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 10-19   | 8                     | 2    | 3           | 1           | 0           | 0           | 1           | 1             | 0             | 0             | 0     |
|         | 20-29   | 15                    | 5    | 5           | 0           | 0           | 3           | 0           | 1             | 1             | 0             | 0     |
|         | 30-39   | 43                    | 25   | 9           | 2           | 3           | 3           | 0           | 1             | 0             | 0             | 0     |
|         | 40-49   | 100                   | 47   | 20          | 4           | 10          | 9           | 9           | 1             | 0             | 0             | 0     |
|         | 50+     | 102                   | 47   | 22          | 4           | 10          | 13          | 4           | 1             | 1             | 0             | 0     |
| 1981-85 | Total   | 274                   | 124  | 69          | 15          | 18          | 24          | 18          | 2             | 4             | 0             | 0     |
|         | 0-9     | 2                     | 1    | 0           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0     |
|         | 10-19   | 7                     | 5    | 1           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0     |
|         | 20-29   | 16                    | 9    | 4           | 0           | 0           | 0           | 0           | 2             | 1             | 0             | 0     |
|         | 30-39   | 54                    | 22   | 12          | 7           | 4           | 3           | 4           | 0             | 2             | 0             | 0     |
|         | 40-49   | 139                   | 57   | 37          | 6           | 11          | 15          | 12          | 0             | 1             | 0             | 0     |
|         | 50+     | 56                    | 30   | 15          | 2           | 3           | 5           | 1           | 0             | 0             | 0             | 0     |

**Appendix Table 9.** Regression coefficients of the linear-quadratic model\* for age  $\geq 40$  at the time of the bombings (ATB) by period

| Period  | Age ATB    |            |            |            |            |            |
|---------|------------|------------|------------|------------|------------|------------|
|         | $\geq 40$  |            | 40-49      |            | $\geq 50$  |            |
|         | $\alpha_1$ | $\alpha_2$ | $\alpha_1$ | $\alpha_2$ | $\alpha_1$ | $\alpha_2$ |
| 1950-55 | -0.2400    | 0.0715     | -0.1162    | 0.0113     | -0.2707    | 0.0875     |
| 1956-60 | -0.1986    | 0.0379     | -0.0199    | -0.0201    | -0.2463    | 0.0549     |
| 1961-65 | -0.0420    | 0.0330     | -0.0227    | 0.0333     | -0.0472    | 0.0318     |
| 1966-70 | 0.1615     | -0.0326    | 0.1700     | -0.0058    | 0.1547     | -0.0505    |
| 1971-75 | 0.0836     | -0.0171    | 0.1448     | -0.0179    | 0.0335     | -0.0190    |
| 1976-80 | 0.0362     | -0.0075    | 0.0058     | -0.0100    | 0.0938     | -0.0049    |
| 1981-85 | 0.0635     | -0.0199    | 0.1877     | -0.0324    | -0.3716    | 0.0342     |

\*Relative risk =  $1 + \alpha_1 d + \alpha_2 d^2$ , where  $d$  is the radiation dose in gray.

**Appendix Table 10.** Estimated coefficients of regression models for all diseases except neoplasm and blood disease

| Model     | Age<br>ATB<br>(yr) | $\alpha_1$ | $\alpha_2$ | $\alpha_3$ | $\beta_1$ | $\beta_2$ | Deviance | df   |
|-----------|--------------------|------------|------------|------------|-----------|-----------|----------|------|
| Null      |                    |            |            |            |           |           | 2372.2   | 2681 |
| Model 1   |                    | 0.0288     |            |            |           |           | 2368.7   | 2680 |
| Model 2   |                    | -0.0309    | 0.0189     |            |           |           | 2364.0   | 2679 |
| Model 3   |                    |            | 0.0115     |            |           |           | 2365.0   | 2680 |
| Model 4   |                    |            | 0.0042     |            | 1.976     |           | 2359.0   | 2679 |
| Model 5-1 |                    | -0.1208    | 0.0149     | 0.0214     |           |           | 2357.9   | 2678 |
| Model 5-2 |                    | -0.0641    | 0.0123     | 0.0079     | 0.8490    |           | 2356.5   | 2677 |
| Model 5-3 |                    | -0.1177    | 0.0123     | 0.0218     | 0.8397    | -2.649    | 2354.1   | 2676 |
| Model 5-4 | <40                | 0.0606     | 0.0425     | -0.0537    |           |           | 2346.0   | 2675 |
|           | ≥40                | -0.1597    | 0.0008     | 0.0461     |           |           |          |      |
| Model 5-5 | <50                | -0.0058    | 0.0259     | -0.0231    |           |           | 2345.8   | 2675 |
|           | ≥50                | -0.1905    | -0.0113    | 0.0698     |           |           |          |      |
| Model 5-6 | <40                | 0.0606     | 0.0425     | -0.0537    |           |           | 2341.7   | 2672 |
|           | 40-49              | -0.0665    | 0.0110     | 0.0044     |           |           |          |      |
|           | ≥50                | -0.1905    | -0.0113    | 0.0698     |           |           |          |      |
| Model 6-1 |                    | -0.1701    | 0.0141     | 0.0328     |           |           | 2355.7   | 2678 |
| Model 6-2 |                    | -0.1556    | 0.0136     | 0.0299     | 0.2310    |           | 2355.6   | 2677 |
| Model 6-3 |                    | -0.2594    | 0.0054     | 0.0671     | 1.789     | -4.503    | 2346.7   | 2676 |
| Model 6-4 | <40                | 0.0499     | 0.0319     | -0.0223    |           |           | 2347.4   | 2675 |
|           | ≥40                | -0.2181    | 0.0062     | 0.0479     |           |           |          |      |
| Model 6-5 | <50                | -0.0145    | 0.0222     | -0.0171    |           |           | 2347.1   | 2675 |
|           | ≥50                | -0.2590    | -0.0016    | 0.0732     |           |           |          |      |
| Model 6-6 | <40                | 0.0499     | 0.0319     | -0.0223    |           |           | 2342.3   | 2672 |
|           | 40-49              | -0.0709    | 0.0138     | -0.0177    |           |           |          |      |
|           | ≥50                | -0.2590    | -0.0016    | 0.0732     |           |           |          |      |

*Continued*

Appendix Table 10. Continued

| Model        | Age<br>ATB<br>(yr) | $\alpha_1$ | $\alpha_2$ | $\alpha_3$ | $\beta_1$ | $\beta_2$ | Deviance | df   |
|--------------|--------------------|------------|------------|------------|-----------|-----------|----------|------|
| Model<br>7-1 |                    | -0.1067    | 0.0149     | 0.0110     |           |           | 2358.6   | 2678 |
| Model<br>7-2 |                    | -0.0532    | 0.0136     | 0.0017     | 0.6912    |           | 2357.9   | 2677 |
| Model<br>7-3 |                    | -0.1071    | 0.0131     | 0.0082     | 0.7357    | -237.4    | 2356.0   | 2676 |
| Model<br>7-4 | <40                | 0.1733     | 0.0425     | -0.0703    |           |           | 2339.7   | 2675 |
|              | ≥40                | -0.1683    | 0.0008     | 0.0363     |           |           |          |      |
| Model<br>7-5 | <50                | -0.0041    | 0.0259     | -0.0239    |           |           | 2345.8   | 2675 |
|              | ≥50                | -0.1879    | -0.0113    | 0.0575     |           |           |          |      |
| Model<br>7-6 | <40                | 0.1733     | 0.0425     | -0.0703    |           |           | 2335.4   | 2672 |
|              | 40-49              | -0.1407    | 0.0110     | 0.0061     |           |           |          |      |
|              | ≥50                | -0.1879    | -0.0113    | 0.0575     |           |           |          |      |

NOTE: ATB = at the time of the bombings. The definitions of the models follow.

Models 1, 2, 3, and 4:  $RR = 1 + (\alpha_1 \cdot d + \alpha_2 \cdot d^2) \cdot \exp[\beta_1 I(A < 40)]$ .

Models 5-1 to 3:  $RR = 1 + [\alpha_1 \cdot d \cdot I(T \leq 1965) + \alpha_2 \cdot d^2 + \alpha_3 \cdot d^2 \cdot I(T \leq 1965)] \cdot \exp[\beta_1 \cdot I(A < 40) + \beta_2 \cdot I(A < 50) \cdot I(T \leq 1960)]$ .

Models 6-1 to 3:  $RR = 1 + [\alpha_1 \cdot d \cdot I(T \leq 1960) + \alpha_2 \cdot d^2 + \alpha_3 \cdot d^2 \cdot I(T \leq 1960)] \cdot \exp[(\beta_1 \cdot I(A < 40) + \beta_2 \cdot I(A < 50) \cdot I(T \leq 1960))]$ .

Models 7-1 to 3:  $RR = 1 + [\alpha_1 \cdot d \cdot I(T \leq 1960) + \alpha_2 \cdot d^2 + \alpha_3 \cdot d^2 \cdot I(T \leq 1965)] \cdot \exp[(\beta_1 \cdot I(A < 40) + \beta_2 \cdot I(A < 50) \cdot I(T \leq 1960))]$ .

Models 5-4 to 6:  $RR = 1 + \alpha_{1j} \cdot d \cdot I(T \leq 1965) + \alpha_{2j} \cdot d^2 + \alpha_{3j} \cdot d^2 \cdot I(T \leq 1965)$ .

Models 6-4 to 6:  $RR = 1 + \alpha_{1j} \cdot d \cdot I(T \leq 1960) + \alpha_{2j} \cdot d^2 + \alpha_{3j} \cdot d^2 \cdot I(T \leq 1960)$ .

Models 7-4 to 6:  $RR = 1 + \alpha_{1j} \cdot d \cdot I(T \leq 1960) + \alpha_{2j} \cdot d^2 + \alpha_{3j} \cdot d^2 \cdot I(T \leq 1965)$ .

Where  $j$  = age ATB category and  $d$  is in gray.  $I(T \leq 1960) = 1$  if the period is 1950-60 and 0 if the period is 1961-85.  $I(A < 40) = 1$  if age ATB < 40 and 0 if age ATB ≥ 40.  $I(T \geq 1965) = 1$  if the period is 1950-65 and 0 if the period is 1966-85.  $I(A < 50) = 1$  if age ATB < 50 and 0 if age ATB ≥ 50.



**Appendix Table 11.** Estimated coefficients of regression models for various causes of death

| Cause of death      | Model*    | Age ATB (yr) | $\alpha_1$ | $\alpha_2$ | $\alpha_3$ | Deviance | df   |
|---------------------|-----------|--------------|------------|------------|------------|----------|------|
| Circulatory disease | Null      |              |            |            |            | 1881.9   | 2681 |
|                     | Model 1   |              | 0.0464     |            |            | 1877.4   | 2680 |
|                     | Model 2   |              | 0.0233     | 0.0073     |            | 1877.1   | 2679 |
|                     | Model 3   |              |            | 0.0129     |            | 1877.3   | 2680 |
|                     | Model 5-1 |              | -0.0716    | 0.0118     | 0.0199     | 1876.4   | 2678 |
|                     | Model 5-4 | <40          | 0.3204     | 0.0513     | -0.1264    | 1864.3   | 2675 |
|                     |           | ≥40          | -0.1134    | -0.0043    | 0.0485     |          |      |
| Stroke              | Null      |              |            |            |            | 1450.5   | 2681 |
|                     | Model 1   |              | 0.0260     |            |            | 1449.7   | 2680 |
|                     | Model 2   |              | -0.0199    | 0.0145     |            | 1448.8   | 2679 |
|                     | Model 3   |              |            | 0.0098     |            | 1448.9   | 2680 |
|                     | Model 5-1 |              | -0.1114    | 0.0067     | 0.0335     | 1447.3   | 2678 |
|                     | Model 5-4 | <40          | 0.5546     | 0.0567     | -0.1521    | 1435.3   | 2675 |
|                     |           | ≥40          | -0.1657    | -0.0139    | 0.0649     |          |      |
| Heart disease       | Null      |              |            |            |            | 1546.7   | 2681 |
|                     | Model 1   |              | 0.0733     |            |            | 1542.0   | 2680 |
|                     | Model 2   |              | 0.0782     | -0.0016    |            | 1542.0   | 2679 |
|                     | Model 3   |              |            | 0.0169     |            | 1543.4   | 2680 |
|                     | Model 5-1 |              | -0.0034    | 0.0172     | -0.0002    | 1543.4   | 2678 |
|                     | Model 5-4 | <40          | 0.0566     | 0.0390     | -0.0762    | 1539.1   | 2675 |
|                     |           | ≥40          | -0.0180    | 0.0057     | 0.0259     |          |      |
| Respiratory disease | Null      |              |            |            |            | 1055.1   | 2681 |
|                     | Model 1   |              | 0.0595     |            |            | 1053.5   | 2680 |
|                     | Model 2   |              | -0.1562    | 0.0683     |            | 1047.8   | 2679 |
|                     | Model 3   |              |            | 0.0304     |            | 1050.1   | 2680 |
|                     | Model 5-1 |              | -0.2442    | 0.0238     | 0.0827     | 1048.1   | 2678 |
|                     | Model 5-4 | <40          | -0.1109    | 0.0405     | 0.0648     | 1047.5   | 2675 |
|                     |           | ≥40          | -0.2629    | 0.0168     | 0.0878     |          |      |

*Continued*

Appendix Table 11. Continued

| Cause of death    | Model*    | Age ATB (yr) | $\alpha_1$ | $\alpha_2$ | $\alpha_3$ | Deviance | df   |
|-------------------|-----------|--------------|------------|------------|------------|----------|------|
| Digestive disease | Null      |              |            |            |            | 1449.0   | 2681 |
|                   | Model 1   |              | 0.0958     |            |            | 1445.0   | 2680 |
|                   | Model 2   |              | -0.0316    | 0.0420     |            | 1442.9   | 2679 |
|                   | Model 3   |              |            | 0.0340     |            | 1443.0   | 2680 |
|                   | Model 5-1 |              | -0.1052    | 0.0719     | -0.0526    | 1436.8   | 2678 |
|                   | Model 5-4 | <40          | 0.0677     | 0.0956     | -0.1142    | 1435.6   | 2675 |
|                   |           | ≥40          | -0.1407    | 0.0437     | -0.0143    |          |      |
| Other disease     | Null      |              |            |            |            | 1438.0   | 2681 |
|                   | Model 1   |              | -0.0543    |            |            | 1435.4   | 2680 |
|                   | Model 2   |              | -0.1270    | 0.0222     |            | 1433.9   | 2679 |
|                   | Model 3   |              |            | -0.0076    |            | 1437.3   | 2680 |
|                   | Model 5-1 |              | -0.2942    | -0.0263    | 0.1031     | 1424.0   | 2678 |
|                   | Model 5-4 | <40          | -0.3091    | -0.0276    | 0.1059     | 1423.9   | 2675 |
|                   |           | ≥40          | -0.2852    | -0.0276    | 0.1041     |          |      |

NOTE: ATB = at the time of the bombings.

\*See Appendix Table 10 for definitions of these different models.

**Appendix Table 12.** Results of hematologic review of deaths certified as disease of the blood and blood-forming organs, 1950–82

| Radiation dose (Gy) | Total person-years | Total deaths with blood disease |       | Not in leukemia registry | In leukemia registry, by registry diagnosis |          |              |               |
|---------------------|--------------------|---------------------------------|-------|--------------------------|---------------------------------------------|----------|--------------|---------------|
|                     |                    | Obs.                            | Exp.  |                          | Total                                       | Leukemia | Other cancer | Other disease |
| 0                   | 918,564            | 42                              | 59.0  | 21                       | 21                                          | 2        | 2            | 9             |
| 0.01–0.99           | 1,040,366          | 71                              | 66.8  | 36                       | 35                                          | 1        | 5            | 11            |
| ≥1.00               | 80,876             | 18                              | 5.2   | 7                        | 11                                          | 6        | 1            | 1             |
| Total               | 2,039,806          | 131                             | 131.0 | 64                       | 67                                          | 9        | 8            | 21            |
|                     |                    |                                 |       |                          |                                             |          |              | 9.46          |
|                     |                    |                                 |       |                          |                                             |          |              | 10.71         |
|                     |                    |                                 |       |                          |                                             |          |              | 0.83          |
|                     |                    |                                 |       |                          |                                             |          |              | 21.00         |
|                     |                    |                                 |       |                          |                                             |          |              | 29            |

NOTE: The expected number of deaths is calculated under the null hypothesis of no association with dose. Obs. = observed; Exp. = expected.

**Appendix Table 13. Accuracy of cause of death, noncancer deaths, 1950–85**

| Disease                   | Primary cause of death stated on autopsy |                     |        |                   |                  | Primary or contributing causes stated on autopsy |        |                   |                  |  |
|---------------------------|------------------------------------------|---------------------|--------|-------------------|------------------|--------------------------------------------------|--------|-------------------|------------------|--|
|                           | Death certificate                        | Autopsy (principal) | Agree. | Confirm. rate (%) | Detect. rate (%) | Autopsy (any)                                    | Agree. | Confirm. rate (%) | Detect. rate (%) |  |
| Circulatory disease       | 2072                                     | 2036                | 1475   | 71.2              | 72.4             | 5227                                             | 2025   | 97.7              | 38.7             |  |
| Heart disease             | 806                                      | 836                 | 317    | 39.3              | 37.9             | 4464                                             | 739    | 91.7              | 16.6             |  |
| Coronary heart disease    | 322                                      | 245                 | 92     | 28.6              | 37.6             | 2134                                             | 222    | 68.9              | 10.4             |  |
| Stroke                    | 1214                                     | 730                 | 495    | 40.8              | 67.8             | 2778                                             | 1047   | 86.2              | 37.7             |  |
| Other circulatory disease | 52                                       | 470                 | 14     | 26.9              | 3.0              | 3919                                             | 41     | 78.8              | 1.0              |  |
| Senility                  | 249                                      | 6                   | 2      | 0.8               | 33.3             | 45                                               | 10     | 4.0               | 22.2             |  |
| Infectious disease        | 319                                      | 375                 | 180    | 56.4              | 48.0             | 1553                                             | 231    | 72.4              | 14.9             |  |
| Tuberculosis              | 255                                      | 316                 | 161    | 63.1              | 50.9             | 1170                                             | 200    | 78.4              | 17.1             |  |
| Other infectious disease  | 64                                       | 59                  | 12     | 18.8              | 20.3             | 473                                              | 22     | 34.4              | 4.7              |  |
| Blood disease             | 54                                       | 31                  | 21     | 38.9              | 67.7             | 1534                                             | 39     | 72.2              | 2.5              |  |
| Pneumonia                 | 215                                      | 224                 | 39     | 18.1              | 17.4             | 2881                                             | 156    | 72.6              | 5.4              |  |
| Liver cirrhosis           | 198                                      | 200                 | 106    | 53.5              | 53.0             | 1082                                             | 164    | 82.8              | 15.2             |  |
| Nephritis and nephrosis   | 79                                       | 35                  | 17     | 21.5              | 48.6             | 343                                              | 19     | 24.1              | 5.5              |  |

NOTE: Agree. = agreement; Confirm. = confirmation; Detect. = detection.

SOURCE: Tokunaga et al.<sup>27</sup>

**Appendix Table 14.** Proportion of deaths confirmed by clinical diagnoses among those exposed to  $\geq 2$  Gy and examined in the Adult Health Study (AHS)

| Cause of death    | No. of deaths |               |                                  |                                 |
|-------------------|---------------|---------------|----------------------------------|---------------------------------|
|                   | Total         | Undetermined* | Compared with clinical diagnoses | Confirmed by clinical diagnoses |
| Total             | 125           | 59            | 66                               | 55<br>(83.3%)                   |
| Tuberculosis      | 2             | —             | 2                                | 2<br>(100.0%)                   |
| Stroke            | 34            | 22            | 12                               | 12<br>(100.0%)                  |
| Heart disease     | 42            | 23            | 19                               | 17<br>(89.5%)                   |
| Digestive disease | 18            | 3             | 15                               | 12<br>(80.0%)                   |
| Other             | 29            | 11            | 18                               | 12<br>(66.7%)                   |

NOTE: The total number of deaths from all diseases except neoplasm among individuals exposed to  $\geq 2$  Gy and examined in the AHS is 140. Of these 140 subjects, 7 died from blood disease and 8 have inadequate diagnoses for cause of death. The results based on the remaining 125 deaths are shown in the table.

\*These deaths were excluded because of either the possible sudden occurrence of an event (e.g., stroke or heart attack) or because a long period ( $>10$  years) intervened between the last AHS examination and death.

**Appendix Table 15.** Confirmation of liver cirrhosis on the death certificate among members of the Adult Health Study (AHS) sample, Hiroshima

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|                                                              |    |
|--------------------------------------------------------------|----|
| <i>A. When all sources of information were used</i>          |    |
| Total no. of deaths with liver cirrhosis                     | 77 |
| 1. Confirmed by autopsy (any pathological diagnosis)         | 19 |
| 2. Confirmed by AHS diagnosis as liver cirrhosis             | 18 |
| 3. Confirmed by AHS diagnosis as chronic hepatitis           | 10 |
| 4. Confirmed by AHS diagnosis as probable liver cirrhosis    | 4  |
| 5. Confirmed by AHS diagnosis as probable chronic hepatitis  | 1  |
| 6. Confirmed by past history in Epidemiological Survey Sheet | 5  |
| <br><i>B. When autopsy findings were used</i>                |    |
| Total no. of autopsies among 77 deaths with liver cirrhosis  | 23 |
| Confirmed by principal pathological diagnosis                | 16 |

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**Appendix Table 16A.** Comparison of cause of death and autopsy diagnosis: All diseases except neoplasm and blood disease

| Radiation dose (Gy)   | Person-years | No. of cases |           | No. of autopsies | Autopsy rate (%) | Cancer found on autopsy |      |        |      |
|-----------------------|--------------|--------------|-----------|------------------|------------------|-------------------------|------|--------|------|
|                       |              | Observed     | Expected* |                  |                  | Principal Dx            |      | Any Dx |      |
|                       |              |              |           |                  |                  | No.                     | %    | No.    | %    |
| All ages ATB, 1950-85 |              |              |           |                  |                  |                         |      |        |      |
| Total                 | 2,185,336    | 20,777       | —         | 2610             | 12.6             | 251                     | 9.6  | 490    | 18.8 |
| 0                     | 984,271      | 9490         | 9509.9    | 908              | 9.6              | 102                     | 11.2 | 177    | 19.5 |
| 0.01-0.99             | 1,114,651    | 10,507       | 10,509.4  | 1561             | 14.9             | 124                     | 7.9  | 275    | 17.6 |
| 1.00-1.99             | 55,261       | 506          | 528.7     | 93               | 18.4             | 19                      | 20.4 | 28     | 30.1 |
| 2.00-2.99             | 18,311       | 149          | 131.9     | 24               | 16.2             | 4                       | 16.7 | 5      | 20.8 |
| 3.00-3.99             | 5923         | 45           | 39.0      | 11               | 24.4             | 0                       | —    | 2      | 18.2 |
| ≥4.00                 | 6919         | 80           | 58.1      | 13               | 16.3             | 2                       | 15.4 | 3      | 23.1 |
| Age ATB < 40, 1966-85 |              |              |           |                  |                  |                         |      |        |      |
| Total                 | 935,269      | 3109         | —         | 312              | 10.0             | 27                      | 8.7  | 53     | 17.0 |
| 0                     | 422,205      | 1417         | 1420.7    | 120              | 8.5              | 13                      | 10.8 | 19     | 15.8 |
| 0.01-0.99             | 476,220      | 1543         | 1559.0    | 169              | 11.0             | 12                      | 7.1  | 30     | 17.8 |
| 1.00-1.99             | 23,133       | 82           | 86.4      | 13               | 15.9             | 2                       | 15.4 | 3      | 23.1 |
| ≥2.00                 | 13,711       | 67           | 42.9      | 10               | 14.9             | 0                       | —    | 1      | 10.0 |

NOTE: ATB = at the time of the bombings; Dx = diagnosis.

\*The numbers of expected deaths were calculated under the null hypothesis of no dose effect, adjusted for differences by city, sex, age ATB group, and interval of follow-up by the Mantel-Haenszel method.



**Appendix Table 16B.** Comparison of cause of death and autopsy diagnosis: Heart disease

| Radiation dose (Gy)   | Person-years | No. of cases |           | No. of autopsies | Autopsy rate (%) | Cancer found on autopsy |      |        |      |
|-----------------------|--------------|--------------|-----------|------------------|------------------|-------------------------|------|--------|------|
|                       |              | Observed     | Expected* |                  |                  | Principal Dx            |      | Any Dx |      |
|                       |              |              |           |                  |                  | No.                     | %    | No.    | %    |
|                       |              |              |           |                  |                  |                         |      |        |      |
| All ages ATB, 1950-85 |              |              |           |                  |                  |                         |      |        |      |
| Total                 | 2,185,336    | 4962         | —         | 570              | 11.5             | 40                      | 7.0  | 100    | 17.5 |
| 0                     | 984,271      | 2209         | 2249.7    | 199              | 9.0              | 21                      | 10.6 | 41     | 20.6 |
| 0.01-0.99             | 1,114,651    | 2565         | 2533.7    | 338              | 13.2             | 17                      | 5.0  | 52     | 15.4 |
| 1.00-1.99             | 55,261       | 117          | 125.0     | 19               | 16.2             | 2                       | 10.5 | 5      | 26.3 |
| ≥2.00                 | 31,153       | 71           | 53.5      | 14               | 19.7             | 0                       | —    | 2      | 14.3 |
| ≥1.00                 | 86,413       | 188          | 178.5     | 33               | 17.6             | 2                       | 6.1  | 7      | 21.2 |
| Age ATB < 40, 1966-85 |              |              |           |                  |                  |                         |      |        |      |
| Total                 | 935,269      | 880          | —         | 75               | 8.5              | 5                       | 6.7  | 9      | 12.0 |
| 0                     | 422,205      | 382          | 397.3     | 23               | 6.0              | 2                       | 8.7  | 3      | 13.0 |
| 0.01-0.99             | 476,220      | 454          | 446.6     | 42               | 9.3              | 2                       | 4.8  | 5      | 11.9 |
| 1.00-1.99             | 23,133       | 25           | 24.4      | 5                | 20.0             | 1                       | 20.0 | 1      | 20.0 |
| ≥2.00                 | 13,711       | 19           | 11.7      | 5                | 26.3             | 0                       | —    | 0      | —    |
| ≥1.00                 | 36,844       | 44           | 36.1      | 10               | 22.7             | 1                       | 10.0 | 1      | 10.0 |

NOTE: ATB = at the time of the bombings; Dx = diagnosis.

\*The numbers of expected deaths were calculated under the null hypothesis of no dose effect, adjusted for differences by city, sex, age ATB group, and interval of follow-up by the Mantel-Haenszel method.

**Appendix Table 16C.** Comparison of cause of death and autopsy diagnosis: Liver cirrhosis

| Radiation dose (Gy)   | Person-years | No. of cases |           | No. of autopsies | Autopsy rate (%) | Cancer found on autopsy |      |        |       |
|-----------------------|--------------|--------------|-----------|------------------|------------------|-------------------------|------|--------|-------|
|                       |              | Observed     | Expected* |                  |                  | Principal Dx            |      | Any Dx |       |
|                       |              |              |           |                  |                  | No.                     | %    | No.    | %     |
| All ages ATB, 1950-85 |              |              |           |                  |                  |                         |      |        |       |
| Total                 | 2,185,336    | 697          | —         | 121              | 17.4             | 24                      | 19.8 | 33     | 27.3  |
| 0                     | 984,271      | 328          | 322.1     | 49               | 14.9             | 11                      | 22.4 | 15     | 30.6  |
| 0.01-0.99             | 1,114,651    | 330          | 345.2     | 67               | 20.3             | 13                      | 19.4 | 17     | 25.4  |
| 1.00-1.99             | 55,261       | 23           | 19.3      | 4                | 17.4             | 0                       | —    | 1      | 25.0  |
| ≥2.00                 | 31,153       | 16           | 9.5       | 1                | 6.3              | 0                       | —    | 0      | —     |
| ≥1.00                 | 86,413       | 39           | 28.8      | 5                | 12.8             | 0                       | —    | 1      | 20.0  |
| Age ATB < 40, 1966-85 |              |              |           |                  |                  |                         |      |        |       |
| Total                 | 935,269      | 281          | —         | 33               | 11.7             | 8                       | 24.2 | 11     | 33.3  |
| 0                     | 422,205      | 132          | 132.0     | 13               | 9.8              | 3                       | 23.1 | 4      | 30.8  |
| 0.01-0.99             | 476,220      | 129          | 136.5     | 18               | 14.0             | 5                       | 27.8 | 6      | 33.3  |
| 1.00-1.99             | 23,133       | 9            | 7.8       | 1                | 11.1             | 0                       | —    | 1      | 100.0 |
| ≥2.00                 | 13,711       | 11           | 4.7       | 1                | 9.1              | 0                       | —    | 0      | —     |
| ≥1.00                 | 36,844       | 20           | 12.5      | 2                | 10.0             | 0                       | —    | 1      | 50.0  |

NOTE: ATB = at the time of the bombings; Dx = diagnosis.

\*The numbers of expected deaths were calculated under the null hypothesis of no dose effect, adjusted for differences by city, sex, age ATB group, and interval of follow-up by the Mantel-Haenszel method.

**Appendix Table 16D.** Comparison of cause of death and autopsy diagnosis: Circulatory disease

| Radiation dose (Gy)   | Person-years | No. of cases |           | No. of autopsies | Autopsy rate (%) | Cancer found on autopsy |      |        |      |
|-----------------------|--------------|--------------|-----------|------------------|------------------|-------------------------|------|--------|------|
|                       |              | Observed     | Expected* |                  |                  | Principal Dx            |      | Any Dx |      |
|                       |              |              |           |                  |                  | No.                     | %    | No.    | %    |
| All ages ATB, 1950-85 |              |              |           |                  |                  |                         |      |        |      |
| Total                 | 2,185,336    | 11,164       | —         | 1368             | 12.3             | 84                      | 6.1  | 212    | 15.5 |
| 0                     | 984,271      | 5025         | 5083.2    | 474              | 9.4              | 38                      | 8.0  | 83     | 17.5 |
| 0.01-0.99             | 1,114,651    | 5718         | 5678.7    | 821              | 14.4             | 40                      | 4.9  | 116    | 14.1 |
| 1.00-1.99             | 55,261       | 273          | 282.1     | 45               | 16.5             | 3                       | 6.7  | 8      | 17.8 |
| ≥2.00                 | 31,153       | 148          | 119.8     | 28               | 18.9             | 3                       | 10.7 | 5      | 17.9 |
| ≥1.00                 | 86,413       | 421          | 401.9     | 78               | 18.5             | 6                       | 7.7  | 13     | 16.7 |
| Age ATB < 40, 1966-85 |              |              |           |                  |                  |                         |      |        |      |
| Total                 | 935,269      | 1764         | —         | 151              | 8.6              | 8                       | 5.3  | 16     | 10.6 |
| 0                     | 422,205      | 789          | 798.9     | 58               | 7.4              | 4                       | 6.9  | 6      | 10.3 |
| 0.01-0.99             | 476,220      | 887          | 892.4     | 81               | 9.1              | 3                       | 3.7  | 9      | 11.1 |
| 1.00-1.99             | 23,133       | 46           | 49.2      | 6                | 13.0             | 1                       | 16.7 | 1      | 16.7 |
| ≥2.00                 | 13,711       | 42           | 23.4      | 6                | 14.3             | 0                       | —    | 0      | —    |
| ≥1.00                 | 36,844       | 88           | 72.6      | 12               | 13.6             | 1                       | 8.3  | 1      | 8.3  |

NOTE: ATB = at the time of the bombings; Dx = diagnosis.

\*The numbers of expected deaths were calculated under the null hypothesis of no dose effect, adjusted for differences by city, sex, age ATB group, and interval of follow-up by the Mantel-Haenszel method.

**Appendix Table 16E.** Comparison of cause of death and autopsy diagnosis: Coronary heart disease

| Radiation dose (Gy)   | Person-years | No. of cases |           | No. of autopsies | Autopsy rate (%) | Cancer found on autopsy |     |        |      |
|-----------------------|--------------|--------------|-----------|------------------|------------------|-------------------------|-----|--------|------|
|                       |              | Observed     | Expected* |                  |                  | Principal Dx            |     | Any Dx |      |
|                       |              |              |           |                  |                  | No.                     | %   | No.    | %    |
| All ages ATB, 1950-85 |              |              |           |                  |                  |                         |     |        |      |
| Total                 | 2,185,336    | 1765         | —         | 205              | 11.6             | 12                      | 5.9 | 36     | 17.6 |
| 0                     | 984,271      | 744          | 788.1     | 71               | 9.5              | 7                       | 9.9 | 16     | 22.5 |
| 0.01-0.99             | 1,114,651    | 954          | 911.0     | 121              | 12.7             | 5                       | 4.1 | 17     | 14.0 |
| 1.00-1.99             | 55,261       | 40           | 46.0      | 6                | 15.0             | 0                       | —   | 2      | 33.3 |
| ≥2.00                 | 31,153       | 27           | 20.0      | 7                | 25.9             | 0                       | —   | 1      | 14.3 |
| ≥1.00                 | 86,413       | 67           | 66.0      | 13               | 19.4             | 0                       | —   | 3      | 23.1 |
| Age ATB < 40, 1966-85 |              |              |           |                  |                  |                         |     |        |      |
| Total                 | 935,269      | 363          | —         | 29               | 8.0              | 1                       | 3.4 | 4      | 13.8 |
| 0                     | 422,205      | 136          | 162.1     | 6                | 4.4              | 0                       | —   | 1      | 16.7 |
| 0.01-0.99             | 476,220      | 209          | 185.7     | 20               | 9.6              | 1                       | 5.0 | 3      | 15.0 |
| 1.00-1.99             | 23,133       | 8            | 10.4      | 1                | 12.5             | 0                       | —   | 0      | —    |
| ≥2.00                 | 13,711       | 10           | 4.8       | 2                | 20.0             | 0                       | —   | 0      | —    |
| ≥1.00                 | 36,844       | 18           | 15.2      | 3                | 16.7             | 0                       | —   | 0      | —    |

NOTE: ATB = at the time of the bombings; Dx = diagnosis.

\*The numbers of expected deaths were calculated under the null hypothesis of no dose effect, adjusted for differences by city, sex, age ATB group, and interval of follow-up by the Mantel-Haenszel method.

**Appendix Table 16F.** Comparison of cause of death and autopsy diagnosis: Stroke

| Radiation dose (Gy)   | Person-years | No. of cases |           | No. of autopsies | Autopsy rate (%) | Cancer found on autopsy |      |        |      |
|-----------------------|--------------|--------------|-----------|------------------|------------------|-------------------------|------|--------|------|
|                       |              | Observed     | Expected* |                  |                  | Principal Dx            |      | Any Dx |      |
|                       |              |              |           |                  |                  | No.                     | %    | No.    | %    |
| All ages ATB, 1950-85 |              |              |           |                  |                  |                         |      |        |      |
| Total                 | 2,185,336    | 6202         | —         | 798              | 12.9             | 44                      | 5.5  | 112    | 14.0 |
| 0                     | 984,271      | 2816         | 2833.5    | 275              | 9.8              | 17                      | 6.2  | 42     | 15.3 |
| 0.01-0.99             | 1,114,651    | 3153         | 3145.0    | 483              | 15.3             | 23                      | 4.8  | 64     | 13.3 |
| 1.00-1.99             | 55,261       | 156          | 157.1     | 26               | 16.7             | 1                       | 3.8  | 3      | 11.5 |
| ≥2.00                 | 31,153       | 77           | 66.3      | 14               | 18.2             | 3                       | 21.4 | 3      | 21.4 |
| ≥1.00                 | 86,413       | 233          | 223.4     | 40               | 17.2             | 4                       | 10.0 | 6      | 15.0 |
| Age ATB < 40, 1966-85 |              |              |           |                  |                  |                         |      |        |      |
| Total                 | 935,269      | 884          | —         | 76               | 8.6              | 3                       | 3.9  | 7      | 9.2  |
| 0                     | 422,205      | 407          | 401.6     | 35               | 8.6              | 2                       | 5.7  | 3      | 8.6  |
| 0.01-0.99             | 476,220      | 433          | 445.8     | 39               | 9.0              | 1                       | 2.6  | 4      | 10.3 |
| 1.00-1.99             | 23,133       | 21           | 24.8      | 1                | 4.8              | 0                       | —    | 0      | —    |
| ≥2.00                 | 13,711       | 23           | 11.7      | 1                | 4.3              | 0                       | —    | 0      | —    |
| ≥1.00                 | 36,844       | 44           | 36.5      | 2                | 4.5              | 0                       | —    | 0      | —    |

NOTE: ATB = at the time of the bombings; Dx = diagnosis.

\*The numbers of expected deaths were calculated under the null hypothesis of no dose effect, adjusted for differences by city, sex, age ATB group, and interval of follow-up by the Mantel-Haenszel method.

**Appendix Table 17A.** Number and proportion of cancers reported in the Hiroshima and Nagasaki tumor registries among noncancer deaths by radiation dose

| Radiation dose<br>(Gy) | No. of deaths | Cancer* found in<br>tumor registry |     |
|------------------------|---------------|------------------------------------|-----|
|                        |               | No.                                | %   |
| All ages ATB, 1950–85  |               |                                    |     |
| Total                  | 20,777        | 889                                | 4.3 |
| 0                      | 9490          | 353                                | 3.7 |
| 0.01–0.99              | 10,507        | 476                                | 4.5 |
| 1.00–1.99              | 506           | 39                                 | 7.7 |
| ≥2.00                  | 274           | 21                                 | 7.7 |
| <40 ATB, 1966–85       |               |                                    |     |
| Total                  | 3109          | 179                                | 5.8 |
| 0                      | 1417          | 73                                 | 5.2 |
| 0.01–0.99              | 1543          | 96                                 | 6.2 |
| 1.00–1.99              | 82            | 5                                  | 6.1 |
| ≥2.00                  | 67            | 5                                  | 7.5 |

NOTE: ATB = at the time of the bombings.

\*Latent cancers are excluded.

**Appendix Table 17B.** Number and proportion of cancer cases reported in the Hiroshima and Nagasaki tumor registries among deaths stated to be due to noncancer causes on the death certificate by cause of death

| Cause of death                                 | No. of deaths | Cancer* found in tumor registry |      |
|------------------------------------------------|---------------|---------------------------------|------|
|                                                |               | No.                             | %    |
| All ages ATB, 1950–85                          |               |                                 |      |
| All diseases except neoplasm and blood disease | 20,777        | 889                             | 4.3  |
| Circulatory disease                            | 11,164        | 431                             | 3.9  |
| Stroke                                         | 6202          | 208                             | 3.4  |
| Heart disease                                  | 4962          | 223                             | 4.5  |
| Respiratory disease                            | 2036          | 120                             | 5.9  |
| Digestive disease                              | 2149          | 156                             | 7.3  |
| Liver cirrhosis                                | 697           | 63                              | 9.0  |
| <40 ATB, 1966–85                               |               |                                 |      |
| All diseases except neoplasm and blood disease | 3109          | 179                             | 5.8  |
| Circulatory disease                            | 1764          | 76                              | 4.3  |
| Stroke                                         | 884           | 38                              | 4.3  |
| Heart disease                                  | 880           | 38                              | 4.3  |
| Respiratory disease                            | 276           | 22                              | 8.0  |
| Digestive disease                              | 455           | 48                              | 10.5 |
| Liver cirrhosis                                | 281           | 27                              | 9.6  |

NOTE: Data for infections and other diseases are not shown. ATB = at the time of the bombings.

\*Latent cancers are excluded.

**Appendix Table 18A. Proportion of deaths at hospitals (%) by radiation dose, age ATB, period, and cause of death**

| Cause of death, dose (Gy)          | All ages ATB |              |              |             | <40 ATB     |             |             |             | ≥40 ATB     |             |             |             |
|------------------------------------|--------------|--------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                    | 1950-65      | 1966-75      | 1976-85      | 1950-65     | 1966-75     | 1976-85     | 1950-65     | 1966-75     | 1950-65     | 1966-75     | 1976-85     | 1976-85     |
| <b>Noncancer</b>                   |              |              |              |             |             |             |             |             |             |             |             |             |
| 0                                  | 16<br>(656)  | 39<br>(1071) | 58<br>(1557) | 36<br>(236) | 61<br>(333) | 73<br>(645) | 12<br>(420) | 33<br>(738) | 12<br>(420) | 33<br>(738) | 51<br>(912) | 51<br>(912) |
| ≥2.0                               | 28<br>(33)   | 59<br>(47)   | 76<br>(68)   | 41<br>(11)  | 84<br>(21)  | 85<br>(40)  | 24<br>(22)  | 48<br>(26)  | 24<br>(22)  | 48<br>(26)  | 65<br>(28)  | 65<br>(28)  |
| <b>Leukemia</b>                    |              |              |              |             |             |             |             |             |             |             |             |             |
| 0                                  | 85<br>(17)   | 94<br>(15)   | 95<br>(21)   | 100<br>(8)  | 91<br>(10)  | 100<br>(14) | 75<br>(9)   | 100<br>(5)  | 75<br>(9)   | 100<br>(5)  | 88<br>(7)   | 88<br>(7)   |
| ≥2.0                               | 74<br>(14)   | 100<br>(6)   | 80<br>(4)    | 69<br>(9)   | 100<br>(5)  | 67<br>(2)   | 83<br>(5)   | 100<br>(1)  | 83<br>(5)   | 100<br>(1)  | 100<br>(2)  | 100<br>(2)  |
| <b>All cancers except leukemia</b> |              |              |              |             |             |             |             |             |             |             |             |             |
| 0                                  | 37<br>(298)  | 71<br>(538)  | 87<br>(759)  | 62<br>(82)  | 81<br>(214) | 93<br>(477) | 32<br>(216) | 65<br>(324) | 32<br>(216) | 65<br>(324) | 78<br>(282) | 78<br>(282) |
| ≥2.0                               | 48<br>(19)   | 74<br>(29)   | 89<br>(47)   | 92<br>(12)  | 73<br>(16)  | 97<br>(36)  | 26<br>(7)   | 76<br>(13)  | 26<br>(7)   | 76<br>(13)  | 69<br>(11)  | 69<br>(11)  |

NOTE: The values within parentheses are the numbers of deaths occurring at hospitals.



**Appendix Table 18B.** Relative risk at 1 Gy for mortality due to major causes of death by place of death

| Cause of death              | Place of death    |                   |
|-----------------------------|-------------------|-------------------|
|                             | Hospital          | Home              |
| Noncancer                   | 1.20 (1.15, 1.26) | 0.96 (0.93, 1.02) |
| Stroke                      | 1.18 (1.08, 1.29) | 0.96 (0.91, 1.02) |
| Heart disease               | 1.30 (1.18, 1.44) | 0.96 (0.91, 1.03) |
| Digestive disease           | 1.23 (1.11, 1.38) | 0.95 (0.87, 1.06) |
| Other                       | 1.07 (0.99, 1.17) | 0.95 (0.90, 1.00) |
| Leukemia                    | 4.61 (3.57, 6.07) | 7.92 (4.02, 18.7) |
| All cancers except leukemia | 1.38 (1.29, 1.47) | 1.14 (1.05, 1.25) |

NOTE: The values within parentheses are the 90% confidence limits.

**Appendix Table 18C.** Accuracy of cause of death on death certificate by place of death

| Cause of death                      | Place of death | Confirmation rate (%) | Detection rate (%) | Correction factor for death certificate |
|-------------------------------------|----------------|-----------------------|--------------------|-----------------------------------------|
| Stroke                              | Hospital       | 48.9                  | 62.2               | 0.79                                    |
|                                     | Home           | 35.7                  | 70.1               | 0.51                                    |
| Heart disease                       | Hospital       | 39.7                  | 52.2               | 0.76                                    |
|                                     | Home           | 39.9                  | 32.6               | 1.22                                    |
| Liver cirrhosis                     | Hospital       | 58.5                  | 60.2               | 0.97                                    |
|                                     | Home           | 34.1                  | 35.9               | 0.95                                    |
| Tuberculosis                        | Hospital       | 63.4                  | 64.5               | 0.98                                    |
|                                     | Home           | 60.0                  | 30.3               | 1.98                                    |
| Leukemia                            | Hospital       | 82.9                  | 90.6               | 0.92                                    |
|                                     | Home           | 100.0                 | 100.0              | 1.00                                    |
| Malignant neoplasms except leukemia | Hospital       | 92.7                  | 81.5               | 1.14                                    |
|                                     | Home           | 93.5                  | 64.8               | 1.44                                    |

SOURCE: Yamamoto et al.<sup>28</sup>

**Appendix Table 18D. Radiation effect after adjusting for place of death**

| Cause of death           | Dose<br>(Gy) | No. of deaths by place of death |                       |      |          |      |       | Corrected no. of deaths |                       |                       |  |
|--------------------------|--------------|---------------------------------|-----------------------|------|----------|------|-------|-------------------------|-----------------------|-----------------------|--|
|                          |              | Total                           |                       |      | Hospital |      | Other | RR                      | Observed <sup>b</sup> | Expected <sup>a</sup> |  |
|                          |              | Observed                        | Expected <sup>a</sup> | RR   |          |      |       |                         |                       |                       |  |
| Heart disease            |              |                                 |                       |      |          |      |       |                         |                       |                       |  |
| Total                    | 0            | 2209                            | 2246.1                | 1.0  | 762      | 1447 |       | 2344                    | 2357.5                | 1.0                   |  |
|                          | ≥2.0         | 71                              | 54.6                  | 1.34 | 35       | 36   |       | 71                      | 56.6                  | 1.26                  |  |
| Age ATB < 40,<br>1966-85 | 0            | 382                             | 395.5                 | 1.0  | 223      | 159  |       | 363                     | 375.9                 | 1.0                   |  |
|                          | ≥2.0         | 19                              | 12                    | 1.64 | 13       | 6    |       | 17                      | 11.3                  | 1.56                  |  |
| Liver cirrhosis          |              |                                 |                       |      |          |      |       |                         |                       |                       |  |
| Total                    | 0            | 328                             | 322.6                 | 1.0  | 208      | 120  |       | 316                     | 310.5                 | 1.0                   |  |
|                          | ≥2.0         | 16                              | 9.5                   | 1.66 | 13       | 3    |       | 15                      | 9.2                   | 1.60                  |  |
| Age ATB < 40,<br>1966-85 | 0            | 132                             | 131.7                 | 1.0  | 112      | 20   |       | 128                     | 127.4                 | 1.0                   |  |
|                          | ≥2.0         | 11                              | 4.7                   | 2.34 | 10       | 1    |       | 11                      | 4.5                   | 2.43                  |  |

NOTE: ATB = at the time of the bombings; RR = relative risk.

<sup>a</sup>Adjusted by city, sex, age ATB, and period.

<sup>b</sup>Calculated using the place-of-death-specific correction factors for the accuracy of death certificates.

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寿命調査 第11報 第3部  
改訂被曝線量(DS86)に基づく癌以外の死因による  
死亡率, 1950-85年

Life Span Study Report 11. Part 3.  
Noncancer Mortality, 1950-85,  
Based on the Revised Doses (DS86)

清水由紀子 加藤寛夫 William J. Schull David G. Hoel

## 放影研業績報告書シリーズ RERF Technical Report Series

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## 要約

寿命調査対象集団における1950-85年の死亡調査を行い、改訂被曝線量(DS86線量)と癌死亡率の関連については、すでに別に報告した(寿命調査 第11報, 第1部および第2部)。本報告では癌以外の死因による死亡について被曝線量との関連を調べた。

まだ限られた根拠しかないが、高線量域(2または3 Gy以上)において癌以外の疾患による死亡リスクの過剰があるように思われる。統計学的にみると、二次モデルまたは線形-閾値モデル(推定閾値線量1.4 Gy [0.6-2.8 Gy])のほうが、単純な線形または線形-二次モデルよりもよく当てはまる。癌以外の疾患による死亡率のこのような増加は、一般的に1965年以降で若年被曝群(被曝時年齢40歳以下)において認められ、若年被曝者の感受性が高いことを示唆している。死因別にみると、循環器および消化器系疾患について、高線量域(2 Gy以上)で相対リスクの過剰が認められる。しかし、この相対リスクは癌の場合よりもはるかに小さい。

これらの所見は、死亡診断書に基づいているので信頼性には限界がある。おそらく最も重要な問題は、放射線誘発癌が他の死因に誤って分類される可能性があることである。高線

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量域で癌以外の死因による死亡が増加していることは明白だが、どれだけこの誤りに起因するのかを明確かつ厳密に推定することは、現在のところむずかしい。しかしながら、死因の分類の誤りだけで、この増加を完全には説明できないように思われる。

高線量を被曝した被爆者において癌以外の死因による死亡が増加しているという傾向を確認し、更に、そのような死亡増加が寿命短縮をもたらしているか否かを明らかにするためには、寿命調査対象の部分集団(成人健康調査対象)について2年に1回行う検診で確認される疾患、および寿命調査対象の死亡率に関して追跡調査を更に行うことが必要であろう。

## 緒 言

1950年以降、原爆傷害調査委員会(ABCC)およびその後継機関である放射線影響研究所(放影研)は、原爆放射線の死亡率への影響を究明するために原爆被爆者およびその対照群からなる固定集団、いわゆる寿命調査集団を調査している。その調査結果は定期的に解析されている。最近、1950-85年の寿命調査集団における死亡調査が行われた。これまでにDS86線量を用いた癌死亡率に関する二つの報告が本シリーズの第1部<sup>1</sup> および第2部<sup>2</sup> として出版された。これらは、1) 線量推定方式がT65DRからDS86へ移行したことによる放射線に関する部位別癌死亡率の推定値への影響の評価<sup>1</sup> に関するもの、2) 放射線誘発癌にかかわるいくつかの生物学的問題<sup>2</sup> に関するものである。要約すれば、部位別悪性腫瘍が放射線に関連して増加していることが継続的に観察され、追跡調査を継続することによる症例数の増加につれて、これまでに観察されていた因果関係が更に強く裏付けられてきた。しかし、癌以外の死因による死亡率も増加しているか否か、またそれらの死因による寿命短縮が起きているか否かはいまだに明らかでない。1950-78年の癌以外の死因による死亡率に関する以前の解析<sup>3</sup> では、4 Gy(T65DR線量)以上の線量域を除くと、これらの可能性のいずれについても証拠が認められなかった。

本報(本シリーズの第3部)では二つの問題、すなわち、1) 前回までに蓄積されたデータに1979-85年の7年間の死亡を追加し、新しいDS86線量を用いて癌以外の死因による死亡率の線量反応関係の経時的傾向を探り、2) 癌以外の死因による寿命短縮の有無を扱う。

## 方 法

本解析で用いる被曝線量および集団

寿命調査拡大集団(LSS-E85)の対象者120,128人のうちT65DR線量<sup>4</sup> が推定できたのは91,228人である。これには原爆時広島・長崎に居なかった者、すなわち“市内不在”(NIC)群の26,517人、および線量(T65DR)が推定できなかった原爆被爆者2,383人は含まれていない。本解析時には、これら91,228人の被爆者のうち計75,991人(83.3%)についてDS86線量推定値が算出されていた。以下ではこれら75,991人をDS86副次群という。被爆者個

人のDS86線量算出については他報<sup>5</sup>に詳述している。要約すれば、広島で爆心地から1,600 m以内に居て(長崎では2,000 m以内)屋外の遮蔽のない状態で被爆し熱傷を負った者、および木造の日本家屋内で被爆し詳細な遮蔽状況が判明している者については、被爆状況のモデル化により線量が直接推定された。用いた方法では、構造的遮蔽物、特定の組織におけるエネルギーの減弱、姿勢、方向、および年齢は考慮に入れているが、木造建造物および組織のいずれについても特定の透過率は用いていない。遠距離では、詳細な遮蔽歴がなかった場合、線量が直接算出されている広島・長崎の1,000 m以遠の被爆者から求めた平均透過率を用いて線量を間接的に推定した。<sup>6</sup> 以前の寿命調査報告で述べたように、6 Gyを超える遮蔽カーマの推定値は6 Gyで打ち切った。このようにして線量を打ち切った対象者は99人である。関連する疾患の異質性および自然史を考えると、あらゆる組織の代用となり得る適当な単一組織はないと思われるので、すべての解析は遮蔽カーマについて行う。

## 死亡の確認

日本の法的家族登録制度(戸籍)を照合して死亡を確認するので、死亡確認は完全である。死因は、死亡診断書に基づく人口動態統計死亡票から入手する。原死因はICD(国際疾病分類)によって分類した。(詳細なコード分類と特定の死因による死亡症例数を表1と付表1に示した。)

DS86副次群で1950-85年の間に死亡した計28,737例のうち6,224例が腫瘍によるものであった。そのうち5,936例が悪性腫瘍、288例が良性または性質不詳の腫瘍であった。これらの死亡例と電離放射線との関係はすでに報告されている。<sup>1,2</sup> 本解析の対象者は他の死亡例、すなわち腫瘍以外の全疾患による20,777の死亡例である。ただし、これには死因が不明の75例、外因死1,515例および“血液疾患”146例は含まれていない(表1)。血液疾患による死亡の診断の正確性は極めて低く、多くの場合、白血病および悪性リンパ腫が関係している。<sup>3</sup> そのため本解析からは血液疾患による死亡を除外した。したがって本報では“癌以外”という用語は腫瘍と血液疾患を除く全疾患を意味する。本報で解析する人年数および特定の死因による死亡例数は放射線量、性別、原爆時年齢、期間別に付表2~付表8に示した。

## 統計的方法

我々が用いる統計的方法は、本シリーズの第1部と第2部で述べたものと同じである。<sup>1,2</sup> 簡約すると、時間をいくつかの群に区分した生存解析で、相対リスクモデルを用いる。<sup>7</sup> 具体的には、当てはめるモデルは次のとおりである。 $i$ を都市、性、被爆時年齢および追跡期間の交差分類における層、 $j$ を被曝線量カテゴリー、 $Y_{ij}$ 、 $PY_{ij}$ および $M_{ij}$ を層 $i$ および線量群 $j$ における死亡数、観察人年、ならびに死亡率とする。

表1. DS86 副次群75,991人中の死因別死亡数(1950-85年)

| 死 因              | 死 亡 数  | ICD 第9回改訂                          |
|------------------|--------|------------------------------------|
| 全死因              | 28,737 |                                    |
| 外因死              | 1515   | E800-E999                          |
| 不 明              | 75     |                                    |
| 全疾患              | 27,147 | 001-799                            |
| 腫 瘍              | 6224   | 140-208, 210-239                   |
| 血液疾患             | 146    | 280-289                            |
| 腫瘍および血液疾患を除く全疾患  | 20,777 | 001-799 ただし<br>140-239, 280-289を除く |
| 感染症              | 1413   | 001-139                            |
| 循環器疾患            | 11,164 | 390-459                            |
| 脳卒中              | 6202   | 430-438                            |
| 心疾患(脳卒中を除く循環器疾患) | 4962   | 390-429, 440-459                   |
| 呼吸器疾患            | 2036   | 460-519                            |
| 消化器疾患            | 2149   | 520-579                            |
| その他              | 4015   |                                    |

統計学的解析では、人年および死亡数を都市別、性別、11の被爆時年齢カテゴリー別(5歳未満, 5-9歳, 10-14歳, 15-19歳, 20-24歳, 25-29歳, 30-34歳, 35-39歳, 40-44歳, 45-49歳, 50歳以上)、7の追跡期間別(1950-55年, 1956-60年, 1961-65年, 1966-70年, 1971-75年, 1976-80年, 1981-85年)および10の放射線量カテゴリー別(0 Gy, 0.01-0.05 Gy, 0.06-0.09 Gy, 0.10-0.19 Gy, 0.20-0.49 Gy, 0.50-0.99 Gy, 1.00-1.99 Gy, 2.00-2.99 Gy, 3.00-3.99 Gy, 4.00 Gy 以上)にまとめ、層化した。その結果、3,080個の層が得られた。いくつかの解析では七つの追跡調査期間を更に1950-65年, 1966-75年, 1976-85年にまとめた。

これらの条件*ij*番目の層の死亡率は

$$M_{ij} = M_{i0}RR_{ij}$$

とモデル化されるが、ここで、 $RR_{ij}$ はバックグラウンド死亡率を都市、性、被爆時年齢および被爆後経過期間について補正した、線量群0に対する線量群*j*の層*i*における相対危険度で



ある。更に具体的に言うと、 $RR_{ij}$ は

$$\begin{aligned} RR_{ij} &= 1 + b_1 D_{ij} \\ RR_{ij} &= 1 + b_1 D_{ij}^2 \text{ または} \\ RR_{ij} &= 1 + b_1 D_{ij} + b_2 D_{ij}^2 \end{aligned}$$

とモデル化される。ただし、 $D_{ij}$ は $ij$ 番目のカテゴリーにおける平均総線量である。

癌以外の死因による死亡への電離放射線の影響は確率的な性質のものとする理由はほとんど、または全くないと推測されるので、次の式の線形-閾値モデルも通常の方法でデータに当てはめた。

$$RR_{ij} = \begin{cases} 1 + b_1 (D_{ij} - D_T) & D_{ij} > D_T \text{ の場合} \\ 1 & \text{それ以外の場合} \end{cases}$$

ただし  $D_T$  は閾値線量である。閾値を決定するために任意の値について deviance を算出し、それが最小となる値を閾値とした。

放射線影響に対する潜在的修飾要因の影響を調べるために、次の単純なモデルを用いた。

$$\text{Modified } RR_{ij} = 1 + (RR_{ij} - 1) \cdot \exp(\alpha X)$$

ただし  $X$  は都市、性、被爆時年齢、被爆後経過期間などの放射線の影響を修飾する要因である。

死亡数  $Y_{ij}$  は独立した Poisson 確率変数で、期待値が  $E(Y_{ij}) = PY_{ij} \cdot M_{i0} \cdot RR_{ij}$  (ここで観察人年  $PY_{ij}$  は定数として扱う) と仮定して、各パラメータを最尤法で推定した。このような近似をしたのは、得られる尤度関数が、各追跡期間内で一定の階段関数によって近似したハザード関数をもつ生存時間モデルから求めた尤度関数と同じになるという事実による。<sup>7</sup> 様々なモデルを当てはめるのに AMFIT プログラム<sup>8</sup> を用いた。包含関係のあるモデル間の deviance の差異を用いて、線量反応関数へ新たな項を追加することによる適合度の向上を評価した。

## 結 果

### 腫瘍および血液疾患を除く全疾患

表2に0線量群と比較した場合の九つの線量群の“腫瘍および血液疾患を除く全疾患”に

表2. 腫瘍および血液疾患を除く全疾患による死亡率の相対リスク(対0 Gy比), 1950-85年

| 死亡数     | 放射線量 (Gy) |           |           |           |           |           |           |           |       |      | 検定(p値) <sup>a</sup> |                 |      |                                               |       |       |
|---------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------|------|---------------------|-----------------|------|-----------------------------------------------|-------|-------|
|         | 0         | 0.01-0.05 | 0.06-0.09 | 0.10-0.19 | 0.20-0.49 | 0.50-0.99 | 1.00-1.99 | 2.00-3.99 | ≥4.00 | 均一性  | L                   | LQ <sup>b</sup> | Q    | LT                                            |       |       |
| 合計      | 20,777    | 1.0       | 1.03      | 0.97      | 0.97      | 0.97      | 1.15      | 0.96      | 1.13  | 1.16 | 1.38                | 0.02            | 0.06 | 0.004 (-, + <sup>*</sup> )                    | 0.007 | 0.003 |
| 都市      |           |           |           |           |           |           |           |           |       |      |                     |                 |      |                                               |       |       |
| 広島      | 14,436    | 1.0       | 1.03      | 0.96      | 0.96      | 0.96      | 1.00      | 0.96      | 1.17  | 1.01 | 1.53                | 0.01            | 0.07 | 0.01 (-, + <sup>*</sup> )                     | 0.006 | 0.003 |
| 長崎      | 6341      | 1.0       | 1.03      | 0.99      | 1.04      | 0.99      | 1.11      | 0.93      | 0.96  | 2.34 | 1.08                | 0.43            | 0.53 | 0.79 (+, +)                                   | 0.50  | 0.41  |
| 性       |           |           |           |           |           |           |           |           |       |      |                     |                 |      |                                               |       |       |
| 男性      | 9344      | 1.0       | 1.03      | 0.94      | 0.95      | 0.96      | 0.98      | 0.95      | 1.05  | 1.17 | 1.60                | 0.03            | 0.06 | 0.004 (-, + <sup>**</sup> )                   | 0.003 | 0.002 |
| 女性      | 11,433    | 1.0       | 1.03      | 0.99      | 0.99      | 0.97      | 1.04      | 0.97      | 1.21  | 1.13 | 1.07                | 0.66            | 0.48 | 0.77 (+, -)                                   | 0.55  | 0.40  |
| 被爆時年齢   |           |           |           |           |           |           |           |           |       |      |                     |                 |      |                                               |       |       |
| <10     | 324       | 1.0       | 0.80      | 0.78      | 1.20      | 1.25      | 0.76      | 0.46      | 1.46  | 1.29 | 1.35                | 0.31            | 0.83 | 0.95 (-, +)                                   | 0.76  | 0.49  |
| 10-19   | 814       | 1.0       | 1.06      | 1.03      | 0.73      | 0.94      | 1.07      | 1.07      | 0.62  | 0.81 | 2.21                | 0.28            | 0.35 | 0.20 (-, +)                                   | 0.13  | 0.18  |
| 20-29   | 929       | 1.0       | 0.97      | 0.80      | 0.92      | 0.98      | 0.74      | 1.07      | 0.94  | 0.72 | 2.03                | 0.48            | 0.43 | 0.16 (-, + <sup>Sup.</sup> )                  | 0.13  | 0.16  |
| 30-39   | 2441      | 1.0       | 1.12      | 1.09      | 1.05      | 0.84      | 1.26      | 0.94      | 1.87  | 1.47 | 1.81                | 0.002           | 0.01 | 0.02 (+, +)                                   | 0.006 | 0.003 |
| 40-49   | 5995      | 1.0       | 1.07      | 0.97      | 0.99      | 1.05      | 1.07      | 1.07      | 1.22  | 0.95 | 1.28                | 0.37            | 0.14 | 0.27 (+, -)                                   | 0.34  | 0.36  |
| >50     | 10,274    | 1.0       | 1.00      | 0.96      | 0.95      | 0.95      | 0.96      | 0.89      | 0.95  | 1.45 | 1.10                | 0.39            | 0.58 | 0.16 (- <sup>Sup.</sup> , + <sup>Sup.</sup> ) | 0.66  | 0.36  |
| 期間      |           |           |           |           |           |           |           |           |       |      |                     |                 |      |                                               |       |       |
| 1950-55 | 2901      | 1.0       | 1.07      | 0.95      | 0.91      | 0.92      | 0.99      | 0.74      | 0.97  | 1.49 | 1.46                | 0.09            | 0.91 | 0.04 (- <sup>*</sup> , + <sup>*</sup> )       | 0.30  | 0.13  |
| 1956-60 | 2999      | 1.0       | 0.97      | 0.93      | 0.93      | 1.06      | 0.71      | 0.94      | 0.88  | 1.08 | 1.10                | 0.07            | 0.41 | 0.20 (-, + <sup>Sup.</sup> )                  | 0.97  | 0.80  |
| 1961-65 | 2969      | 1.0       | 1.12      | 0.96      | 1.01      | 1.00      | 1.20      | 0.87      | 1.07  | 1.24 | 1.52                | 0.08            | 0.47 | 0.60 (-, +)                                   | 0.33  | 0.25  |
| 1966-70 | 2958      | 1.0       | 1.03      | 0.86      | 0.97      | 1.04      | 0.94      | 1.18      | 1.23  | 0.96 | 1.21                | 0.49            | 0.24 | 0.46 (+, -)                                   | 0.42  | 0.54  |
| 1971-75 | 2988      | 1.0       | 0.97      | 0.95      | 0.95      | 0.92      | 1.16      | 1.02      | 1.13  | 1.04 | 1.45                | 0.48            | 0.11 | 0.28 (+, -)                                   | 0.18  | 0.22  |
| 1976-80 | 3057      | 1.0       | 0.94      | 1.01      | 1.05      | 0.82      | 0.96      | 0.98      | 1.34  | 1.00 | 1.34                | 0.11            | 0.37 | 0.35 (-, +)                                   | 0.18  | 0.14  |
| 1981-85 | 2905      | 1.0       | 1.11      | 1.11      | 0.94      | 1.03      | 1.17      | 0.97      | 1.30  | 1.27 | 1.59                | 0.14            | 0.12 | 0.28 (+, +)                                   | 0.12  | 0.11  |

<sup>a</sup> パターンを特定しない10の線量群の均一性, 当てはめた線形(L), 線形-二次(LQ), 二次(Q), 線形-閾値(LT)モデルの有意性。閾値線量は1.5 Gyと仮定した。

<sup>b</sup> LQの括弧内の符号は線形および二次項の回帰係数の符号である。これら係数の統計的有意性についても示した。 <sub>Sup</sub>  $p < 10$  \*  $p < 05$  \*\*  $p < 01$

よる死亡率の相対リスクを都市、性、被爆時年齢、期間別に示した。線量区分間の推定相対リスクの均一性および線形(L)、線形-二次(LQ)、二次(Q)、または1.5 Gyの閾値線量をもつ線形-閾値(LT)モデルに基づく線量反応の有意性に関する統計的検定の結果も示した。相対リスクは、1950-85年の全期間で両市、男女、全被爆時年齢群を合わせた場合、最も高い線量域(2 Gy以上)で高くなる傾向を示した(図1)。統計的には、LQモデルは、Lモデルよりも有意によく適合したが、Qモデルの適合度とはあまり変わらない。これらの検定は、LQモデルにおける二次項および一次項の係数の検定に、それぞれ対応している(表2)。LモデルとQモデルの適合度の比較では、QモデルがLモデルよりも、よりよく適合しているが、LモデルとQモデルは包含関係がないので、統計的に検定できない。LTモデルの適合度の検定では、閾値として1.5 Gyを仮定したが、閾値を仮定しないで、推定したLTモデルは、有意( $p = 0.01$ )であった。その推定値は1.4 Gyで90%信頼区間は、0.6-2.8 Gyであった。このLTモデルは、単純なLモデルに比べ、適合度はよりよくなる( $p = 0.02$ )。これらの結果は、線量反応関係が非線型であり、死亡率の増加が、主として高線量域で起きていることを示している。

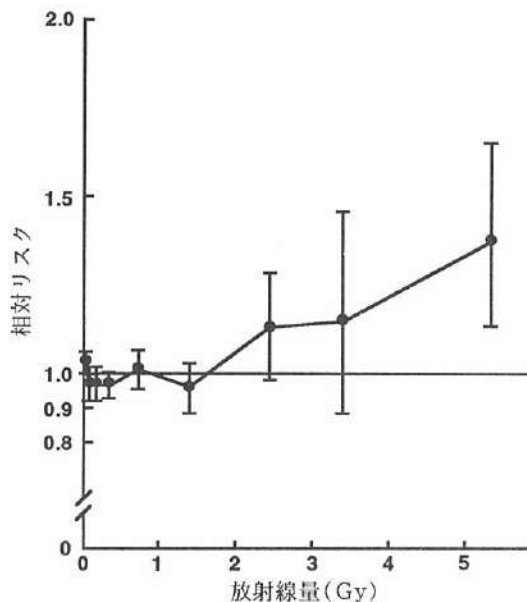


図1. 腫瘍および血液疾患を除く全疾患による死亡率の線量反応曲線、両市、男女、全被爆時年齢、1950-85年。縦線は相対リスクの90%信頼区間を示す。

表2の推定相対リスクは都市および男女間の差異を示唆している。しかし男女および都市間の統計的比較では、いずれの場合もこの差異の有意性は見られない。被爆時年齢群別の線量反応もまた、高線量域で相対リスクが高い傾向を示唆しているが、被爆時年齢が30-39歳の者についてのみ統計的に有意である。三つの10歳ごとの年齢群、すなわち0-9歳、10-19歳、20-29歳群を合わせた被爆時年齢30歳以下の被爆者に関する解析では、Q( $p = 0.03$ )およびLT( $p = 0.04$ )モデルでリスク増加が統計的に有意である。更に、被爆時年齢40歳以上の群に比べて40歳未満の群の方がリスクが有意に高いことが認められた。

表3および図2に二つの被爆時年齢群、すなわち40歳未満群と40歳以上群内での三つの連続期間(1950-65年、1966-75年、1976-85年)における“腫瘍および血液疾患を除く全疾患”による死亡率の線量反応曲線を示した。表3および図2に示すように、被爆時年齢

表3. 被爆時年齢および期間によって分類した群の腫瘍および血液疾患を除く全疾患による死亡率の  
相対リスク (対0 Gy比), 1950-85年 (両市・男女)

| 被曝時<br>年齢 | 期 間     | 死亡数  | 放射線量 (Gy) |                    |                    |                    |                    |                    |                    |                    |       |      | 検定 (p 値) <sup>a</sup> |                 |                  |        |        |
|-----------|---------|------|-----------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-------|------|-----------------------|-----------------|------------------|--------|--------|
|           |         |      | 0         | 0.01-0.06-<br>0.05 | 0.06-0.10-<br>0.09 | 0.10-0.20-<br>0.19 | 0.20-0.50-<br>0.49 | 0.50-1.00-<br>0.99 | 1.00-2.00-<br>1.99 | 2.00-3.00-<br>2.99 | ≥4.00 | 均一性  | L                     | LQ <sup>b</sup> | Q                | LT     |        |
| <40       | 1950-65 | 1399 | 1.0       | 1.06               | 0.96               | 0.94               | 1.14               | 0.95               | 1.00               | 1.12               | 0.97  | 1.14 | 0.94                  | 0.67            | 0.85 (+, -)      | 0.84   | 0.81   |
|           | 1966-75 | 1159 | 1.0       | 1.04               | 0.71               | 1.13               | 0.77               | 1.22               | 0.94               | 1.14               | 0.92  | 2.08 | 0.02                  | 0.15            | 0.14 (-, +)      | 0.06   | 0.07   |
|           | 1976-85 | 1950 | 1.0       | 1.03               | 1.16               | 0.91               | 0.84               | 1.01               | 0.95               | 1.52               | 1.31  | 2.56 | 0.006                 | 0.01            | 0.001 (-, +**)   | 0.0005 | 0.0003 |
| ≥40       | 1950-65 | 7470 | 1.0       | 1.05               | 0.94               | 0.95               | 0.97               | 0.94               | 0.83               | 0.93               | 1.39  | 1.41 | 0.02                  | 0.73            | 0.005 (-**, +**) | 0.22   | 0.08   |
|           | 1966-75 | 4787 | 1.0       | 0.99               | 0.96               | 0.93               | 1.03               | 1.02               | 1.14               | 1.19               | 1.04  | 1.06 | 0.72                  | 0.16            | 0.16 (+ Sup, -)  | 0.62   | 0.76   |
|           | 1976-85 | 4012 | 1.0       | 1.01               | 1.00               | 1.03               | 0.96               | 1.08               | 0.98               | 1.18               | 1.01  | 0.85 | 0.96                  | 0.91            | 0.74 (+, -)      | 0.75   | 0.79   |

<sup>a</sup> パターンを特定しない10の線量群の均一性, 当てはめた線形(L), 線形-二次(LQ), 二次(Q), 線形-閾値(LT)モデルの有意性。閾値線量は1.5 Gyと仮定した。

<sup>b</sup> LQの括弧内の符号は線形および二次項の回帰係数の符号である。これら係数の統計的有意性についても示した。 <sup>Sup</sup>  $p < 10^{-5}$  \*  $p < 0.05$  \*\*  $p < 0.01$

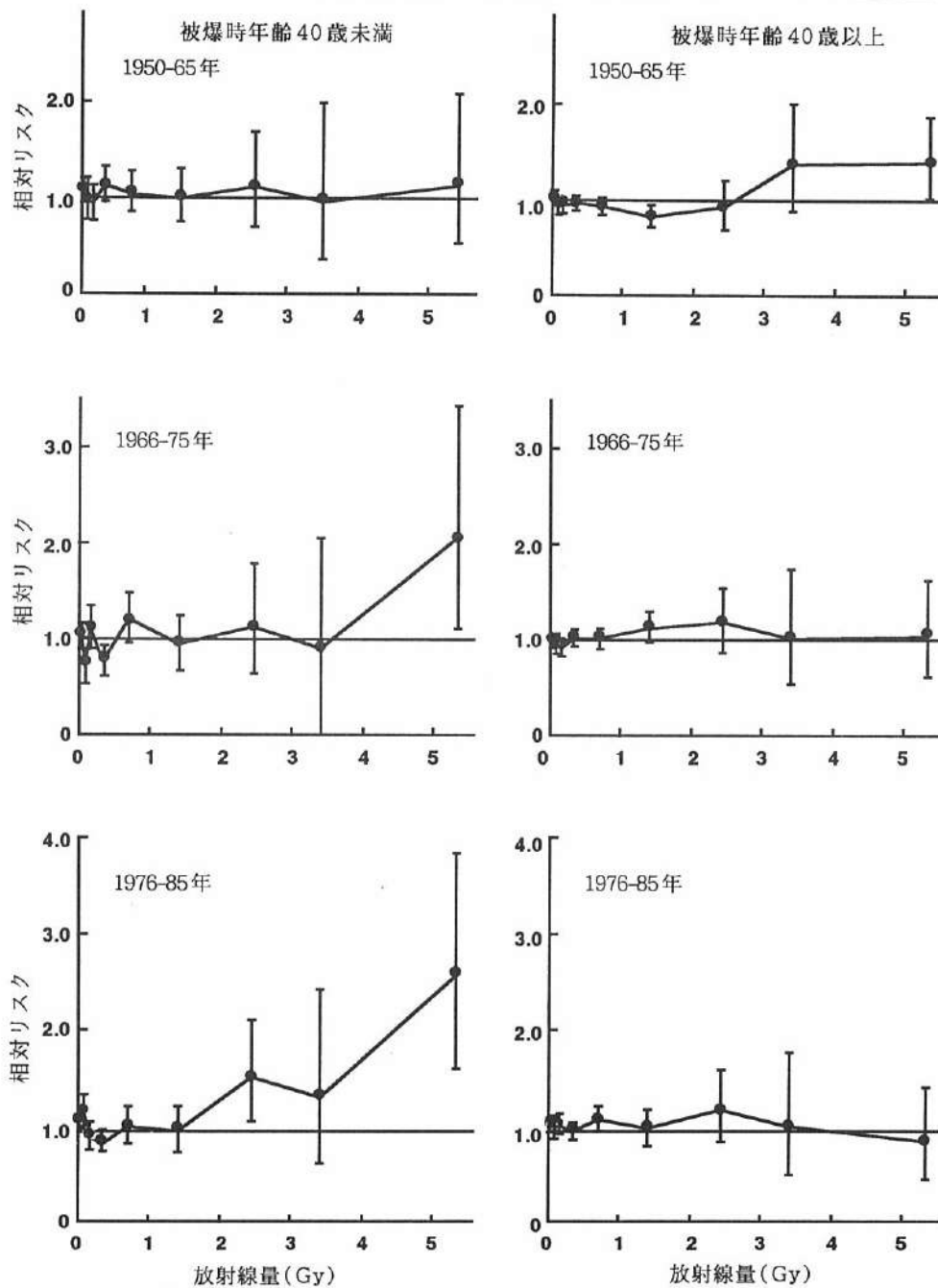


図2. 腫瘍および血液疾患を除く全疾患による死亡率の線量反応曲線, 被爆時年齢および期間別。縦線は相対リスクの90%信頼区間を示す。

が40歳未満の群では、最近の期間(1976-85年)で増加の傾向が認められている。この期間では単純なLモデルよりも非線形モデル(LTまたはQモデル)の方がよく適合するようである。しかし最初の期間(1950-65年)では、被爆時年齢が40歳以上の群の線量反応曲線はU字型である。(すなわち低線量では負の下降傾向、高線量では上昇傾向である。)

表4に被爆時年齢が40歳未満の群と40歳以上の群についてそれぞれ期間別の回帰係数の変化を示した。40歳未満の群のQモデルおよびLTモデルの係数は期間が後になるほど大きくなる傾向がある。三つの期間の係数の差異は有意でないが、二つの期間のみ(1965年までと1966年以降)を用いると、QモデルおよびLTモデルの両方についてその差異は統計的有意差を示唆している( $p = 0.06$ )。被爆時年齢が40歳以上の群のLQモデルの係数は三つの期間で有意に異なっていた。これは1965年までと1966年以降の差異による。1965年以前では、線形の項では負の下降傾向があり、二次の項では上昇傾向が認められるが、これは低線量ではリスクが低下し高線量ではリスクが増大していることを示している。1966年以降は放射線の影響は認められない。1965年までの期間を更に5年の間隔に分け、被爆時年齢が40歳以上の群を40-49歳と50歳以上に分けると、U字型線量反応の下降傾向は1950-60年の期間で被爆時年齢が50歳以上の群で大きくなっている(付表9)。

上記のとおり、年齢および期間別の解析から、線量反応パターンは被爆時年齢および観察期間により異なることが示された。これらの所見から、我々はデータ全体に様々な“混合”統計モデルを当てはめる別の解析も行った。このモデルでは、初期での線量反応はLQモデルに適合し、最近の期間ではQモデルが適合するが、係数は被爆時年齢によって異なると仮定した。

単純化のために、観察期間および被爆時年齢を区分けした。観察期間を1965年以前と1966年以降1985年までに分け、被爆時年齢を40歳未満と40歳以上に分けた。LQ線量反応は、1965年以

表4. 期間別回帰係数の変化

| 期 間     | 被爆時年齢40歳未満 |      |        |      | 被爆時年齢40歳以上 |         |       |
|---------|------------|------|--------|------|------------|---------|-------|
|         | Q          | Test | LT     | Test | LQ         |         | Test  |
|         |            |      |        |      | $a_1$      | $a_2$   |       |
| 1950-65 | 0.0028     | 0.13 | 0.0249 | 0.10 | -0.1589    | 0.0468  | 0.008 |
| 1966-75 | 0.0310     |      | 0.2152 |      | 0.1249     | -0.0248 |       |
| 1976-85 | 0.0508     |      | 0.3977 |      | 0.0482     | -0.0132 |       |

注：これは三つの期間の係数の均一性の検定である。二次(Q)モデル： $RR = 1 + a_1 d^2$ ，ただしdの単位はグレイである。線形-閾値(LT)モデル： $RR = 1 + a_1 (d - 1.5)$ ；線形-二次(LQ)モデル： $RR = 1 + a_1 d + a_2 d^2$

前で被爆時年齢 40 歳以上の群よりも 1960 年以前の期間で被爆時年齢 50 歳以上の群の方がデータによく当てはまったので、1960 年および被爆時年齢 50 歳も区分点として用いた。

付表 10 に回帰分析の結果を示した。それらのデータは、初期において、リスクは L 項が有意に負で Q 項が有意に正の LQ モデルに従い、それは、被爆時年齢が高い群によることを裏付けている。しかし、後期においては、Q モデルがデータによく適合し、最近のリスクの増大は被爆時年齢が低い群によると思われる。我々の選択したモデル(付表 10 のモデル 5-4)は、下記のとおりである。

被爆時年齢 40 歳未満, 1950-65 年  $RR = 1 + 0.0606d - 0.0112d^2$

被爆時年齢 40 歳以上, 1950-65 年  $RR = 1 - 0.1597d + 0.0469d^2$

被爆時年齢 40 歳未満, 1966-85 年  $RR = 1 + 0.0425d^2$

被爆時年齢 40 歳以上, 1966-85 年  $RR = 1 + 0.0008d^2$

付録図 1 に、モデル 5-4 を基にした四つの線量反応曲線を示した。

LQ モデルは 1960 年以前および被爆時年齢 50 歳以上でデータに最も適合し、Q モデルは 1966 年以降および被爆時年齢 40 歳未満で最適であるが、データを二つの区分(すなわち 1960 年以前と 1961 年以降または 1965 年以前と 1966 年以降の期間、被爆時年齢 40 歳未満と 40 歳以上または 50 歳未満と 50 歳以上)に分けたモデル以上に、三つの区分のモデル(期間: 1960 年以前, 1961-65 年, 1966-85 年, 被爆時年齢: 40 歳未満, 40-49 歳, 50 歳以上)がよく適合したということはなかった。つまり、データを二つ(少ない区分)に分割したモデルも三つの区分のモデルと同程度に適合した(付表 10 のモデル 5-4, 5-5, 6-4, 6-5)。

#### 疾患別観察

必ずしも統計的に有意ではないが、特定疾患の線量反応曲線は、概して“腫瘍および血液疾患を除くすべての疾患”と同様である。全期間では非線型であり、また過剰死亡率は主に最近の期間での被爆時年齢の低い群における死亡に起因している。初期には、U 字型線量反応(低線量で下降傾向、高線量で上昇傾向)が被爆時年齢の高い群について認められた。

腫瘍および血液疾患を除く死亡のうち、特定の疾患による死亡の相対リスクおよび線量反応の統計的有意性検定の結果を、全期間における都市、性、被爆時年齢合計について表 5 に示した。また“腫瘍および血液疾患を除く全疾患”で過剰死亡のみられた 1966-85 年間の被爆時年齢 40 歳未満について表 6 に示した。図 3 に“最近の期間での若年被爆群”と“初期の期間での被爆時年齢の高い群”の両方の群について、線量反応を示した。被爆時年齢および観察

期間によるリスクの変化に関するモデルの統計的検定結果は付表 11 に示した。

### 感染症

1965年以前の被爆時年齢 40 歳以上の群では下降傾向は統計的有意差を示唆していたが、感染症の死亡率が線量に関連している傾向を示す証拠はデータ全体からは認められず、線量反応は被爆時年齢、性、追跡期間によって変化しない(図 3)。感染症による死亡の大部分を占める結核の死亡率には、放射線量との関係は認められなかった。(データは表に示していない。)

### 循環器疾患

1950-85 年の循環器疾患による死亡率は、線量との有意な関連を示した。脳卒中による死亡率にはそのような関連は認められなかったが、脳卒中以外の循環器疾患(ここでは心疾患とした)は全期間で有意な傾向を示した(表 5)。しかし後期(1966-85 年)になると被爆時年齢が低い群(40 歳未満)では、循環器疾患全体の死亡率ならびに脳卒中または“心疾患”の死亡率は、線量と有意な関係を示し、線量反応曲線は純粋な二次または線形-閾値型を示した(表 6)。“心疾患”群のうち最も死亡数が多い“冠状動脈性心疾患”の死亡率は、同じ期間・同じ被爆時年齢区分の“心疾患”と同じ傾向を示している(表 6)。

“腫瘍および血液疾患を除く全疾患”による死亡率に認められたように、被爆時年齢および観察期間によるリスクの差が、循環器疾患全体、および脳卒中、“心疾患”でも観察された。最近の期間における被爆時年齢の低い群で Q モデル、初期における被爆時年齢の高い群で U 字型の線量反応を仮定する混合モデルは、全期間で Q モデルと仮定するよりも、循環器疾患全体および脳卒中で、有意により適合を示した(付表 11)。脳卒中は、初期における U 字型線量反応が顕著であり、後期における過剰は心疾患に大きい(表 6, 図 3)。

### 呼吸器疾患

呼吸器疾患による死亡率は全期間で非線型の線量反応を示す(表 5)。後期の係数が初期の係数より大きくなる傾向はあるが、この線量反応は追跡期間によって変わらない。しかし、1966-85 年の被爆時年齢 40 歳のこの線量反応は統計的に有意でない。

### 消化器疾患

1950-85 年の消化器疾患の死亡率には、線量に伴う有意な増加傾向が認められる(表 5)。この傾向は後期の被爆時年齢が低い群で認められる(表 6)。消化器疾患のうち、肝硬変の死亡率は消化器疾患全体と同じ線量反応を示している(表 6)。初期の被爆時年齢が高い群の消



表5. 主な死因による死亡率の死亡数の死亡数および相対リスク(対0 Gy), 1950-85年(都市および男女合計)

| 死 因             | 放射線量(Gy)   |      |           |           |           |           |           |           |           |           |       |       |      |                             | 検定(p値) <sup>a</sup> |       |
|-----------------|------------|------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-------|-------|------|-----------------------------|---------------------|-------|
|                 | 死亡数        | 0    | 0.01-0.05 | 0.06-0.09 | 0.10-0.19 | 0.20-0.49 | 0.50-0.99 | 1.00-1.99 | 2.00-3.00 | 3.00-3.99 | ≥4.00 | 均一性   | L    | LQ <sup>b</sup>             | Q                   | LT    |
| 腫瘍および血液疾患を除く全疾患 | No. 20,777 | 9490 | 5159      | 1109      | 1411      | 1796      | 1032      | 506       | 149       | 45        | 80    |       |      |                             |                     |       |
| RR              |            | 1.00 | 1.03      | 0.97      | 0.97      | 0.97      | 1.15      | 0.96      | 1.13      | 1.16      | 1.38  | 0.02  | 0.06 | 0.004 (-, +*)               | 0.007               | 0.003 |
| 感染症             | No. 1413   | 651  | 367       | 64        | 85        | 126       | 64        | 38        | 10        | 5         | 3     |       |      |                             |                     |       |
| RR              |            | 1.00 | 1.12      | 0.90      | 0.96      | 1.11      | 0.98      | 0.98      | 0.95      | 1.49      | 0.63  | 0.59  | 0.65 | 0.69 (+, -)                 | 0.46                | 0.53  |
| 循環器疾患           | No. 11,164 | 5025 | 2767      | 605       | 775       | 981       | 590       | 273       | 85        | 20        | 43    |       |      |                             |                     |       |
| RR              |            | 1.00 | 1.03      | 0.98      | 0.99      | 0.98      | 1.08      | 0.98      | 1.24      | 1.00      | 1.43  | 0.10  | 0.03 | 0.09 (+, +)                 | 0.03                | 0.02  |
| 脳卒中             | No. 6202   | 2816 | 1551      | 314       | 443       | 538       | 307       | 156       | 45        | 7         | 25    |       |      |                             |                     |       |
| RR              |            | 1.00 | 1.04      | 0.92      | 1.01      | 0.97      | 1.01      | 1.00      | 1.18      | 0.64      | 1.49  | 0.24  | 0.37 | 0.21 (-, +)                 | 0.44                | 0.18  |
| 心疾患             | No. 4962   | 2209 | 1216      | 291       | 332       | 443       | 283       | 117       | 40        | 13        | 18    |       |      |                             |                     |       |
| RR              |            | 1.00 | 1.03      | 1.07      | 0.96      | 1.00      | 1.18      | 0.95      | 1.32      | 1.45      | 1.36  | 0.11  | 0.03 | 0.07 (+, -)                 | 0.09                | 0.06  |
| 呼吸器疾患           | No. 2036   | 888  | 528       | 135       | 162       | 150       | 95        | 45        | 17        | 4         | 12    |       |      |                             |                     |       |
| RR              |            | 1.00 | 1.14      | 1.26      | 1.19      | 0.87      | 1.02      | 0.91      | 1.46      | 1.15      | 2.19  | 0.002 | 0.21 | 0.03 (-, +*)                | 0.03                | 0.01  |
| 消化器疾患           | No. 2149   | 1002 | 510       | 105       | 142       | 194       | 98        | 63        | 14        | 8         | 13    |       |      |                             |                     |       |
| RR              |            | 1.00 | 0.98      | 0.87      | 0.94      | 1.01      | 0.92      | 1.10      | 0.93      | 1.76      | 2.00  | 0.28  | 0.04 | 0.05 (-, +)                 | 0.01                | 0.02  |
| その他             | No. 4015   | 1924 | 987       | 200       | 247       | 345       | 185       | 87        | 23        | 8         | 9     |       |      |                             |                     |       |
| RR              |            | 1.00 | 0.95      | 0.86      | 0.83      | 0.91      | 0.89      | 0.83      | 0.88      | 1.05      | 0.81  | 0.10  | 0.11 | 0.13 (- <sub>Sup</sub> , +) | 0.41                | 0.65  |

<sup>a</sup> パターンを特定しない10の線量群の均一性, 当てはめた線形(L), 線形-二次(LQ), 二次(Q), 線形-閾値(LT)モデルの有意性。閾値線量は1.5 Gyと仮定した。

<sup>b</sup> LQの括弧内の符号は線形および二次項の回帰係数の符号である。これら係数の統計的有意性についても示した。<sub>Sup</sub>  $p < 10$ ; \*  $p < 0.05$

図3. 特定疾患の線量反応曲線, 1966-85年, 被爆時年齢40歳未満, および1950-65年, 被爆時年齢40歳以上。縦線は相対リスクの90%信頼区間を示す。

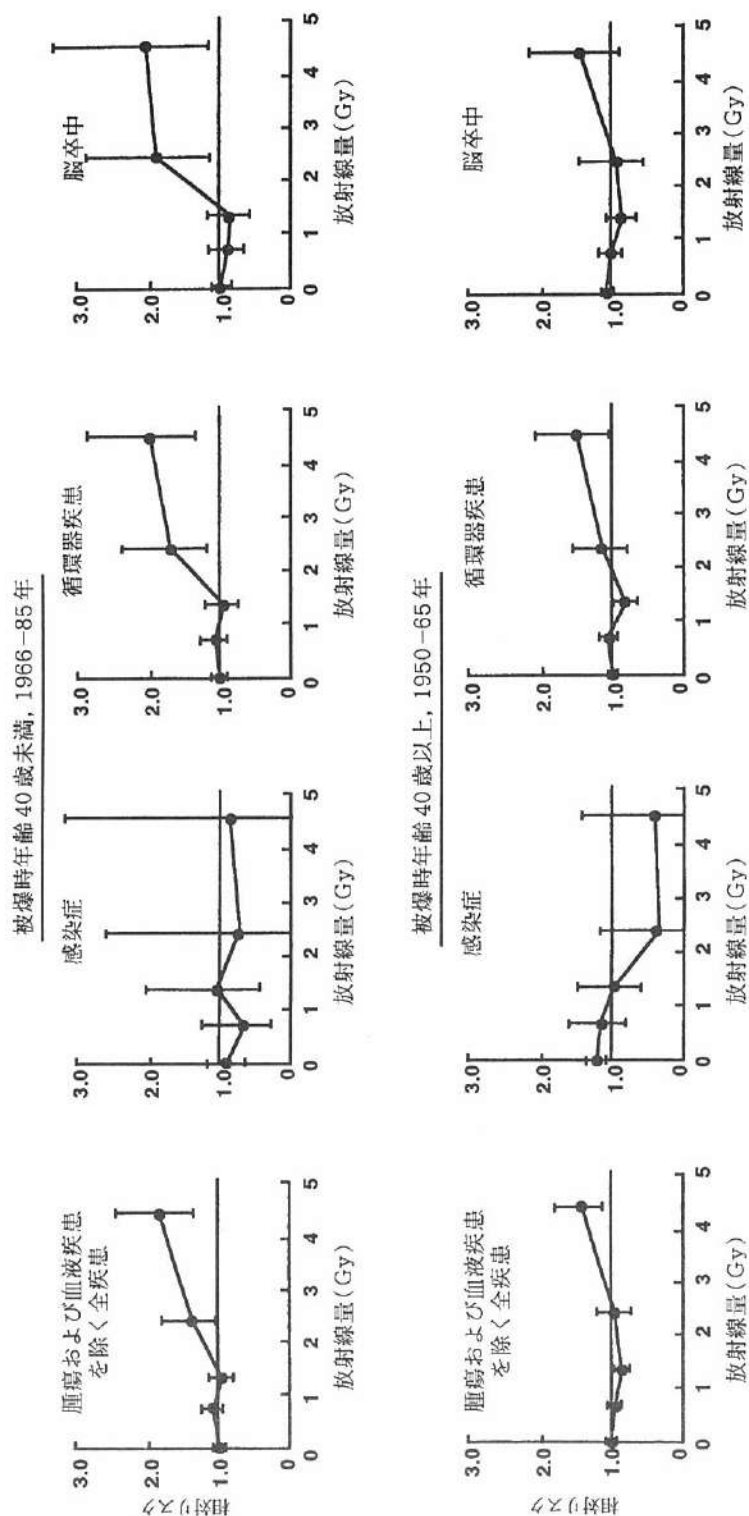
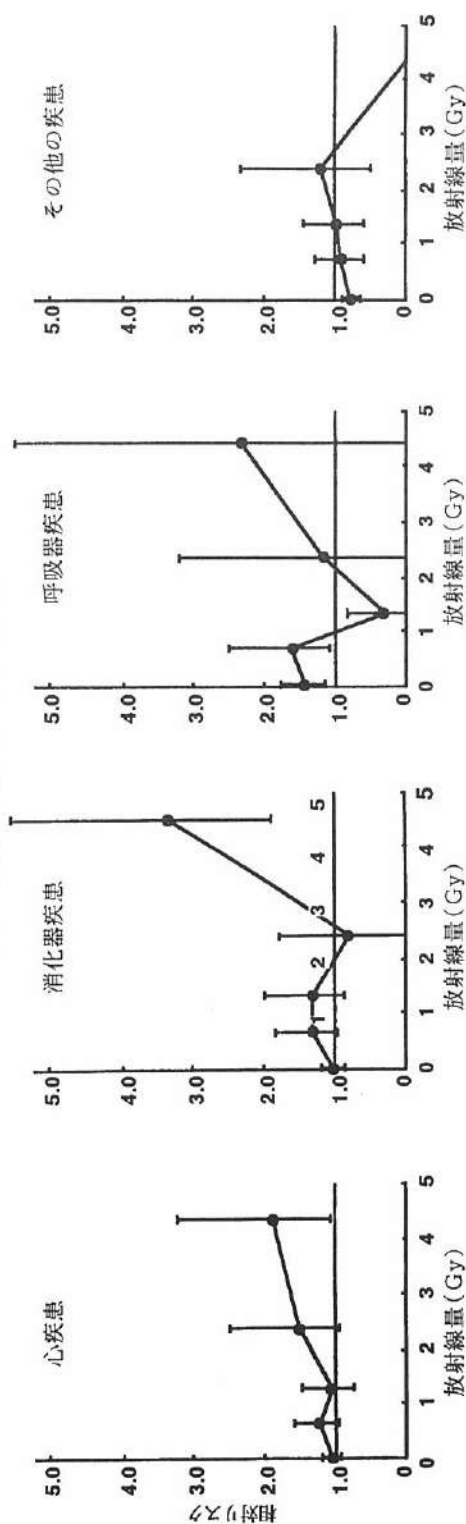


図 3. つづき

被爆時年齢 40 歳未満, 1966-85 年



被爆時年齢 40 歳以上, 1950-65 年

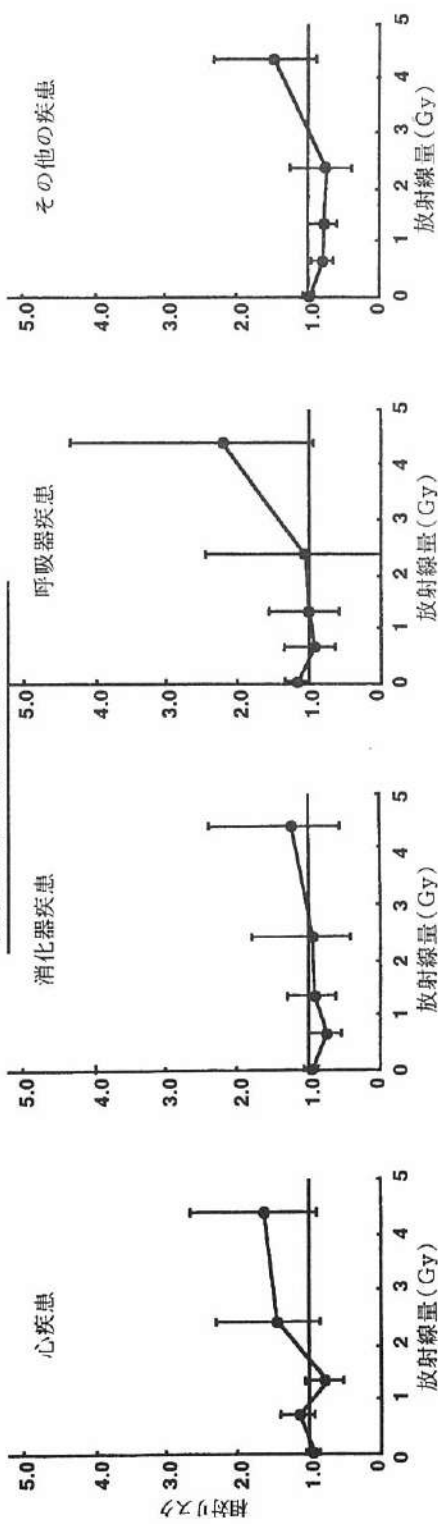


表 6. 被爆時年齢 40 歳未満の主な死因による死亡率の相対リスク (対 0 Gy), 1966-85 年 (都市および男女合計)

| 死 因             | 死亡数  | 放射線量 (Gy) |               |               |               |               | 検定(p 値) <sup>a</sup> |       |       |                                 |        |        |
|-----------------|------|-----------|---------------|---------------|---------------|---------------|----------------------|-------|-------|---------------------------------|--------|--------|
|                 |      | 0         | 0.01-<br>0.49 | 0.50-<br>0.99 | 1.00-<br>1.99 | 2.00-<br>2.99 | ≥3.00                | 均一性   | L     | LQ <sup>b</sup>                 | Q      | LT     |
| 腫瘍および血液疾患を除く全疾患 | 3109 | 1.0       | 0.98          | 1.09          | 0.95          | 1.37          | 1.83                 | 0.01  | 0.004 | 0.0002 (-, +**)                 | 0.0001 | 0.0001 |
|                 | 1764 | 1.0       | 1.00          | 1.06          | 0.94          | 1.69          | 1.98                 | 0.03  | 0.02  | 0.002 (-, +*)                   | 0.001  | 0.0003 |
| 循環器疾患           | 884  | 1.0       | 0.97          | 0.89          | 0.84          | 1.88          | 2.04                 | 0.08  | 0.11  | 0.007 (- <sup>Sug.</sup> , +**) | 0.009  | 0.004  |
| 脳卒中             | 880  | 1.0       | 1.04          | 1.24          | 1.06          | 1.52          | 1.92                 | 0.28  | 0.07  | 0.12 (-, +)                     | 0.04   | 0.04   |
| 心疾患             | 363  | 1.0       | 1.35          | 1.25          | 0.92          | 2.57          | 2.38                 | 0.03  | 0.11  | 0.14 (-, +)                     | 0.05   | 0.04   |
| 冠状動脈性心疾患        | 276  | 1.0       | 1.40          | 1.64          | 0.31          | 1.18          | 2.33                 | 0.007 | 0.43  | 0.26 (-, +)                     | 0.18   | 0.14   |
| 呼吸器疾患           | 455  | 1.0       | 0.96          | 1.29          | 1.29          | 0.76          | 3.33                 | 0.021 | 0.002 | 0.005 (+, +)                    | 0.001  | 0.003  |
| 消化器疾患           | 281  | 1.0       | 0.90          | 1.39          | 1.15          | 1.16          | 3.93                 | 0.02  | 0.003 | 0.005 (+, +)                    | 0.001  | 0.002  |
| 肝硬変             |      |           |               |               |               |               |                      |       |       |                                 |        |        |

<sup>a</sup> パターンを特定しない六つの線量群の均一性, 当てはめた線形(L), 線形-二次(LQ), 二次(Q), 線形-閾値(LT)モデルの有意性。閾値線量は 1.5 Gy と仮定した。

<sup>b</sup> LQ の括弧内の符号は線形および二次項の回帰係数の符号である。これら係数の統計的有意性についても示した。<sup>Sug</sup>  $p < 0.10$ ; \*  $p < 0.05$ ; \*\*  $p < 0.01$

化器疾患の線量反応曲線は“腫瘍および血液疾患を除く全疾患”と類似している(図3)。統計的には、初期ではLQ、後期ではQの線量反応を仮定するモデルは、全期間でのQモデルよりよく適合している。この期間依存モデルは被曝時年齢によって変わらない(付表11)。

#### その他の疾患

このカテゴリーは様々な疾患を含む。老衰による死亡が多数を占める。“その他の疾患”による死亡は全期間では放射線量との関係は認められない(表5)。しかし、初期の線量反応はLQモデルに従い、L項は有意に負でQ項は有意に正である。後期では、負の線量反応が認められるが、線量に伴う傾向を示す統計的に有意な証拠はない(図3)。

#### 腫瘍および血液疾患を除く全疾患による死亡リスク推定値

癌のリスクとの比較をするために、全対象者および1966-85年の被曝時年齢40歳未満の者について“腫瘍および血液疾患を除く全疾患”のリスクの尺度の総括、すなわち、2 Gyでの相対リスク、 $10^4$  PYGy、寄与リスク(%)を示した(表7)。

相対リスクおよび寄与リスクは癌に比べかなり低く、1.4 Gy未満の線量域では過剰死亡がないことを反映して、自然死亡が高いにもかかわらず過剰死亡数はかなり低かった。

表7. 線形-閾値モデルに基づく“腫瘍および血液疾患を除く全疾患”による死亡率のリスク推定値、閾値線量を1.4 Gyと仮定

| 死 因                      | 2 Gyでの推定<br>相対リスク | $10^4$ PYGy当たりの<br>過剰死亡        | 寄与リスク<br>(%) <sup>a</sup> |
|--------------------------|-------------------|--------------------------------|---------------------------|
| 腫瘍および血液疾患を除く全疾患          |                   |                                |                           |
| 合 計                      | 1.06(1.02, 1.09)  | 1.18 <sup>b</sup> (0.51, 1.19) | 0.36(0.16, 0.59)          |
| 被曝時年齢：<40<br>期間：1966-85年 | 1.19(1.10, 1.29)  | 1.69 (0.90, 2.62)              | 1.49(0.79, 2.30)          |
| 全悪性腫瘍 <sup>c</sup>       | 1.78(1.64, 1.92)  | 10.00 (8.36, 11.8)             | 10.2 (8.50, 12.0)         |
| 白血病                      | 8.84(6.78, 11.8)  | 2.29 (1.18, 2.73)              | 55.4 (45.7, 66.3)         |
| 白血病以外の全悪性腫瘍              | 1.58(1.46, 1.72)  | 7.41 (5.83, 9.08)              | 7.86 (6.19, 9.64)         |

括弧内は90%信頼区間。

<sup>a</sup>0.01 Gy以上(平均0.295 Gy)に被曝した41,719人の対象者に基づく。

<sup>b</sup>線形閾値モデルについては過剰死亡は線量に依存する。(すなわち線量が $\leq 1.4$  Gyのときは過剰死亡は0,  $>1.4$  Gyのときは3.26であり、平均は1.18である。)

<sup>c</sup>リスク推定値は全対象者について線形モデルに基づいて行われた。<sup>2</sup>

ちなみに、線量が1.4 Gy以下では過剰死亡は0であり、線量が1.4 Gyより高いと3.26であった。また集団全体では、平均は1.18であった。

### 寿命短縮

寿命調査集団の死亡率解析がこれまでのように進められてきたのは、癌以外の死因による寿命の短縮にも関心があったためでもある。そのような寿命短縮を最も顕著に示すものは、全疾患、特に人生の後半に特有の疾患による年齢別死亡率の増加であろう。年齢別死亡率の対数であるGompertz関数は、成人の多くの慢性疾患による死亡率を適切に表すことが判明している。年齢別死亡率の対数は直線になり、寿命短縮はGompertz関数の上昇によって示唆される。2 Gy以上の被爆者の癌および血液疾患を除く全病死因(外因死を除く)に基づくGompertz関数を対照群(0 Gy)と比較すると、放射線が誘発した寿命短縮は、腫瘍の誘発のみではなく、他の全病死因にも起因していることが分かる(図4)。後者の証拠は、0 Gy群に比べ $\geq 2$  Gy群で死亡率が一貫して著しく高い若年被爆群で特に明らかである(図5A)。三つの期間、すなわち1950-65年、1966-75年、1976-85年(図5B)に分けて被爆時年齢が40歳未満の群を観察すると、2 Gy以上の死亡率の明らかな増加は1966年までは認められず、被爆時年齢が40歳以上の群では、初期、すなわち1950-65年で(50歳以上の死亡に)わずかな増加が認められる。

寿命短縮は余命が短縮した年数で表す。我々はこれを平均余命の短縮で表した。2 Gy以上に被爆した者の“腫瘍および血液疾患を除く全疾患”の過剰死亡に起因する平均余命の短縮に関する調査結果を表8に示した。参考のために、同じ対象者( $\geq 2$  Gy)の悪性腫瘍による平均余命の短縮も示した。平均余命の短縮は被爆群と非被爆群の平均余命の差として定義する。非被爆者の平均余命は1985年の日本人の生命表を用いて算出した。2 Gy以上の被爆者(平均3.3 Gy)については、過剰相対リスクが全年齢および男女を通して一定であると仮定した。過剰相対リスクは、“腫瘍および血液疾患を除く全疾患”が0.10、悪性腫瘍が1.29であった。<sup>2</sup> “腫瘍および血液疾患を除く全疾患”の0歳の男性の平均余命の短縮は0.4年と算出されたが、悪性腫瘍では3年であった。

表8. 2 Gy以上(平均線量3.3 Gy)に被曝した者の平均余命短縮の推定(年)

| 性別              | 被爆時年齢 |      |      |      |      |      |      |      |
|-----------------|-------|------|------|------|------|------|------|------|
|                 | 0     | 10   | 20   | 30   | 40   | 50   | 60   | 70   |
| 腫瘍および血液疾患を除く全疾患 |       |      |      |      |      |      |      |      |
| 男性              | 0.42  | 0.42 | 0.42 | 0.40 | 0.37 | 0.30 | 0.21 | 0.06 |
| 女性              | 0.32  | 0.31 | 0.31 | 0.30 | 0.28 | 0.25 | 0.18 | 0.05 |
| 悪性腫瘍            |       |      |      |      |      |      |      |      |
| 男性              | 2.91  | 2.90 | 2.87 | 2.79 | 2.55 | 1.92 | 1.03 | 0.17 |
| 女性              | 2.17  | 2.16 | 2.12 | 1.99 | 1.71 | 1.27 | 0.68 | 0.12 |

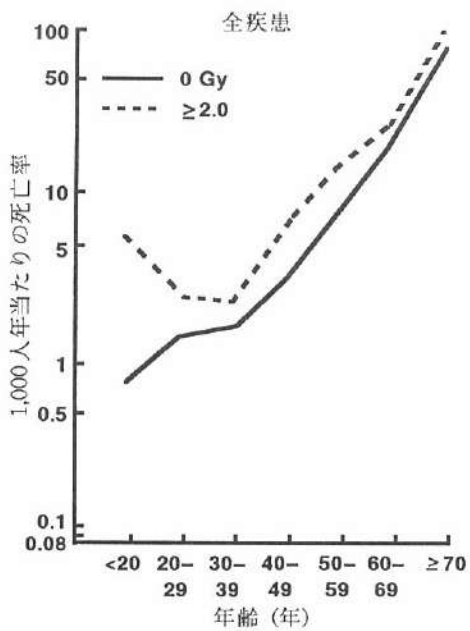
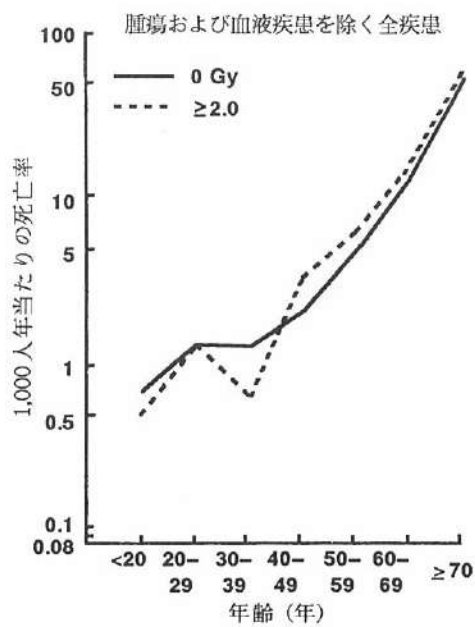
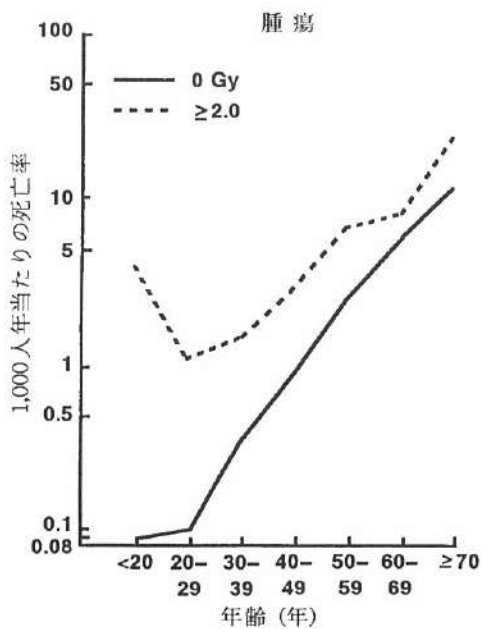


図4. 全疾患, 腫瘍, 腫瘍および血液疾患を除く全疾患の年齢別死亡率, 放射線量別



癌以外の死因による死亡の線量反応は癌による死亡の誤診の結果であるのか

以前述べたとおり、血液疾患について認められた過剰死亡率は、主に死因の誤診によるもの、すなわち白血病症例を誤ってこのカテゴリーに入れたことによるものであった。腫瘍および血液疾患を除く全疾患についても、誤って分類した放射線関連の癌症例を含めることにより、偽の正の線量反応が起こり得る。(a) 実際に癌以外の死因による死亡には放射線に誘発された過剰はないが、(b) 過剰癌リスクが線量に伴い増加するにつれて誤診の癌症例数も増加した、と仮定した場合に期待される死亡率と、癌以外の死因による死亡率の観察相対リスクを比較し、この可能性を調査した。

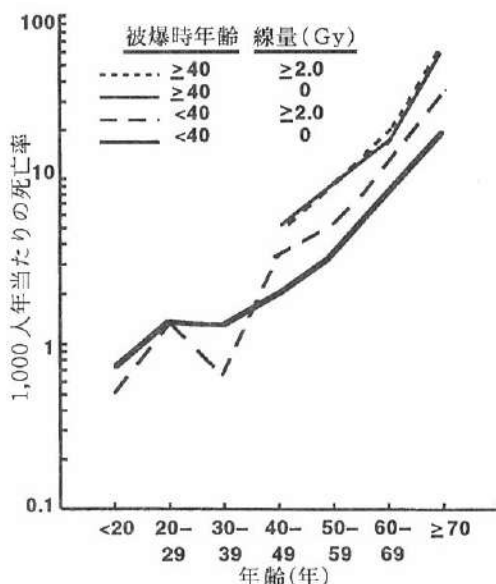


図 5A. 腫瘍および血液疾患を除く全疾患の年齢別死亡率、放射線量および被爆時年齢別

表9に、腫瘍および血液疾患を除く全疾患による死亡のうち剖検で認められた癌の割合を示した。剖検時に癌による死亡であることが判明した癌以外の死因による死亡の割合は合計で10%である。この割合は線量に伴い増加したが統計的には有意でなかった。癌以外の死亡診断書症例のうちの癌の割合が10%(<1 Gy)から18%(≥1 Gy)に増加するのは、≥1 Gy (平均線量は2.1 Gy)の放射線誘発癌の観察相対リスク1.8から期待される増加とほぼ同程度である。これは分類上の誤りの確率は線量に依存しないが、誤りの期待数が癌の相対リスク増加に伴い増加することを示唆している。表10に癌以外の死因による死亡のうち剖検で癌と判明した割合を死因別に示した。その割合は5.5%(脳卒中)から19.8%(肝硬変)に及んでいる。

癌以外の死亡例には放射線に関連する過剰がないと仮定し、次のように癌が誤って癌以外の死因であると診断された場合の、癌以外の死因による死亡の相対リスクを算出した。

$$1 + (\text{癌の過剰相対リスク}) \times (\text{癌以外の死亡例に占める癌の割合})$$

誤診のみに基づく期待相対リスクを算出するために、本シリーズの第2部<sup>2</sup>で報告した全癌症例の相対リスク、すなわち1 Gy, 2 Gy, 3 Gyで各々1.4, 1.8, 2.2という値を用いた。剖検例にも被爆者が含まれていることを考慮に入れて、全剖検例に占める癌の割合9.9%を補



図5B. 腫瘍および血液疾患を除く全疾患の年齢別死亡率, 放射線量, 被爆時年齢, 期間別

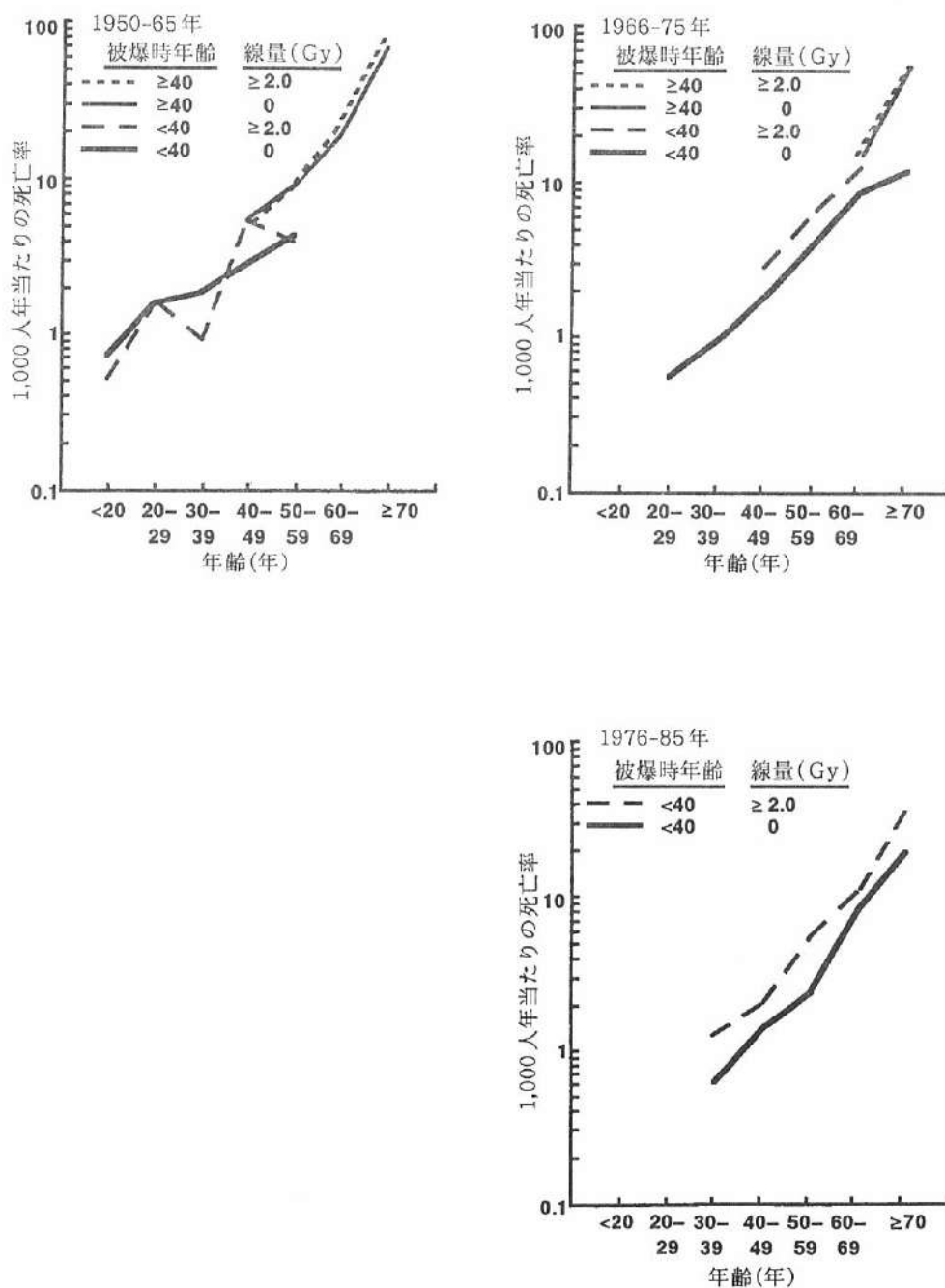


表 9. 癌以外の死亡診断書症例の剖検結果, 腫瘍および血液疾患を除く全疾患

| 放射線量(Gy)  | 死亡数    | 剖検数  | 剖検率(%) | 剖検で発見された癌 |      |
|-----------|--------|------|--------|-----------|------|
|           |        |      |        | 例 数       | %    |
| 合 計       | 20,777 | 2610 | 12.6   | 251       | 9.6  |
| 0         | 9490   | 908  | 9.6    | 102       | 11.2 |
| 0.01-0.99 | 10,507 | 1561 | 14.9   | 124       | 7.9  |
| 1.00-1.99 | 506    | 93   | 18.4   | 19        | 20.4 |
| ≥2.00     | 274    | 48   | 17.5   | 6         | 12.5 |

9.2  
17.7

表 10. 死亡診断書に癌以外の死因によると記載された死亡のうち剖検で癌と診断された者の比率

| 死 因             | 死亡数    | 剖検数  | 剖検で発見された癌 |      |
|-----------------|--------|------|-----------|------|
|                 |        |      | 例 数       | %    |
| 腫瘍および血液疾患を除く全疾患 | 20,777 | 2610 | 251       | 9.6  |
| 循環器疾患           | 11,164 | 1368 | 84        | 6.1  |
| 脳卒中             | 6202   | 798  | 44        | 5.5  |
| 心疾患             | 4962   | 570  | 40        | 7.0  |
| 呼吸器疾患           | 2036   | 244  | 31        | 12.7 |
| 消化器疾患           | 2149   | 308  | 59        | 19.2 |
| 肝硬変             | 697    | 121  | 24        | 19.8 |

注：感染症およびその他の疾患のデータは挙げていない。

表 11. 癌以外の死亡に過剰がないと仮定した場合の放射線誘発癌の誤診のみに基づく癌以外の死因による死亡の相対リスク

| 死 因             | 相対リスク       |             |             |
|-----------------|-------------|-------------|-------------|
|                 | 1 Gy        | 2 Gy        | 3 Gy        |
| 腫瘍および血液疾患を除く全疾患 | 1.04 (1.04) | 1.07 (1.17) | 1.11 (1.38) |
| 循環器疾患           | 1.02 (1.05) | 1.05 (1.21) | 1.07 (1.46) |
| 脳卒中             | 1.02        | 1.04        | 1.07        |
| 心疾患             | 1.03        | 1.05        | 1.08        |
| 消化器疾患           | 1.07 (1.09) | 1.14 (1.38) | 1.22 (1.86) |
| 肝硬変             | 1.07        | 1.15        | 1.22        |

括弧内は付表 10 および 11 のモデル 5-4 に基づく癌以外の死因による死亡率の推定相対リスク, 被爆時年齢 40 歳未満, 1966-85 年。付表 10, 11 のモデル 5-4 は次のとおりである。

$$RR = 1 + \alpha_{1j} \cdot d \cdot I(T \leq 1965) + \alpha_{2j} \cdot d^2 + \alpha_{3j} \cdot d^2 \cdot I(T \leq 1965)$$

ただし,  $j$  は被爆時年齢カテゴリーで,  $d$  の単位はグレイ。  $I(T \leq 1965)$  は, 1950-65 年では 1, 1966-85 年では 0。

正した(1.067で割った)。 $[\text{剖検例の分布は } 0 \text{ Gy, } 0.01\text{--}0.99 \text{ Gy, } \geq 1 \text{ Gy で } 0.5, 0.45, 0.05. \text{ これらの線量区分の平均線量は } 0, 0.15, 2.1 \text{ Gy であり, 線形線量反応に基づく癌の相対リスクは } 1.0, 1.06, 1.8 \text{ である。したがって, } (0.5 \times 1) + (0.45 \times 1.06) + (0.05 \times 1.8) = 1.067 \text{ となる。}]$

表11に、癌の誤診による癌以外の症例の相対リスクおよび癌以外の観察相対リスクを示した。期待されるとおり、肝硬変など癌の割合が高い疾患では誤診による相対リスクが高い。しかし、2 Gy または 3 Gy では、観察相対リスクは推定値を上回っている。したがって、高線量で観察された有意な過剰死亡率は、癌の誤った分類のみに基づくものではない。

## 考 察

癌以外の様々な死因の増加によって放射線が寿命を短縮するという仮説を調べることは重要である。改訂 T65 線量推定方式に基づく以前の解析では、<sup>3</sup> 生命表法を用いて算出された腫瘍を除く全死因による累積死亡率は、概して線量に伴い増加しなかった。また、個々の疾患カテゴリーの解析でもそのような影響は示されなかった。しかし、癌以外の死因による死亡率への放射線関連影響の唯一の証拠は、最も高い T65DR 線量群、すなわち  $\geq 4 \text{ Gy}$  群に認められた。<sup>3</sup> 集団全体にも、また三つの組み合わせ群(広島、女性、被爆時年齢 35–49 歳群)にも有意な増加が認められた。

以前の解析から更に7年間の追跡調査を加味し、新しい線量推定方式を用いることにより、2 Gy 以上の線量で癌以外の死因による死亡リスクの過剰を示す強力な証拠を得た。血液疾患について観察された過剰死亡率は、主にこの疾患に白血病症例を誤って含めたことによる死因の誤診に起因することが、以前の寿命調査集団の解析で指摘された。<sup>3,9</sup> 本解析でも、“血液疾患”による死亡を1950–82年の白血病登録と比較すると、同じ所見が得られた(付表12)。したがって、本解析では癌以外の死因による死亡から血液疾患を除外した。“腫瘍および血液疾患を除く全疾患”の死亡率は1950–85年の全期間で線量に伴い有意な増加を示した(表2)。しかし、この増加傾向は線形ではなく線形-閾値型である。更に、線量反応は追跡期間と被爆時年齢によって異なる。初期では、L項は有意に負で、Q項は有意に正であるLQモデルに従う。しかし後期では、線形-閾値型の線量反応の方がデータによく当てはまる。最近の増加は若年被爆群(< 40 歳)に起因すると思われる(図2)。特定の疾患(循環器疾患、呼吸器疾患、消化器疾患など)について解析を行うと、これらの疾患の線量反応は概して“腫瘍および血液疾患を除く全疾患”と同じ傾向を示している(図3)。

本解析は寿命調査集団のうち T65DR 線量が推定されている 91,000 人の 83 % に基づいている。しかし、最近更に約 12,000 人についても DS86 線量が推定されており、現在では

集団の95%について新線量が利用可能である。このより大きな集団についての予備的解析も本結果に変更をもたらすに至らなかった。しかし、若年被爆者の多くは死亡率が通常かなり上昇する年齢には達していないので、癌以外の死因による死亡率に関する最近の増加が現実のものであるかについては、更に調査を重ねなければ明確な結論は出せない。

癌誘発への放射線の影響(確率的現象と考えられる)と癌以外の死因による死亡率への影響は異なっており、後者が閾値線量をもつ非確率的過程に従うと仮定するのは理由のないことではない。しかし、粥状斑における変異遺伝子の存在が最近立証されたことを考えると<sup>10</sup> 心臓血管疾患の増加は特に興味ある所見であり、このことは、関連が実際にあるとすれば、アテローム硬化症への電離放射線の影響が確率的現象として扱われるべきであることを示唆している。この点について更にデータが得られれば特に興味深い。

腫瘍および血液疾患を除く全疾患に起因する死亡に関する観察結果をGompertz曲線(対数尺度での死亡年齢別死亡率)として示すと、特に被爆時年齢<40歳群について $\geq 2$  Gy群に有意な増加が認められる(図5Aおよび図5B)。

癌および癌以外の疾患の両方について、平均余命の短縮を計算した。算出した0歳の平均余命の短縮は平均すると、癌以外の疾患による短縮が0.4年、癌による短縮が3年であった。自然死亡率は癌以外の疾患の場合が高いが(3~4倍)、癌による平均余命短縮が大きいことは過剰相対リスクが明らかに大きい(7倍)ことと、癌以外の死因による死亡に比べ、癌の死亡が早期に起こることを反映している。本解析では、1985年の日本人生命表の定常人口と1985年の癌および癌以外の死因による死亡率を用いた。全対象者が死亡した後にのみ得られる寿命調査集団の推定値は、我々の推定値に近いものになるであろうが全く同じではない。2.0 Gy以上(平均3.3 Gy)について癌以外の死因による寿命短縮と比較するために致死癌による寿命短縮を推定した。閾値線量は1.4 Gyと推定されたので、1 Gyでの寿命短縮は癌以外の死因による死亡で0年であったが、癌による死亡では0.9年であった。この後者の値はUNSCEAR報告で推定されている範囲内にある。<sup>11</sup> しかし、放射線関連疾患による推定寿命短縮は対象集団の年齢構成と死亡率に伴い大きく変化すると考えられる。したがって、我々が算出した推定寿命短縮は恐らく日本人のみに当てはまる有益な指標に過ぎないと見なすべきであろう。

#### 癌以外の疾患の死亡率への線量影響を誤って起こし得る要因

我々がこれまで述べてきた所見は、死亡診断書に基づくものなので限界があり、放射線以外の数多くの因子も癌以外の死因による死亡の見かけ上の増加に寄与し得る。恐らくもっとも重要なのは、放射線関連の癌死亡を誤って他の死因とすることであろう。癌以外の疾患

による死亡率が、観察相対リスクを増加させるといった誤った影響を調べるために、剖検および腫瘍登録データならびに成人健康調査から得られた臨床データの誤分類に関する情報を利用した。

結果の項で剖検資料について述べた。他の報告としては、癌以外の死因による死亡率の観察線量反応が癌死亡の分類の誤りのみによるものであるか否かを究明するため、Spostoら<sup>12</sup>が同じデータを使用して行った統計解析について述べている。彼らも、癌以外の死因による死亡率の非線形線量反応が、単純に誤って癌を癌以外の死因に分類したことのみによっては説明できないと結論づけている。実際、彼らは、“癌以外の死亡率の線量反応の有意性は、癌を誤って分類した比率の過小評価には比較的影響されにくい、癌の分類の誤りが線量と正の関係をもつと仮定することには影響される”という結論を出している。しかし、このためには死因を確認する医師が線量を知る必要があるし、ほとんどの場合、被爆者は自分の実際の線量を知らない、我々と同様に彼らも分類の誤りが線量と正の相関関係をもつとは考えられないとしている。

広島と長崎には腫瘍登録があるので、この誤診に関する情報源として1958年(登録開始の年)から1985年までの腫瘍登録データも調べた。“腫瘍および血液疾患を除く全疾患”に含まれる癌の割合は、剖検データに基づくよりも低かった(付表17A, 17B)。したがって、放射線によって癌以外の死因による死亡に過剰は起こらないが、癌の過剰リスクが線量に伴い増加するにつれて誤診された癌症例数も増すと仮定し、癌以外の死因による死亡の相対リスクを腫瘍登録データを用いて算出すると、リスクは剖検から得たものより低くなる。

死亡診断書の正確性、線量推定方式の変更、死亡場所、およびその他の交絡因子など、他の問題については、付録で詳細に述べる。要約すると、これらの要因はいずれも、少なくとも単独では、癌以外の死因による死亡について観察された過剰の説明にはならない。死亡診断書を剖検または臨床的所見と比較すると、疾患の診断の正確度がかなり高いことがわかる。剖検所見については、主な死因だけでなく関連死因を考慮に入れると、老衰、腎炎、ネフローゼ、結核以外のその他の感染症など、剖検での確認が困難であるかまたは不可能な(老衰など)診断を除いた場合、確診率は69%(冠状動脈性心疾患)から86%(脳卒中)の範囲にあった(付表13)。これらを除外した疾患は、老衰以外は、死因全体に占める割合が小さいことに留意すべきである。

2 Gy以上に被曝した成人健康調査対象者の死亡について、死亡診断書に記載された死因を2年に1回行われる検診の臨床的診断と比較すると、確診率は全死因については83%で、個々の死因についても高かった(付表14)。これらの所見は診断の正確さを示しているとい

うものの、診断の不確定要素のすべてを解明しないことは明らかである。そのことは、特に、突然に起こった病死(外因死でない死亡)について言える。

#### 他の調査

これらの所見と比較できる他の調査は少ない。しかし、放射線治療を受けた強直性脊椎炎患者の追跡調査では、<sup>13</sup> 腫瘍以外の疾患の死亡が51%増加したことが示唆されている。脊椎炎との関連が臨床的に認められた疾患だけが低い死亡率を示すのではなく、他の疾患群の死亡率も前者ほどではないがすべて高いことが認められている。しかし、その報告<sup>13</sup>では、放射線を照射しなかった患者にも同様の過剰が認められているので、<sup>14</sup> この過剰はX線治療よりむしろ疾患そのものと関連があるらしいと結論づけている。しかし、放射線を照射しなかった患者の過剰は男性のみに限られ、女性では、X線治療を受けた患者の過剰が多く、放射線照射をしなかった患者では過剰は認められなかった。このことは、強直性脊椎炎に関連がない腫瘍以外の疾患による死亡率と放射線治療との間に関係があることを示唆している。米国の放射線医<sup>15</sup>とその他の専門医とを比較した場合、癌だけでなく心臓血管疾患および他の腫瘍以外の疾患による死亡率も高いことが報告されている。しかし、英国の放射線医<sup>16</sup>については、癌以外の死因による死亡率増加は認められていない。

1958年から1974年までの期間に行われた放影研の成人健康調査対象者の脳卒中および冠状動脈性心疾患発生率に関する初期の調査<sup>17</sup>は、我々が心臓疾患について述べてきた所見を裏付けている。その調査は、心電図および剖検を含む臨床的所見を用いて特定の診断基準に従って確認した症例について行われ、常に成人健康調査検診時に行われた臨床診断のみに依存するものではない。その調査では、高線量、すなわち2.0 Gy以上のT65線量を受けた広島女性の発生率が有意に高いことが示されたが、長崎の女性および両市の男性には被曝の影響が認められなかった。広島で高線量に被曝した女性の剖検率が高いという証拠がいくらかあるため、喫煙、血清コレステロール値の上昇、高血圧症の発生など、主な心臓血管リスク因子のいずれとの交絡によってもこれが説明できないにもかかわらず、この関連が真のものであるとは一般に考えられていない。この調査はそれ以後も継続され1958年(成人健康調査開始の年)から1986年までの期間を含むようになった。新しい結果<sup>18</sup>は、広島で高線量に被曝した女性で初期にリスクが増加したことを確認するものであるが、現在では長崎の男性でもリスクの有意な増加が認められている。臨床診断に基づく肝硬変の期間有病率が高線量群の成人健康調査対象者で増加しているらしいことも興味深い。<sup>19</sup> これらの所見は、かなり小さい集団に基づくが、寿命調査集団全体の死亡率に関する観察結果と一致している。

## Stewart および Kneale の論議に対するコメント

Stewart および Kneale<sup>20,21</sup> は最近の二つの報告で、放射線影響研究所が調査している被爆者の寿命調査に偏りがあるかもしれないことを示唆している。つまり、寿命調査集団が1950年に設定されたが、追跡調査を開始する以前、すなわち1945-50年の間にすでに死亡した者がいることから、放射線の影響に対して抵抗力のある者が選択されたかもしれないという考えに基づいている。T65線量に基づく彼らの解析では、心臓血管疾患には放射線の線量反応は認められなかった。しかし、心臓血管疾患以外の腫瘍を除く全疾患という広いカテゴリーでは死亡率にU字型線量反応が認められた。彼らはまた、低線量域での負の下降傾向は初期において、より顕著で、時間の経過に伴い減少すること、そして、恐らく骨髄障害に起因する高線量での上昇傾向は比較的、時期による変動が少なかったことも認めている。彼らの主張によると、このことは、初期に生き延びたこと、または淘汰の影響が原爆被爆者の癌リスクの過小評価につながるという彼らの考えと一貫している。

Stewart および Kneale は“腫瘍および心臓血管疾患を除く全疾患”を“感染症”と呼んでいるが、このカテゴリーは免疫能力とは関係ないと思われる多くの疾患を含むので、このカテゴリーを特徴づけることは難しいことに留意すべきである。しかし、ICD分類の“感染症”は“結核”および“その他の感染症”のみからなっている。我々はこれらの疾患では有意な線量反応を見ることはできなかった。寿命調査集団の死亡に関する初期の解析<sup>3</sup>では特に結核が取り上げられたことにも留意すべきである。その報告では、1940年代後半の人口調査データが解析され、線量と感染症による死亡との間に関係は認められなかった。

原爆被爆者のデータに偏りがあるというStewartおよびKnealeの主張にかんがみ、1950-85年の死亡率に関する観察結果と新線量を用いて彼らの仮説をより詳細に調べた。我々は疾患を更に細かく分け、データを三つの期間、すなわち1950-65年、1966-75年、および1976-85年に分けた。結果を以下に要約する。

(1) 特に若年被爆群で最近の期間における循環器系の疾患(心臓血管疾患)による死亡率は線量に伴い有意に増加する。脳卒中および脳卒中以外の循環器疾患(すなわち心疾患)の死亡率は両者とも最後の期間で有意な増加傾向を示す。この所見は心臓血管疾患による死亡率の過剰はないとする彼らの所見とは一致しない。

(2) 腫瘍、心臓血管疾患および血液疾患を除く全疾患による死亡率は(血液疾患は死亡診断書に基づく場合の誤診率が高いため除外)、全期間ではU字型線量反応関係を示唆しており、Stewart および Kneale の観察どおり初期において明らかに有意である。しかしこの傾向は1950-65年の期間、被爆時年齢が40歳以上のものについてのみ認められた。この疾患



カテゴリーを更に分類すると、同様の有意なU字型線量反応は、大部分が老衰に分類される“その他”の疾患についてのみ認められることがわかる。老衰による死亡は医学的にあまり理解されておらず、また定義が困難な状態であるが、彼らの仮説が示唆するように免疫能力または骨髄障害に関係するとは思われない。ついでながら、循環器疾患については、初期の被爆時年齢が40歳以上の群についてもU字型線量反応が認められた。この所見は淘汰の影響が特に感染症については重要であり、循環器疾患については淘汰の影響を裏付ける証拠がないとするStewartおよびKnealeの主張とは一致しない。

(3)したがって、重要な問題は、この淘汰の影響が癌のリスクの解釈に大きな役割を果たすか否かである。癌以外の死因による死亡率は、初期のみに低くなっているため、癌死亡率に及ぼす影響はこの時期に限られていると思われる。疫学調査では一般的に、追跡調査の数年後には癌死亡率への“healthy worker effect (健康な人が対象として選択されたことによる効果)”は認められていない。<sup>22-24</sup> 放射線誘発癌(白血病を除く)は主に後期で認められるので、“healthy worker effect”はこの場合は当てはまらない。ちなみに、被爆時年齢40歳以上で、観察期間1965年以前に観察された淘汰の影響を補正した場合の白血病および白血病以外の癌の生涯リスクを算出した。補正しない場合に比べて、リスクは白血病で7%、白血病以外の癌で5%のみ上昇した。<sup>25</sup> LittleおよびCharles<sup>26</sup>も最近、公表されたデータを用いて原爆被爆者の淘汰に基づく偏りを解析している。彼らも、このような淘汰が、放射線誘発癌の感受性低下を導くことを示唆する証拠はないと結論づけている。

強直性脊椎炎患者および子宮頸癌の女性と寿命調査対象者の癌リスクを比べた最近のUNSCEAR報告<sup>11</sup>によると、寿命調査のリスクと医用X線データから得たリスクはかなり一致している。実際、寿命調査対象者のリスクは他のリスクに比べ概して高く、これはStewartおよびKnealeの主張と一致しない。

## 謝 辞

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## 付録. 癌以外の死亡率の線量影響を誤って起こし得る要因に関する詳細な検討

### 死亡診断書に記載された原死因の正確性

本解析ではやむを得ず、死亡診断書に記載された原死因を無条件で受け入れてきた。しかし、診断書の死因の多くは不正確であり、それにより真の放射線の影響が不明確になったり、偽の影響を生み出す可能性があることに注意しなければならない。更に、これらの不正確性が本調査に限られたものではないことにも留意すべきである。死亡診断書を疫学調査に使用する場合には、多かれ少なかれ必ずこの問題が起きる。

本解析における死因の不正確性の程度を検討するために、寿命調査集団で1950-85年にABCC-放影研で剖検が行われた全死亡例について、剖検時の所見と死亡診断書の記述を比較した。<sup>27</sup> 付表13に、この比較で明らかになった確認率および発見率を示した。これらの率は概して、死因が癌である場合よりも低いことが分かる。<sup>28</sup> しかし、主な死因だけでなく関連死因も考慮に入れた場合、死亡診断書の診断の正確性はかなり高い。正確性を評価する際に主な死因と関連死因をすべて考慮に入れた主な理由は、幾つかの死因が存在する場合に主な死因の選択が病理医間で異なることである。これらの記載死因の不正確性は個々の死因によって信頼性がかなり異なるであろうことを示唆している。しかし、正確性が線量に関連せず、関連の証拠もない場合には、報告された所見はおおむね真実を表していると思われる。

2 Gy以上の線量に被曝した成人健康調査対象者について、成人健康調査検診時の臨床診断と死因とを比較した。結果を付表14に示した。突然起こる疾患、すなわち脳卒中または心臓発作(冠状動脈性心疾患)については、成人健康調査では最後の検診時に症状がなくその後そのような疾患が起きたということは十分考えられる。同様に、最終検診から死亡までの期間が10年のようにかなり長ければ、最後の成人健康調査の検診で発見された疾患と死因には関係がないかもしれない。したがって、これらの死亡は“決定不能”として分類し、合計59の死亡例を以下の観察から除外した。“決定不能”の症例の死因は、ほとんどは脳卒中と心疾患であった。その他の死亡については、死因が成人健康調査のいずれかの周期のICD疾病分類による臨床診断と直接または“間接的(死因の原因となる疾患)”に一致すれば、死因は臨床診断により“確認された”と見なされた。このようにして決定された確認率は全死因について83%であり、個々の死因についても高かった。

肝硬変についても、利用可能な全情報、<sup>29</sup> すなわち剖検時の所見、臨床診断、肝機能検査やB型肝炎抗原をはじめとする臨床検査所見、肝硬変の既往歴と飲酒歴に関する疫学調査の情報を用いて、広島で検診を受けた成人健康調査対象者全員について死亡診断書との比較を行った。結果を付表15に示したが、情報源が二つ以上ある場合には、前述の情報源の順に優先させた。死亡診断書で死因が肝硬変となっていた77例のうち剖検時の所見または成人健康調

査の診断で確認された症例数は  $19 + 18 = 37$  (48.1%) 例である。情報源を疫学調査による既往歴などの不確実なものにまで拡大すると、確認症例は合計 57 ( $57/77 = 74.0\%$ ) になる。付表 15 の B に示すように、合計 23 例の剖検例のうち、主な病理学的診断によって確認された症例数は  $16$  ( $16/23 = 69.6\%$ ) である。

### 癌死亡の誤診

癌以外の疾患による死亡の過剰は、その一部に誤って分類した放射線関連癌が含まれていることによるのかもしれない。この可能性を調査するために、剖検所見と広島・長崎の腫瘍登録にある癌症例と死亡診断書に記載された原死因とを比較した。

剖検データ：組織的な剖検調査は 1961 年に ABCC で開始され、初期では剖検率は比較的高く 30~40% であったが、時とともに減少し、1975 年の死亡のうち剖検されたのは 20% 未満であった。その時点で組織的な剖検調査は中止された。1966-85 年では剖検率は極めて低く約 10~20% で、若年被爆者では特に低かった。我々の目的にとっては残念なことであるが、“腫瘍および血液疾患を除く全疾患” による有意な過剰死亡率が現れたのはこの期間である。したがって、最近の剖検データは、それ自体は貴重であるが、他の死因による死亡の見かけの増加に、癌症例の誤診がいかなる役割を果たすかを調べるには限られた情報しか提供しない。しかし、利用可能なデータを用いて、その期間(1966-85 年)における若年被爆群(40 歳未満)の線量反応関係への誤診の影響について検討を試みた。付表 16A の下段に示した値を用いて、 $\geq 2$  Gy 群の過剰死亡  $67 - 42.9 = 24.1$  のうち、癌症例の誤診の可能性がある例数は  $67 \times 1/10$  ( $1/10$  はこの死因による全死亡例のうち観察癌症例が占める割合を示す)  $= 6.7$  となる。したがって、このカテゴリーの死亡過剰のすべてを誤診した癌症例を含めたことによって説明できない。全被爆時年齢および全期間合計について観察を行うと、同様な結果が得られたが、影響の統計的有意性は低かった(付表 16A)。

心疾患については(付表 16B)、 $\geq 1$  Gy 群の計 44 例の死亡に誤って含まれている癌死亡の推定例数は  $44 \times 1/10$  ( $1/10$  はこの線量群の心疾患による全死亡のうち観察された癌症例の割合を示す)  $= 4.4$  である。 $\geq 1$  Gy 群の過剰死亡例数は 7.9 ( $44 - 36.1$ ) であるので、この過剰のすべてを癌症例を誤って含めたことによって説明できない。この 4.4 という推定値は  $\geq 1$  Gy 群のすべての癌が放射線に関係すると仮定して得られたものであるが、実際には多くても 40% しか放射線に起因しないことに留意すべきである。

肝硬変については(付表 16C)、 $\geq 1$  Gy 群の過剰死亡  $20 - 12.5 = 7.5$  のうち、誤って肝硬変とされた癌死亡例数は最大  $20 \times 1/2$  ( $1/2$  は肝硬変による死亡例のうち観察された癌症例の実際の割合である)  $= 10$  である。最悪の場合には、すなわちこの死因による死亡中の

癌症例がすべて放射線に関連すると仮定した場合は、線量反応は消失することになる。

同様に、循環器疾患(心疾患を含む)、冠状動脈性心疾患、脳卒中についても解析を行い付表 16D-F に示した。

腫瘍登録データ：付表 17A は、様々な線量群について腫瘍登録に報告された癌の症例数および割合を示す。“腫瘍および血液疾患を除く全疾患”による有意な過剰死亡率は 1965 年以降に若年被爆群(<40 歳)に認められるので、腫瘍登録に報告されたこの群の癌の割合も示した。癌の割合は平均で 4.3%であり、高線量群で高い。0 Gy 群に比べ、 $\geq 2$  Gy 群の癌の割合は約 2 倍である。この値は $\geq 2$  Gy 群の癌の相対リスクに近い。1966-85 年に被爆時年齢 40 歳未満群に見られる癌の割合は全期間・全年齢群での割合とほとんど同じである。しかし、高線量で割合が高くなる傾向は、この期間のこの年齢群ではあまり明らかではない。これらの割合は剖検で観察された値よりも低いので(表 9)、放射線誘発癌の誤診のみに基づく癌以外の疾患の相対リスクを腫瘍登録データを用いて算出しても、剖検について得られた値より低くなる(表 11)。

臨床データ：同様に、検診時の臨床診断に基づく癌に関する情報からは(大部分は当然腫瘍登録データと重複する)、 $\geq 2.0$  Gy に被曝した死亡者 133 人中、12 例の癌症例(9.0%)が見いだされた。

#### 死亡場所

我々は死亡場所、すなわち死亡が家と病院のいずれで起きたかに関係する偏りの可能性も調べた。

付表 18A に示すように、病院での死亡の割合は、放射線量、死亡年、被爆時年齢、死因によって異なる。病院での死亡が比較的多いのは、高線量群( $\geq 2.0$  Gy)、最近の期間(1976-85年)、若年被爆群(<40)、悪性腫瘍の場合である。

高線量群で(0 Gy 群に比べて)病院での死亡の割合が大きいことを反映して、特定の死因についても、また癌を除く全死亡合計でも、“家での死亡”より“病院での死亡”の 1 Gy での推定相対リスクが高い。同様の傾向がそれほど有意でないが白血病を除く全癌についても認められる(付表 18B)。

付表 18C に示すように、特定の疾患については、確診率と発見率を用いて示した死亡診断書の死因の正確性は死亡場所によって異なる。

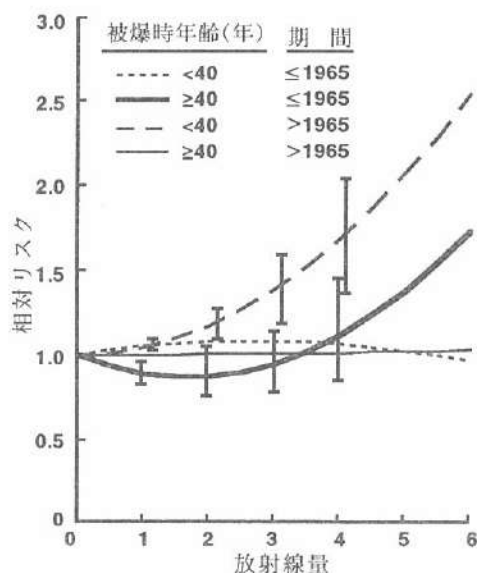
上記のように死亡場所は放射線量と交絡しているので、付表18Cに示すように死亡診断書の診断の正確性に関する補正率(発見率に対する確診率の割合)を用いて死亡場所について補正を行うことにより、線量反応にいかなる影響が及ぶかを検討することは有益である。このような補正に利用できるデータは特定の疾患に限られているので、心疾患および肝硬変による死亡についてのみ補正を行った。 $\geq 2$  Gy 群の心疾患および肝硬変の相対リスク(全期間、全被爆時年齢群)1.34, 1.66は、補正後はそれぞれ1.26, 1.60になった(付表18D)。このように、要約すると、心疾患および肝硬変の両方について補正後も過剰相対リスクが認められる。

#### 一般的ナリスク要因

例えば喫煙と心臓血管疾患の関連や飲酒と肝硬変の死亡率の関連など、癌以外の死因による死亡率が放射線以外の要因と関係していることはよく知られている。したがって、低線量群に比べ高線量群でこれらのリスク要因をもつ対象者の割合が大きいならば、偽の放射線の影響が起り得る。これまでのところ、放射線量と喫煙または飲酒との間に正の相関は本集団では認められていない。<sup>17,30</sup> しかし、他の交絡因子の調査および放射線と他のリスク要因との交互作用に関する調査を更に進めることは明らかに必要である。

#### DS86 副次群

本解析は T65DR 線量をもつ寿命調査対象者91,000人の83%(DS86副次群)に基づいている。本解析がDS86副次群に限られているという事実が、本報で観察した過剰死亡率の理由の一つになっている可能性がある。しかし、最近更に12,000人のDS86線量が推定されたので、現在では集団の95%についてDS86線量が利用できる。この大きな集団の相対リスクはDS86副次群の値と差異がない。



付録図1. 腫瘍および血液疾患を除く全疾患の推定線量反応曲線。縦線は相対リスクの90%信頼区間を示す。

付表 1. 死因別死亡数

| 死 因              | 死亡数    | ICD 第9回改訂            |
|------------------|--------|----------------------|
| 腫瘍を除く全疾患         | 20,923 |                      |
| 感染症              | 1413   | 001-139              |
| 結核               | 1151   | 010-018              |
| その他の感染症          | 262    | (001-139)-(010-018)  |
| 血液疾患             | 146    | 280-289              |
| 循環器疾患            | 11,164 | 390-459              |
| 脳卒中              | 6202   | 430-438              |
| 心疾患(脳卒中を除く循環器疾患) | 4962   | 390-429 440-459      |
| リウマチ性心疾患         | 180    | 390-398              |
| 高血圧性心疾患          | 626    | 401-405              |
| その他の高血圧性心疾患      | 337    | 401, 403, 405        |
| 冠動脈性心疾患          | 1765   | 410-414              |
| 心内膜炎             | 297    | 424                  |
| 心不全              | 1095   | 428                  |
| その他の心疾患          | 385    | 415-423 425-427, 429 |
| その他の循環器疾患        | 277    | 440-458              |
| 呼吸器疾患            | 2036   | 460-519              |
| 急性気管支炎           | 57     | 446.0                |
| 肺炎               | 1233   | 480-486              |
| インフルエンザ          | 44     | 487                  |
| 慢性気管支炎           | 191    | 490, 491             |
| 気腫               | 108    | 492                  |
| 喘息               | 329    | 493                  |
| その他              | 74     |                      |
| 消化器疾患            | 2149   | 520-579              |
| 消化性潰瘍            | 392    | 531-533              |
| 虫垂炎              | 27     | 540-543              |

つづく

付表 1. つづき

| 死 因           | 死亡数    | ICD 第 9 回改訂             |
|---------------|--------|-------------------------|
| 腸閉塞           | 137    | 550-553, 560            |
| 胃炎            | 290    | 535, 555, 556, 558, 562 |
| 肝硬変           | 697    | 571                     |
| その他の肝疾患       | 168    | 570, 572, 573           |
| その他           | 438    |                         |
| 泌尿器疾患         | 513    | 580-599                 |
| 急性腎炎, ネフローゼ   | 107    | 580, 581, 584           |
| その他の泌尿器疾患     | 406    | 582, 583, 585-589       |
| その他           | 3502   | The rest                |
| 老衰            | 1565   | 797                     |
| その他           | 1937   |                         |
| 腫瘍            | 6224   |                         |
| 悪性腫瘍          | 5936   | 140-208                 |
| 良性および性質不詳の新生物 | 288    | 210-239                 |
| 外因死           | 1515   | E800-E999               |
| 事故            | 932    | E800-E949               |
| 自殺            | 527    | E950-E959               |
| 殺人            | 34     | E960-E969               |
| その他の外因死       | 22     | E970-E999               |
| 死因不明          | 75     |                         |
| 合計(全死因)       | 28,737 |                         |



付表 2A. 観察人年, 男女合計

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |        |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|--------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0      | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 2185336      | 984271 | 553960      | 119991      | 149669      | 186322      | 102709      | 55261         | 18311         | 5923          | 6919   |
|         | 0-9   | 549016       | 238281 | 160917      | 30765       | 38031       | 44878       | 19879       | 10577         | 3405          | 1090          | 1193   |
|         | 10-19 | 497893       | 243257 | 111655      | 25888       | 28791       | 39838       | 24623       | 13561         | 5634          | 2278          | 2269   |
|         | 20-29 | 320042       | 140542 | 80740       | 17483       | 22346       | 27326       | 16660       | 9611          | 3317          | 912           | 1104   |
|         | 30-39 | 335011       | 145483 | 84791       | 19039       | 24128       | 32187       | 16248       | 8827          | 2569          | 722           | 1017   |
|         | 40-49 | 298752       | 133394 | 69923       | 16287       | 23522       | 27095       | 16207       | 8310          | 2444          | 681           | 889    |
|         | ≥ 50  | 184622       | 83313  | 45935       | 10430       | 12850       | 16998       | 9092        | 4374          | 942           | 241           | 447    |
| 1950-55 | 合 計   | 388882       | 175299 | 98148       | 21183       | 26618       | 33632       | 18496       | 9977          | 3272          | 1056          | 1302   |
|         | 0-9   | 83250        | 36166  | 24322       | 4654        | 5767        | 8799        | 3020        | 1621          | 544           | 166           | 191    |
|         | 10-19 | 77233        | 37759  | 17298       | 3995        | 4430        | 6177        | 3839        | 2140          | 876           | 361           | 357    |
|         | 20-29 | 50694        | 22217  | 12778       | 2745        | 3526        | 4385        | 2619        | 1575          | 541           | 148           | 180    |
|         | 30-39 | 56681        | 24529  | 14432       | 3213        | 4074        | 5323        | 2810        | 1484          | 474           | 142           | 199    |
|         | 40-49 | 60585        | 27039  | 14168       | 3291        | 4679        | 5542        | 3267        | 1729          | 522           | 139           | 210    |
|         | ≥ 50  | 60540        | 27588  | 15149       | 3287        | 4143        | 5426        | 2941        | 1427          | 315           | 98            | 165    |
| 1956-60 | 合 計   | 350755       | 157785 | 88486       | 19247       | 24093       | 30355       | 16719       | 9028          | 2959          | 936           | 1146   |
|         | 0-9   | 78817        | 34252  | 23050       | 4414        | 5452        | 6428        | 2861        | 1529          | 507           | 155           | 170    |
|         | 10-19 | 72486        | 35350  | 16246       | 3783        | 4178        | 5807        | 3600        | 2001          | 825           | 335           | 340    |
|         | 20-29 | 47424        | 20780  | 11958       | 2586        | 3301        | 4070        | 2463        | 1461          | 500           | 140           | 165    |
|         | 30-39 | 52582        | 22765  | 13364       | 2999        | 3801        | 4959        | 2594        | 1380          | 426           | 122           | 172    |
|         | 40-49 | 54101        | 24124  | 12659       | 2910        | 4204        | 4926        | 2956        | 1551          | 460           | 125           | 188    |
|         | ≥ 50  | 45384        | 20514  | 11209       | 2556        | 3158        | 4165        | 2245        | 1106          | 241           | 60            | 110    |
| 1961-65 | 合 計   | 330790       | 148816 | 83501       | 18175       | 22744       | 28599       | 15730       | 8487          | 2791          | 877           | 1070   |
|         | 0-9   | 78348        | 34025  | 22943       | 4395        | 5428        | 6399        | 2838        | 1514          | 482           | 155           | 170    |
|         | 10-19 | 71620        | 34936  | 16082       | 3742        | 4146        | 5720        | 3545        | 1961          | 816           | 330           | 340    |
|         | 20-29 | 46653        | 20468  | 11733       | 2551        | 3261        | 3991        | 2428        | 1431          | 493           | 131           | 165    |
|         | 30-39 | 50926        | 22111  | 12897       | 2889        | 3657        | 4844        | 2503        | 1346          | 405           | 110           | 165    |
|         | 40-49 | 49902        | 22292  | 11638       | 2692        | 3925        | 4525        | 2728        | 1405          | 427           | 111           | 159    |
|         | ≥ 50  | 33341        | 14984  | 8208        | 1906        | 2325        | 3120        | 1688        | 830           | 169           | 40            | 71     |
| 1966-70 | 合 計   | 310411       | 139893 | 78383       | 17100       | 21361       | 26694       | 14659       | 7869          | 2619          | 843           | 988    |
|         | 0-9   | 77936        | 33786  | 22866       | 4373        | 5405        | 6371        | 2823        | 1505          | 473           | 155           | 169    |
|         | 10-19 | 70860        | 34612  | 15902       | 3698        | 4093        | 5653        | 3504        | 1924          | 813           | 325           | 338    |
|         | 20-29 | 46780        | 20124  | 11500       | 2507        | 3207        | 3909        | 2385        | 1381          | 476           | 130           | 162    |
|         | 30-39 | 48752        | 21214  | 12258       | 2764        | 3525        | 4673        | 2365        | 1302          | 374           | 106           | 152    |
|         | 40-49 | 44682        | 20007  | 10323       | 2434        | 3584        | 4055        | 2434        | 1243          | 371           | 104           | 128    |
|         | ≥ 50  | 22400        | 10142  | 5535        | 1326        | 1549        | 2033        | 1127        | 514           | 112           | 24            | 40     |
| 1971-75 | 合 計   | 289580       | 130488 | 73458       | 16011       | 19907       | 24820       | 13551       | 7271          | 2431          | 783           | 901    |
|         | 0-9   | 77452        | 33560  | 22757       | 4337        | 5374        | 6339        | 2802        | 1492          | 470           | 155           | 165    |
|         | 10-19 | 69881        | 34155  | 15656       | 3672        | 4040        | 5580        | 3454        | 1890          | 795           | 320           | 319    |
|         | 20-29 | 44709        | 19670  | 11277       | 2437        | 3112        | 3796        | 2344        | 1334          | 458           | 125           | 155    |
|         | 30-39 | 45948        | 19997  | 11564       | 2637        | 3320        | 4439        | 2204        | 1219          | 341           | 93            | 133    |
|         | 40-49 | 38096        | 16979  | 8876        | 2127        | 3082        | 3418        | 2093        | 1040          | 301           | 85            | 96     |
|         | ≥ 50  | 13494        | 6077   | 3327        | 801         | 978         | 1248        | 654         | 296           | 66            | 15            | 32     |
| 1976-80 | 合 計   | 268137       | 120730 | 68598       | 14766       | 18279       | 23046       | 12338       | 6621          | 2219          | 738           | 800    |
|         | 0-9   | 76956        | 33380  | 22593       | 4309        | 5337        | 6295        | 2786        | 1470          | 468           | 154           | 165    |
|         | 10-19 | 68671        | 33596  | 15402       | 3602        | 3987        | 5495        | 3375        | 1844          | 766           | 310           | 295    |
|         | 20-29 | 43284        | 19026  | 10963       | 2376        | 3016        | 3687        | 2252        | 1257          | 440           | 120           | 147    |
|         | 30-39 | 42419        | 18466  | 10702       | 2417        | 3052        | 4168        | 2007        | 1115          | 301           | 82            | 110    |
|         | 40-49 | 30042        | 13333  | 7190        | 1676        | 2378        | 2711        | 1612        | 792           | 215           | 69            | 65     |
|         | ≥ 50  | 6765         | 2929   | 1750        | 386         | 510         | 690         | 306         | 144           | 29            | 3             | 18     |
| 1981-85 | 合 計   | 246681       | 111310 | 63385       | 13508       | 16668       | 21175       | 11216       | 6007          | 2021          | 680           | 712    |
|         | 0-9   | 76256        | 33102  | 22386       | 4284        | 5267        | 6246        | 2750        | 1445          | 462           | 150           | 163    |
|         | 10-19 | 67162        | 32848  | 15068       | 3495        | 3919        | 5405        | 3305        | 1802          | 742           | 297           | 280    |
|         | 20-29 | 41499        | 18259  | 10529       | 2281        | 2924        | 3508        | 2168        | 1171          | 410           | 118           | 130    |
|         | 30-39 | 37702        | 16400  | 9574        | 2120        | 2700        | 3781        | 1745        | 982           | 247           | 66            | 87     |
|         | 40-49 | 21344        | 9621   | 5070        | 1158        | 1669        | 1919        | 1116        | 549           | 149           | 48            | 43     |
|         | ≥ 50  | 2718         | 1080   | 758         | 169         | 188         | 316         | 131         | 57            | 10            | 0             | 10     |

付表 2B. 観察人年, 男性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |        |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|--------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0      | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 834895       | 397381 | 195972      | 46969       | 53983       | 68679       | 36529       | 22583         | 7016          | 2460          | 3323   |
|         | 0-9   | 268107       | 117945 | 77314       | 14903       | 18683       | 21540       | 9614        | 5429          | 1635          | 593           | 450    |
|         | 10-19 | 212966       | 110233 | 43413       | 11721       | 11278       | 16509       | 8943        | 5774          | 2763          | 932           | 1401   |
|         | 20-29 | 65622        | 31847  | 14343       | 3818        | 3985        | 5088        | 3215        | 2230          | 587           | 189           | 320    |
|         | 30-39 | 98454        | 48410  | 20467       | 5880        | 5923        | 9014        | 4654        | 2973          | 622           | 301           | 409    |
|         | 40-49 | 114493       | 54037  | 23524       | 6490        | 8792        | 9994        | 6226        | 3810          | 895           | 218           | 508    |
|         | ≥ 50  | 75253        | 34911  | 16911       | 4357        | 5322        | 6534        | 3877        | 2367          | 513           | 227           | 235    |
| 1950-55 | 合 計   | 154800       | 73692  | 35996       | 8584        | 9988        | 12819       | 6951        | 4328          | 1313          | 468           | 660    |
|         | 0-9   | 40852        | 17999  | 11733       | 2269        | 2833        | 3277        | 1467        | 838           | 272           | 89            | 76     |
|         | 10-19 | 33465        | 17342  | 8838        | 1810        | 1751        | 2569        | 1434        | 915           | 431           | 155           | 221    |
|         | 20-29 | 10848        | 5236   | 2383        | 616         | 670         | 852         | 528         | 388           | 89            | 33            | 53     |
|         | 30-39 | 17858        | 8595   | 3739        | 997         | 1083        | 1573        | 861         | 530           | 124           | 63            | 94     |
|         | 40-49 | 25355        | 11984  | 5209        | 1433        | 1861        | 2260        | 1358        | 855           | 223           | 43            | 121    |
|         | ≥ 50  | 26823        | 12527  | 6096        | 1460        | 1791        | 2289        | 1302        | 803           | 173           | 85            | 97     |
| 1956-60 | 合 計   | 137446       | 65306  | 31971       | 7713        | 8929        | 11341       | 6187        | 3847          | 1173          | 406           | 574    |
|         | 0-9   | 38618        | 17015  | 11102       | 2151        | 2681        | 3096        | 1386        | 786           | 252           | 85            | 65     |
|         | 10-19 | 31242        | 16141  | 6395        | 1713        | 1648        | 2410        | 1328        | 848           | 409           | 140           | 210    |
|         | 20-29 | 10022        | 4838   | 2202        | 578         | 620         | 773         | 488         | 357           | 85            | 30            | 50     |
|         | 30-39 | 16225        | 7915   | 3436        | 929         | 993         | 1443        | 785         | 482           | 107           | 51            | 75     |
|         | 40-49 | 22193        | 10496  | 4566        | 1230        | 1654        | 1951        | 1213        | 750           | 185           | 40            | 108    |
|         | ≥ 50  | 19145        | 8900   | 4270        | 1112        | 1334        | 1669        | 976         | 623           | 136           | 60            | 66     |
| 1961-65 | 合 計   | 127636       | 60703  | 29759       | 7194        | 8278        | 10487       | 5734        | 3522          | 1065          | 367           | 528    |
|         | 0-9   | 38298        | 16861  | 11030       | 2187        | 2867        | 3079        | 1371        | 775           | 228           | 85            | 65     |
|         | 10-19 | 30804        | 15919  | 6307        | 1696        | 1627        | 2381        | 1298        | 832           | 401           | 135           | 210    |
|         | 20-29 | 9776         | 4736   | 2124        | 568         | 611         | 753         | 477         | 345           | 85            | 26            | 50     |
|         | 30-39 | 15563        | 7637   | 3266        | 889         | 938         | 1396        | 760         | 462           | 100           | 45            | 70     |
|         | 40-49 | 19893        | 9434   | 4097        | 1111        | 1504        | 1704        | 1095        | 658           | 162           | 36            | 92     |
|         | ≥ 50  | 13302        | 6117   | 2935        | 793         | 931         | 1173        | 735         | 449           | 89            | 40            | 41     |
| 1966-70 | 合 計   | 117795       | 56150  | 27492       | 6869        | 7679        | 9623        | 5205        | 3180          | 978           | 343           | 477    |
|         | 0-9   | 38048        | 16723  | 10984       | 2123        | 2649        | 3062        | 1365        | 771           | 223           | 85            | 64     |
|         | 10-19 | 30377        | 15722  | 6202        | 1679        | 1595        | 2348        | 1272        | 819           | 399           | 132           | 210    |
|         | 20-29 | 9457         | 4603   | 2044        | 547         | 580         | 729         | 467         | 327           | 85            | 25            | 50     |
|         | 30-39 | 14553        | 7192   | 2994        | 829         | 888         | 1320        | 698         | 438           | 87            | 45            | 61     |
|         | 40-49 | 16943        | 8023   | 3436        | 976         | 1341        | 1455        | 917         | 562           | 127           | 33            | 73     |
|         | ≥ 50  | 8417         | 3886   | 1833        | 515         | 626         | 709         | 485         | 264           | 56            | 24            | 19     |
| 1971-75 | 合 計   | 108255       | 51573  | 25463       | 6138        | 7028        | 8851        | 4676        | 2872          | 910           | 326           | 418    |
|         | 0-9   | 37760        | 16589  | 10924       | 2092        | 2635        | 3037        | 1354        | 765           | 220           | 85            | 60     |
|         | 10-19 | 29804        | 15438  | 6049        | 1661        | 1574        | 2316        | 1244        | 805           | 389           | 130           | 199    |
|         | 20-29 | 9084         | 4432   | 1965        | 531         | 539         | 702         | 452         | 309           | 85            | 25            | 45     |
|         | 30-39 | 13179        | 6518   | 2694        | 771         | 797         | 1219        | 605         | 404           | 80            | 41            | 48     |
|         | 40-49 | 13661        | 6408   | 2770        | 806         | 1103        | 1170        | 772         | 452           | 97            | 30            | 53     |
|         | ≥ 50  | 4768         | 2189   | 1062        | 277         | 378         | 408         | 249         | 137           | 40            | 15            | 12     |
| 1976-80 | 合 計   | 98923        | 47059  | 23609       | 5628        | 6369        | 8129        | 4107        | 2560          | 825           | 293           | 349    |
|         | 0-9   | 37474        | 16472  | 10833       | 2076        | 2623        | 3010        | 1342        | 755           | 220           | 84            | 60     |
|         | 10-19 | 29087        | 15074  | 5902        | 1618        | 1558        | 2287        | 1204        | 786           | 373           | 124           | 181    |
|         | 20-29 | 8564         | 4162   | 1880        | 511         | 506         | 671         | 415         | 272           | 83            | 25            | 40     |
|         | 30-39 | 11569        | 5718   | 2363        | 691         | 684         | 1106        | 511         | 360           | 70            | 32            | 34     |
|         | 40-49 | 10033        | 4656   | 2123        | 590         | 808         | 872         | 540         | 320           | 65            | 25            | 34     |
|         | ≥ 50  | 2202         | 977    | 509         | 142         | 191         | 202         | 95          | 68            | 14            | 3             | 0      |
| 1981-85 | 合 計   | 90034        | 42898  | 21683       | 5043        | 5712        | 7430        | 3670        | 2274          | 753           | 256           | 316    |
|         | 0-9   | 37057        | 16287  | 10709       | 2056        | 2596        | 2980        | 1329        | 740           | 220           | 80            | 60     |
|         | 10-19 | 28187        | 14597  | 5721        | 1545        | 1525        | 2217        | 1165        | 770           | 362           | 116           | 170    |
|         | 20-29 | 7871         | 3839   | 1747        | 467         | 458         | 609         | 387         | 231           | 75            | 25            | 33     |
|         | 30-39 | 9708         | 4836   | 1975        | 575         | 540         | 958         | 423         | 297           | 54            | 23            | 27     |
|         | 40-49 | 8415         | 3026   | 1323        | 343         | 521         | 583         | 332         | 213           | 36            | 12            | 27     |
|         | ≥ 50  | 796          | 314    | 207         | 58          | 72          | 84          | 33          | 23            | 5             | 0             | 0      |

付表 2C. 観察人年, 女性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |        |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|--------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0      | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≧ 4.00 |
| 合 計     | 合 計   | 1350441      | 586890 | 357988      | 73022       | 95686       | 119643      | 66180       | 32677         | 11295         | 3463          | 3596   |
|         | 0-9   | 280910       | 120337 | 83603       | 15862       | 19347       | 23339       | 10285       | 5148          | 1770          | 487           | 743    |
|         | 10-19 | 284927       | 133024 | 68242       | 14266       | 17514       | 23329       | 15680       | 7787          | 2871          | 1346          | 868    |
|         | 20-29 | 254420       | 108696 | 66396       | 13666       | 18362       | 22238       | 13445       | 7381          | 2729          | 723           | 784    |
|         | 30-39 | 236557       | 97073  | 64324       | 13359       | 18205       | 23173       | 11594       | 5854          | 1947          | 421           | 608    |
|         | 40-49 | 184259       | 79357  | 46400       | 9797        | 14729       | 17101       | 9981        | 4500          | 1549          | 483           | 382    |
|         | ≧ 50  | 109388       | 48403  | 28024       | 8073        | 7528        | 10464       | 5215        | 2008          | 429           | 13            | 212    |
| 1950-55 | 合 計   | 234182       | 101606 | 62151       | 12599       | 16630       | 20813       | 11545       | 5850          | 1959          | 588           | 642    |
|         | 0-9   | 42398        | 18168  | 12589       | 2385        | 2934        | 3523        | 1552        | 784           | 272           | 77            | 115    |
|         | 10-19 | 43768        | 20417  | 10461       | 2185        | 2679        | 3608        | 2404        | 1225          | 446           | 206           | 137    |
|         | 20-29 | 39846        | 16981  | 10396       | 2129        | 2855        | 3513        | 2091        | 1187          | 451           | 116           | 127    |
|         | 30-39 | 39023        | 15934  | 10693       | 2216        | 2991        | 3750        | 1949        | 955           | 350           | 79            | 105    |
|         | 40-49 | 35230        | 15045  | 8959        | 1857        | 2818        | 3282        | 1909        | 875           | 299           | 97            | 89     |
|         | ≧ 50  | 33917        | 15081  | 9053        | 1827        | 2353        | 3137        | 1639        | 624           | 142           | 13            | 68     |
| 1956-60 | 合 計   | 213309       | 92479  | 56515       | 11534       | 15164       | 19015       | 10533       | 5181          | 1786          | 531           | 572    |
|         | 0-9   | 40199        | 17237  | 11948       | 2263        | 2772        | 3332        | 1474        | 743           | 255           | 70            | 105    |
|         | 10-19 | 41224        | 19209  | 9851        | 2070        | 2530        | 3397        | 2272        | 1153          | 417           | 195           | 130    |
|         | 20-29 | 37402        | 15941  | 9756        | 2008        | 2681        | 3298        | 1975        | 1104          | 415           | 110           | 115    |
|         | 30-39 | 36358        | 14850  | 9928        | 2070        | 2808        | 3517        | 1799        | 898           | 320           | 71            | 97     |
|         | 40-49 | 31908        | 13627  | 8093        | 1680        | 2549        | 2975        | 1743        | 801           | 275           | 85            | 80     |
|         | ≧ 50  | 28219        | 11614  | 6939        | 1444        | 1824        | 2496        | 1289        | 483           | 105           | 0             | 45     |
| 1961-65 | 合 計   | 203154       | 88113  | 53743       | 10982       | 14465       | 18112       | 9997        | 4985          | 1727          | 510           | 542    |
|         | 0-9   | 40050        | 17184  | 11913       | 2258        | 2761        | 3319        | 1487        | 739           | 254           | 70            | 105    |
|         | 10-19 | 40816        | 19018  | 9775        | 2047        | 2520        | 3339        | 2250        | 1128          | 415           | 195           | 130    |
|         | 20-29 | 36877        | 15732  | 9609        | 1983        | 2651        | 3238        | 1951        | 1086          | 408           | 105           | 115    |
|         | 30-39 | 35363        | 14474  | 9632        | 2000        | 2719        | 3448        | 1743        | 883           | 305           | 85            | 95     |
|         | 40-49 | 30010        | 12859  | 7541        | 1581        | 2421        | 2821        | 1633        | 747           | 265           | 75            | 86     |
|         | ≧ 50  | 20039        | 8867   | 5273        | 1113        | 1394        | 1947        | 954         | 381           | 80            | 0             | 30     |
| 1966-70 | 合 計   | 192616       | 83744  | 50891       | 10431       | 13682       | 17072       | 9454        | 4689          | 1641          | 500           | 511    |
|         | 0-9   | 39888        | 17073  | 11883       | 2250        | 2756        | 3310        | 1458        | 735           | 250           | 70            | 105    |
|         | 10-19 | 40483        | 18890  | 9700        | 2019        | 2497        | 3305        | 2232        | 1105          | 414           | 193           | 128    |
|         | 20-29 | 36323        | 15521  | 9456        | 1960        | 2626        | 3180        | 1918        | 1054          | 391           | 105           | 112    |
|         | 30-39 | 34200        | 14022  | 9263        | 1935        | 2637        | 3353        | 1687        | 864           | 287           | 61            | 91     |
|         | 40-49 | 27738        | 11983  | 6887        | 1458        | 2243        | 2599        | 1517        | 681           | 244           | 72            | 55     |
|         | ≧ 50  | 13983        | 6256   | 3702        | 810         | 922         | 1324        | 642         | 250           | 55            | 0             | 21     |
| 1971-75 | 合 計   | 181325       | 78865  | 47996       | 9873        | 12880       | 15869       | 8874        | 4399          | 1520          | 466           | 483    |
|         | 0-9   | 39692        | 16971  | 11833       | 2245        | 2739        | 3303        | 1448        | 727           | 250           | 70            | 105    |
|         | 10-19 | 40077        | 18717  | 9607        | 2012        | 2466        | 3264        | 2210        | 1085          | 406           | 190           | 120    |
|         | 20-29 | 35625        | 15238  | 9313        | 1906        | 2574        | 3094        | 1892        | 1025          | 373           | 100           | 110    |
|         | 30-39 | 32770        | 13479  | 8870        | 1866        | 2523        | 3220        | 1599        | 814           | 261           | 52            | 85     |
|         | 40-49 | 24435        | 10571  | 6107        | 1320        | 1979        | 2248        | 1321        | 588           | 203           | 55            | 43     |
|         | ≧ 50  | 8726         | 3888   | 2285        | 524         | 600         | 840         | 404         | 159           | 26            | 0             | 20     |
| 1976-80 | 合 計   | 169208       | 73672  | 44990       | 9139        | 11909       | 14918       | 8231        | 4061          | 1393          | 445           | 451    |
|         | 0-9   | 39483        | 16908  | 11760       | 2233        | 2714        | 3286        | 1444        | 715           | 247           | 70            | 105    |
|         | 10-19 | 39584        | 18522  | 9500        | 1984        | 2429        | 3227        | 2171        | 1058          | 393           | 186           | 114    |
|         | 20-29 | 34720        | 14864  | 9084        | 1866        | 2509        | 3016        | 1837        | 985           | 357           | 95            | 107    |
|         | 30-39 | 30850        | 12749  | 8339        | 1726        | 2368        | 3062        | 1496        | 755           | 231           | 50            | 76     |
|         | 40-49 | 20009        | 8677   | 5067        | 1086        | 1570        | 1839        | 1073        | 472           | 150           | 44            | 32     |
|         | ≧ 50  | 4563         | 1952   | 1241        | 244         | 319         | 488         | 210         | 77            | 15            | 0             | 18     |
| 1981-85 | 合 計   | 156817       | 68412  | 41702       | 8485        | 10956       | 13745       | 7546        | 3733          | 1268          | 424           | 396    |
|         | 0-9   | 39200        | 16816  | 11677       | 2228        | 2672        | 3266        | 1421        | 705           | 242           | 70            | 103    |
|         | 10-19 | 38975        | 18251  | 9347        | 1950        | 2394        | 3188        | 2141        | 1032          | 380           | 181           | 110    |
|         | 20-29 | 33628        | 14419  | 8782        | 1815        | 2466        | 2899        | 1781        | 941           | 335           | 93            | 97     |
|         | 30-39 | 27994        | 11564  | 7598        | 1545        | 2160        | 2823        | 1321        | 685           | 193           | 44            | 60     |
|         | 40-49 | 14928        | 6595   | 3747        | 816         | 1148        | 1336        | 785         | 336           | 113           | 36            | 17     |
|         | ≧ 50  | 1922         | 766    | 550         | 111         | 118         | 232         | 97          | 34            | 5             | 0             | 10     |

付表 3A. 腫瘍および血液疾患を除く全疾患による死亡数, 男女合計

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |      |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 20777        | 9490 | 5159        | 1109        | 1411        | 1798        | 1032        | 508           | 149           | 45            | 80     |
|         | 0-9   | 324          | 158  | 78          | 13          | 26          | 32          | 9           | 3             | 3             | 1             | 1      |
|         | 10-19 | 814          | 402  | 189         | 44          | 34          | 61          | 42          | 24            | 6             | 3             | 9      |
|         | 20-29 | 929          | 435  | 230         | 42          | 59          | 78          | 36          | 31            | 9             | 2             | 7      |
|         | 30-39 | 2441         | 1059 | 630         | 144         | 168         | 187         | 142         | 61            | 30            | 7             | 13     |
|         | 40-49 | 5995         | 2676 | 1441        | 310         | 448         | 540         | 326         | 167           | 52            | 13            | 22     |
|         | ≥ 50  | 10274        | 4760 | 2591        | 558         | 876         | 898         | 477         | 220           | 49            | 19            | 28     |
| 1950-55 | 合 計   | 2801         | 1360 | 768         | 143         | 174         | 227         | 135         | 54            | 18            | 9             | 13     |
|         | 0-9   | 53           | 22   | 13          | 1           | 4           | 9           | 3           | 0             | 1             | 0             | 0      |
|         | 10-19 | 149          | 83   | 39          | 4           | 5           | 9           | 2           | 8             | 0             | 1             | 0      |
|         | 20-29 | 143          | 83   | 35          | 6           | 14          | 12          | 7           | 4             | 0             | 0             | 2      |
|         | 30-39 | 196          | 84   | 52          | 13          | 7           | 16          | 14          | 5             | 3             | 1             | 1      |
|         | 40-49 | 438          | 201  | 113         | 24          | 24          | 42          | 20          | 7             | 8             | 0             | 1      |
|         | ≥ 50  | 1822         | 907  | 516         | 95          | 120         | 139         | 89          | 32            | 8             | 7             | 9      |
| 1956-60 | 合 計   | 2999         | 1430 | 725         | 154         | 194         | 283         | 105         | 75            | 17            | 6             | 10     |
|         | 0-9   | 45           | 23   | 11          | 1           | 4           | 5           | 0           | 0             | 1             | 0             | 0      |
|         | 10-19 | 108          | 60   | 16          | 3           | 1           | 13          | 9           | 3             | 2             | 1             | 0      |
|         | 20-29 | 108          | 47   | 31          | 3           | 5           | 13          | 3           | 5             | 1             | 0             | 0      |
|         | 30-39 | 183          | 78   | 43          | 10          | 18          | 18          | 8           | 3             | 3             | 1             | 3      |
|         | 40-49 | 515          | 239  | 118         | 31          | 38          | 48          | 20          | 17            | 1             | 2             | 1      |
|         | ≥ 50  | 2040         | 983  | 508         | 106         | 128         | 188         | 65          | 47            | 9             | 2             | 6      |
| 1961-65 | 合 計   | 2969         | 1319 | 776         | 151         | 197         | 252         | 171         | 66            | 19            | 6             | 12     |
|         | 0-9   | 28           | 20   | 4           | 1           | 2           | 0           | 0           | 1             | 0             | 0             | 0      |
|         | 10-19 | 84           | 28   | 26          | 7           | 5           | 10          | 2           | 5             | 1             | 0             | 0      |
|         | 20-29 | 90           | 44   | 24          | 3           | 5           | 10          | 3           | 1             | 0             | 0             | 0      |
|         | 30-39 | 212          | 85   | 62          | 17          | 10          | 15          | 17          | 4             | 2             | 0             | 0      |
|         | 40-49 | 605          | 273  | 156         | 20          | 41          | 47          | 42          | 15            | 5             | 1             | 5      |
|         | ≥ 50  | 1950         | 869  | 504         | 103         | 134         | 170         | 107         | 40            | 11            | 5             | 7      |
| 1966-70 | 合 計   | 2958         | 1357 | 725         | 143         | 201         | 268         | 139         | 88            | 23            | 5             | 9      |
|         | 0-9   | 41           | 23   | 7           | 2           | 4           | 3           | 2           | 0             | 0             | 0             | 0      |
|         | 10-19 | 86           | 40   | 22          | 1           | 7           | 7           | 4           | 3             | 2             | 0             | 0      |
|         | 20-29 | 103          | 50   | 23          | 1           | 9           | 7           | 4           | 6             | 1             | 0             | 2      |
|         | 30-39 | 285          | 136  | 81          | 9           | 21          | 18          | 12          | 2             | 5             | 0             | 1      |
|         | 40-49 | 811          | 361  | 194         | 36          | 55          | 79          | 40          | 30            | 8             | 3             | 5      |
|         | ≥ 50  | 1632         | 747  | 398         | 84          | 105         | 154         | 77          | 47            | 7             | 2             | 1      |
| 1971-75 | 合 計   | 2988         | 1378 | 692         | 164         | 212         | 250         | 175         | 77            | 22            | 6             | 12     |
|         | 0-9   | 40           | 17   | 12          | 4           | 1           | 4           | 2           | 0             | 0             | 0             | 0      |
|         | 10-19 | 119          | 60   | 28          | 6           | 3           | 6           | 10          | 3             | 0             | 0             | 3      |
|         | 20-29 | 124          | 60   | 26          | 8           | 11          | 8           | 5           | 4             | 1             | 1             | 0      |
|         | 30-39 | 361          | 153  | 87          | 15          | 31          | 26          | 29          | 13            | 2             | 2             | 3      |
|         | 40-49 | 1018         | 475  | 215         | 52          | 77          | 93          | 54          | 35            | 10            | 1             | 4      |
|         | ≥ 50  | 1328         | 613  | 324         | 79          | 89          | 113         | 75          | 22            | 9             | 2             | 2      |
| 1976-80 | 合 計   | 3057         | 1401 | 717         | 181         | 246         | 242         | 148         | 78            | 27            | 6             | 11     |
|         | 0-9   | 56           | 29   | 10          | 3           | 5           | 7           | 0           | 1             | 0             | 1             | 0      |
|         | 10-19 | 117          | 60   | 28          | 8           | 5           | 4           | 6           | 3             | 1             | 0             | 2      |
|         | 20-29 | 173          | 78   | 44          | 10          | 11          | 11          | 9           | 4             | 4             | 0             | 2      |
|         | 30-39 | 514          | 233  | 137         | 37          | 34          | 27          | 20          | 14            | 9             | 1             | 2      |
|         | 40-49 | 1275         | 581  | 285         | 69          | 117         | 108         | 71          | 31            | 8             | 3             | 2      |
|         | ≥ 50  | 922          | 420  | 213         | 54          | 74          | 85          | 42          | 25            | 5             | 1             | 3      |
| 1981-85 | 合 計   | 2905         | 1245 | 756         | 173         | 187         | 274         | 159         | 88            | 23            | 7             | 13     |
|         | 0-9   | 61           | 24   | 21          | 1           | 6           | 4           | 2           | 1             | 1             | 0             | 1      |
|         | 10-19 | 151          | 71   | 30          | 15          | 8           | 12          | 9           | 1             | 0             | 1             | 4      |
|         | 20-29 | 188          | 93   | 47          | 11          | 4           | 17          | 5           | 7             | 2             | 1             | 1      |
|         | 30-39 | 690          | 290  | 168         | 43          | 47          | 69          | 42          | 20            | 6             | 2             | 3      |
|         | 40-49 | 1335         | 546  | 360         | 78          | 96          | 123         | 79          | 32            | 14            | 3             | 4      |
|         | ≥ 50  | 480          | 221  | 130         | 25          | 26          | 49          | 22          | 7             | 0             | 0             | 0      |

付表 3B. 腫瘍および血液疾患を除く全疾患による死亡数, 男性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |      |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 9344         | 4489 | 2085        | 504         | 626         | 773         | 483         | 272           | 69            | 29            | 54     |
|         | 0-9   | 199          | 97   | 54          | 8           | 12          | 21          | 3           | 2             | 1             | 1             | 0      |
|         | 10-19 | 459          | 235  | 105         | 24          | 15          | 28          | 26          | 11            | 5             | 2             | 8      |
|         | 20-29 | 349          | 183  | 89          | 20          | 30          | 29          | 19          | 13            | 2             | 0             | 4      |
|         | 30-39 | 1029         | 486  | 233         | 53          | 73          | 70          | 60          | 30            | 10            | 5             | 9      |
|         | 40-49 | 2796         | 1330 | 597         | 153         | 195         | 242         | 147         | 88            | 25            | 5             | 14     |
|         | ≥ 50  | 4512         | 2158 | 1027        | 246         | 301         | 383         | 208         | 128           | 26            | 16            | 19     |
| 1950-55 | 合 計   | 1413         | 704  | 331         | 65          | 87          | 112         | 66          | 29            | 7             | 5             | 7      |
|         | 0-9   | 30           | 12   | 9           | 0           | 2           | 6           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 65           | 41   | 13          | 2           | 1           | 4           | 1           | 3             | 0             | 0             | 0      |
|         | 20-29 | 51           | 25   | 6           | 2           | 5           | 5           | 7           | 1             | 0             | 0             | 0      |
|         | 30-39 | 79           | 42   | 16          | 4           | 2           | 6           | 4           | 2             | 1             | 1             | 1      |
|         | 40-49 | 221          | 107  | 45          | 11          | 14          | 23          | 13          | 3             | 4             | 0             | 1      |
|         | ≥ 50  | 967          | 477  | 242         | 46          | 63          | 68          | 40          | 20            | 2             | 4             | 5      |
| 1956-60 | 合 計   | 1468         | 723  | 318         | 71          | 91          | 146         | 50          | 46            | 11            | 4             | 8      |
|         | 0-9   | 26           | 13   | 7           | 1           | 1           | 3           | 0           | 0             | 1             | 0             | 0      |
|         | 10-19 | 50           | 25   | 9           | 1           | 0           | 6           | 5           | 2             | 1             | 1             | 0      |
|         | 20-29 | 34           | 15   | 12          | 1           | 1           | 4           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 83           | 36   | 14          | 4           | 8           | 9           | 4           | 3             | 1             | 1             | 3      |
|         | 40-49 | 284          | 137  | 54          | 17          | 20          | 32          | 12          | 11            | 1             | 0             | 0      |
|         | ≥ 50  | 991          | 497  | 222         | 47          | 61          | 92          | 28          | 30            | 7             | 2             | 5      |
| 1961-65 | 合 計   | 1425         | 662  | 329         | 77          | 93          | 114         | 86          | 38            | 12            | 6             | 8      |
|         | 0-9   | 17           | 13   | 3           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 40           | 13   | 16          | 2           | 4           | 2           | 1           | 1             | 1             | 0             | 0      |
|         | 20-29 | 29           | 13   | 6           | 1           | 4           | 2           | 2           | 1             | 0             | 0             | 0      |
|         | 30-39 | 99           | 41   | 26          | 9           | 5           | 7           | 9           | 2             | 0             | 0             | 0      |
|         | 40-49 | 350          | 170  | 77          | 13          | 19          | 27          | 26          | 10            | 4             | 1             | 3      |
|         | ≥ 50  | 890          | 412  | 201         | 52          | 60          | 75          | 48          | 24            | 7             | 5             | 5      |
| 1966-70 | 合 計   | 1366         | 652  | 308         | 65          | 80          | 118         | 63          | 52            | 10            | 3             | 7      |
|         | 0-9   | 17           | 8    | 2           | 2           | 3           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 55           | 27   | 14          | 1           | 3           | 4           | 2           | 2             | 2             | 0             | 0      |
|         | 20-29 | 40           | 18   | 7           | 1           | 6           | 2           | 1           | 4             | 0             | 0             | 1      |
|         | 30-39 | 148          | 73   | 39          | 2           | 12          | 10          | 6           | 2             | 3             | 0             | 1      |
|         | 40-49 | 421          | 207  | 98          | 19          | 21          | 34          | 19          | 15            | 3             | 1             | 4      |
|         | ≥ 50  | 685          | 319  | 148         | 40          | 45          | 64          | 35          | 29            | 2             | 2             | 1      |
| 1971-75 | 合 計   | 1299         | 617  | 278         | 70          | 88          | 106         | 80          | 39            | 8             | 3             | 10     |
|         | 0-9   | 28           | 13   | 8           | 3           | 0           | 3           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 80           | 39   | 21          | 4           | 0           | 4           | 7           | 2             | 0             | 0             | 3      |
|         | 20-29 | 54           | 24   | 10          | 4           | 6           | 5           | 3           | 2             | 0             | 0             | 0      |
|         | 30-39 | 173          | 85   | 37          | 7           | 10          | 11          | 14          | 6             | 0             | 1             | 2      |
|         | 40-49 | 452          | 220  | 91          | 22          | 34          | 42          | 20          | 18            | 2             | 0             | 3      |
|         | ≥ 50  | 512          | 236  | 111         | 30          | 38          | 41          | 35          | 11            | 6             | 2             | 2      |
| 1976-80 | 合 計   | 1275         | 622  | 288         | 82          | 96          | 93          | 57          | 35            | 14            | 4             | 6      |
|         | 0-9   | 37           | 18   | 8           | 1           | 3           | 5           | 0           | 1             | 0             | 1             | 0      |
|         | 10-19 | 75           | 46   | 19          | 3           | 2           | 1           | 2           | 0             | 1             | 0             | 1      |
|         | 20-29 | 76           | 38   | 12          | 6           | 6           | 4           | 3           | 3             | 2             | 0             | 2      |
|         | 30-39 | 209          | 101  | 48          | 15          | 15          | 9           | 9           | 6             | 4             | 1             | 1      |
|         | 40-49 | 542          | 260  | 108         | 35          | 45          | 43          | 28          | 16            | 5             | 1             | 1      |
|         | ≥ 50  | 336          | 159  | 71          | 22          | 25          | 31          | 15          | 9             | 2             | 1             | 1      |
| 1981-85 | 合 計   | 1098         | 489  | 255         | 74          | 81          | 86          | 61          | 33            | 7             | 4             | 8      |
|         | 0-9   | 44           | 20   | 17          | 1           | 2           | 2           | 1           | 1             | 0             | 0             | 0      |
|         | 10-19 | 94           | 44   | 13          | 11          | 5           | 7           | 8           | 1             | 0             | 1             | 4      |
|         | 20-29 | 65           | 30   | 16          | 5           | 2           | 7           | 2           | 2             | 0             | 0             | 1      |
|         | 30-39 | 238          | 108  | 53          | 12          | 21          | 18          | 14          | 9             | 1             | 1             | 1      |
|         | 40-49 | 526          | 229  | 124         | 36          | 42          | 41          | 29          | 15            | 6             | 2             | 2      |
|         | ≥ 50  | 131          | 58   | 32          | 9           | 9           | 11          | 7           | 5             | 0             | 0             | 0      |

付表 3C. 腫瘍および血液疾患を除く全疾患による死亡数, 女性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |      |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 11433        | 5021 | 3074        | 605         | 785         | 1023        | 569         | 234           | 80            | 16            | 26     |
|         | 0-9   | 125          | 61   | 24          | 5           | 14          | 11          | 6           | 1             | 2             | 0             | 1      |
|         | 10-19 | 355          | 167  | 84          | 20          | 19          | 33          | 16          | 13            | 1             | 1             | 1      |
|         | 20-29 | 580          | 272  | 161         | 22          | 29          | 49          | 17          | 18            | 7             | 2             | 3      |
|         | 30-39 | 1412         | 573  | 397         | 91          | 95          | 117         | 82          | 31            | 20            | 2             | 4      |
|         | 40-49 | 3199         | 1346 | 844         | 157         | 253         | 298         | 179         | 79            | 27            | 8             | 8      |
|         | ≥ 50  | 5762         | 2602 | 1564        | 310         | 375         | 515         | 269         | 92            | 23            | 3             | 9      |
| 1950-55 | 合 計   | 1488         | 656  | 437         | 78          | 87          | 115         | 69          | 25            | 11            | 4             | 6      |
|         | 0-9   | 23           | 10   | 4           | 1           | 2           | 3           | 2           | 0             | 1             | 0             | 0      |
|         | 10-19 | 84           | 42   | 26          | 2           | 4           | 5           | 1           | 3             | 0             | 1             | 0      |
|         | 20-29 | 92           | 38   | 29          | 4           | 9           | 7           | 0           | 3             | 0             | 0             | 2      |
|         | 30-39 | 117          | 42   | 36          | 9           | 5           | 10          | 10          | 3             | 2             | 0             | 0      |
|         | 40-49 | 217          | 94   | 68          | 13          | 10          | 19          | 7           | 4             | 2             | 0             | 0      |
|         | ≥ 50  | 955          | 430  | 274         | 49          | 57          | 71          | 49          | 12            | 6             | 3             | 4      |
| 1956-60 | 合 計   | 1531         | 707  | 407         | 83          | 103         | 137         | 55          | 29            | 6             | 2             | 2      |
|         | 0-9   | 19           | 10   | 4           | 0           | 3           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 58           | 35   | 7           | 2           | 1           | 7           | 4           | 1             | 1             | 0             | 0      |
|         | 20-29 | 74           | 32   | 19          | 2           | 4           | 9           | 2           | 5             | 1             | 0             | 0      |
|         | 30-39 | 100          | 42   | 29          | 6           | 10          | 7           | 4           | 0             | 2             | 0             | 0      |
|         | 40-49 | 231          | 102  | 64          | 14          | 18          | 16          | 8           | 6             | 0             | 2             | 1      |
|         | ≥ 50  | 1049         | 488  | 284         | 59          | 87          | 96          | 37          | 17            | 2             | 0             | 1      |
| 1961-65 | 合 計   | 1544         | 657  | 447         | 74          | 104         | 138         | 85          | 28            | 7             | 0             | 4      |
|         | 0-9   | 11           | 7    | 1           | 1           | 1           | 0           | 0           | 1             | 0             | 0             | 0      |
|         | 10-19 | 44           | 15   | 10          | 5           | 1           | 8           | 1           | 4             | 0             | 0             | 0      |
|         | 20-29 | 61           | 31   | 18          | 2           | 1           | 8           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 113          | 44   | 36          | 8           | 5           | 8           | 8           | 2             | 2             | 0             | 0      |
|         | 40-49 | 255          | 103  | 79          | 7           | 22          | 20          | 16          | 5             | 1             | 0             | 2      |
|         | ≥ 50  | 1060         | 457  | 303         | 51          | 74          | 94          | 59          | 16            | 4             | 0             | 2      |
| 1966-70 | 合 計   | 1592         | 705  | 417         | 78          | 111         | 152         | 76          | 36            | 13            | 2             | 2      |
|         | 0-9   | 24           | 15   | 5           | 0           | 1           | 1           | 2           | 0             | 0             | 0             | 0      |
|         | 10-19 | 31           | 13   | 8           | 0           | 4           | 3           | 2           | 1             | 0             | 0             | 0      |
|         | 20-29 | 63           | 32   | 16          | 0           | 3           | 5           | 3           | 2             | 1             | 0             | 1      |
|         | 30-39 | 137          | 63   | 42          | 7           | 9           | 8           | 6           | 0             | 2             | 0             | 0      |
|         | 40-49 | 390          | 154  | 96          | 17          | 34          | 45          | 21          | 15            | 5             | 2             | 1      |
|         | ≥ 50  | 947          | 428  | 250         | 54          | 60          | 90          | 42          | 18            | 5             | 0             | 0      |
| 1971-75 | 合 計   | 1689         | 761  | 414         | 94          | 124         | 144         | 95          | 38            | 14            | 3             | 2      |
|         | 0-9   | 12           | 4    | 4           | 1           | 1           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 39           | 21   | 7           | 2           | 3           | 2           | 3           | 1             | 0             | 0             | 0      |
|         | 20-29 | 70           | 36   | 16          | 4           | 5           | 3           | 2           | 2             | 1             | 1             | 0      |
|         | 30-39 | 188          | 68   | 50          | 8           | 21          | 15          | 15          | 7             | 2             | 1             | 1      |
|         | 40-49 | 564          | 255  | 124         | 30          | 43          | 51          | 34          | 17            | 8             | 1             | 1      |
|         | ≥ 50  | 816          | 377  | 213         | 49          | 51          | 72          | 40          | 11            | 3             | 0             | 0      |
| 1976-80 | 合 計   | 1782         | 779  | 451         | 99          | 150         | 149         | 91          | 43            | 13            | 2             | 5      |
|         | 0-9   | 19           | 11   | 2           | 2           | 2           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 42           | 14   | 9           | 5           | 3           | 3           | 4           | 3             | 0             | 0             | 1      |
|         | 20-29 | 97           | 40   | 32          | 4           | 5           | 7           | 6           | 1             | 2             | 0             | 0      |
|         | 30-39 | 305          | 132  | 89          | 22          | 19          | 18          | 11          | 8             | 5             | 0             | 1      |
|         | 40-49 | 733          | 321  | 177         | 34          | 72          | 85          | 43          | 15            | 3             | 2             | 1      |
|         | ≥ 50  | 586          | 261  | 142         | 32          | 49          | 54          | 27          | 16            | 3             | 0             | 2      |
| 1981-85 | 合 計   | 1807         | 756  | 501         | 99          | 106         | 188         | 98          | 35            | 16            | 3             | 5      |
|         | 0-9   | 17           | 4    | 4           | 0           | 4           | 2           | 1           | 0             | 1             | 0             | 1      |
|         | 10-19 | 57           | 27   | 17          | 4           | 3           | 5           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 123          | 63   | 31          | 6           | 2           | 10          | 3           | 5             | 2             | 1             | 0      |
|         | 30-39 | 452          | 182  | 115         | 31          | 26          | 51          | 28          | 11            | 5             | 1             | 2      |
|         | 40-49 | 809          | 317  | 236         | 42          | 54          | 82          | 50          | 17            | 8             | 1             | 2      |
|         | ≥ 50  | 349          | 163  | 98          | 16          | 17          | 38          | 15          | 2             | 0             | 0             | 0      |

付表4A. 感染症による死亡数, 男女合計

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |     |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0   | .01<br>-.05 | .05<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 1413         | 651 | 367         | 64          | 85          | 126         | 64          | 38            | 10            | 5             | 3      |
|         | 0-9   | 51           | 19  | 16          | 1           | 6           | 5           | 3           | 0             | 0             | 1             | 0      |
|         | 10-19 | 197          | 105 | 47          | 6           | 10          | 11          | 8           | 6             | 2             | 2             | 0      |
|         | 20-29 | 184          | 78  | 52          | 7           | 12          | 19          | 8           | 7             | 1             | 0             | 0      |
|         | 30-39 | 219          | 101 | 59          | 10          | 12          | 18          | 6           | 8             | 6             | 0             | 1      |
|         | 40-49 | 368          | 162 | 104         | 20          | 20          | 34          | 16          | 9             | 0             | 1             | 2      |
|         | ≥ 50  | 394          | 186 | 89          | 20          | 25          | 39          | 23          | 10            | 1             | 1             | 0      |
| 1950-55 | 合 計   | 504          | 226 | 139         | 22          | 28          | 47          | 24          | 13            | 2             | 2             | 1      |
|         | 0-9   | 14           | 3   | 4           | 1           | 3           | 1           | 2           | 0             | 0             | 0             | 0      |
|         | 10-19 | 87           | 47  | 28          | 1           | 3           | 3           | 1           | 5             | 0             | 1             | 0      |
|         | 20-29 | 82           | 38  | 21          | 2           | 7           | 7           | 5           | 2             | 0             | 0             | 0      |
|         | 30-39 | 77           | 33  | 22          | 6           | 3           | 7           | 2           | 1             | 2             | 0             | 1      |
|         | 40-49 | 107          | 44  | 34          | 4           | 6           | 15          | 3           | 1             | 0             | 0             | 0      |
|         | ≥ 50  | 137          | 61  | 32          | 8           | 6           | 14          | 11          | 4             | 0             | 1             | 0      |
| 1956-60 | 合 計   | 333          | 152 | 79          | 15          | 24          | 33          | 13          | 10            | 6             | 1             | 0      |
|         | 0-9   | 14           | 5   | 6           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 47           | 26  | 7           | 1           | 1           | 4           | 4           | 1             | 2             | 1             | 0      |
|         | 20-29 | 48           | 18  | 15          | 3           | 2           | 7           | 1           | 1             | 1             | 0             | 0      |
|         | 30-39 | 42           | 13  | 11          | 1           | 6           | 4           | 2           | 2             | 3             | 0             | 0      |
|         | 40-49 | 90           | 44  | 20          | 6           | 4           | 8           | 4           | 4             | 0             | 0             | 0      |
|         | ≥ 50  | 92           | 46  | 20          | 4           | 9           | 9           | 2           | 2             | 0             | 0             | 0      |
| 1961-65 | 合 計   | 197          | 84  | 55          | 9           | 16          | 18          | 10          | 4             | 1             | 0             | 0      |
|         | 0-9   | 6            | 4   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 25           | 13  | 3           | 3           | 3           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 22           | 9   | 7           | 0           | 2           | 3           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 29           | 13  | 9           | 1           | 0           | 3           | 2           | 1             | 0             | 0             | 0      |
|         | 40-49 | 53           | 18  | 20          | 2           | 6           | 3           | 2           | 2             | 0             | 0             | 0      |
|         | ≥ 50  | 62           | 27  | 15          | 3           | 4           | 7           | 5           | 0             | 1             | 0             | 0      |
| 1966-70 | 合 計   | 139          | 78  | 29          | 4           | 5           | 13          | 5           | 3             | 0             | 1             | 1      |
|         | 0-9   | 8            | 5   | 0           | 0           | 0           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 14           | 8   | 4           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 7            | 4   | 1           | 0           | 0           | 0           | 1           | 1             | 0             | 0             | 0      |
|         | 30-39 | 23           | 14  | 6           | 0           | 1           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 41           | 22  | 8           | 2           | 2           | 4           | 1           | 0             | 0             | 1             | 1      |
|         | ≥ 50  | 46           | 25  | 10          | 2           | 2           | 4           | 1           | 2             | 0             | 0             | 0      |
| 1971-75 | 合 計   | 114          | 47  | 33          | 6           | 9           | 9           | 6           | 3             | 0             | 0             | 1      |
|         | 0-9   | 6            | 1   | 4           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 8            | 2   | 2           | 0           | 2           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 11           | 2   | 5           | 1           | 0           | 1           | 1           | 1             | 0             | 0             | 0      |
|         | 30-39 | 18           | 12  | 5           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 32           | 16  | 8           | 2           | 2           | 2           | 1           | 0             | 0             | 0             | 1      |
|         | ≥ 50  | 39           | 14  | 9           | 3           | 4           | 4           | 3           | 2             | 0             | 0             | 0      |
| 1976-80 | 合 計   | 66           | 37  | 17          | 3           | 2           | 2           | 3           | 0             | 1             | 1             | 0      |
|         | 0-9   | 1            | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 1             | 0      |
|         | 10-19 | 6            | 3   | 3           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 3            | 2   | 0           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 18           | 12  | 2           | 1           | 1           | 1           | 0           | 0             | 1             | 0             | 0      |
|         | 40-49 | 29           | 13  | 10          | 2           | 0           | 1           | 3           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 9            | 7   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
| 1981-85 | 合 計   | 60           | 27  | 15          | 5           | 1           | 4           | 3           | 5             | 0             | 0             | 0      |
|         | 0-9   | 2            | 1   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 10           | 6   | 2           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 11           | 5   | 3           | 1           | 0           | 1           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 12           | 4   | 4           | 1           | 0           | 1           | 0           | 2             | 0             | 0             | 0      |
|         | 40-49 | 16           | 5   | 4           | 2           | 0           | 1           | 2           | 2             | 0             | 0             | 0      |
|         | ≥ 50  | 9            | 6   | 1           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |

付表 4B. 感染症による死亡数, 男性

| 期 間     | 被曝時年齢 | 放 射 線 量 (Gy) |     |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 774          | 370 | 183         | 37          | 38          | 71          | 38          | 27            | 3             | 4             | 3      |
|         | 0-9   | 28           | 13  | 8           | 0           | 2           | 3           | 0           | 0             | 0             | 1             | 0      |
|         | 10-19 | 96           | 52  | 22          | 3           | 4           | 4           | 5           | 4             | 1             | 1             | 0      |
|         | 20-29 | 66           | 27  | 13          | 4           | 3           | 8           | 6           | 5             | 0             | 0             | 0      |
|         | 30-39 | 110          | 54  | 26          | 7           | 4           | 7           | 3           | 6             | 2             | 0             | 1      |
|         | 40-49 | 230          | 103 | 60          | 12          | 10          | 25          | 12          | 5             | 0             | 1             | 2      |
|         | ≥ 50  | 244          | 121 | 53          | 11          | 15          | 24          | 12          | 7             | 0             | 1             | 0      |
| 1950-55 | 合 計   | 265          | 125 | 63          | 13          | 9           | 27          | 16          | 9             | 1             | 1             | 1      |
|         | 0-9   | 6            | 2   | 2           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 39           | 23  | 10          | 1           | 0           | 1           | 1           | 3             | 0             | 0             | 0      |
|         | 20-29 | 33           | 18  | 4           | 1           | 1           | 3           | 5           | 1             | 0             | 0             | 0      |
|         | 30-39 | 32           | 14  | 9           | 3           | 0           | 2           | 1           | 1             | 1             | 0             | 1      |
|         | 40-49 | 60           | 24  | 16          | 3           | 3           | 10          | 3           | 1             | 0             | 0             | 0      |
|         | ≥ 50  | 95           | 44  | 22          | 5           | 4           | 10          | 6           | 3             | 0             | 1             | 0      |
| 1956-60 | 合 計   | 178          | 81  | 42          | 9           | 13          | 17          | 7           | 6             | 2             | 1             | 0      |
|         | 0-9   | 9            | 4   | 4           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 22           | 10  | 4           | 1           | 0           | 2           | 2           | 1             | 1             | 1             | 0      |
|         | 20-29 | 10           | 3   | 4           | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 19           | 7   | 3           | 1           | 3           | 1           | 1           | 2             | 1             | 0             | 0      |
|         | 40-49 | 60           | 28  | 14          | 4           | 3           | 6           | 3           | 2             | 0             | 0             | 0      |
|         | ≥ 50  | 58           | 29  | 13          | 2           | 6           | 6           | 1           | 1             | 0             | 0             | 0      |
| 1961-65 | 合 計   | 109          | 46  | 29          | 5           | 9           | 11          | 7           | 2             | 0             | 0             | 0      |
|         | 0-9   | 4            | 4   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 13           | 6   | 2           | 0           | 3           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 5            | 1   | 1           | 0           | 1           | 1           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 11           | 4   | 3           | 1           | 0           | 1           | 1           | 1             | 0             | 0             | 0      |
|         | 40-49 | 32           | 12  | 12          | 2           | 2           | 3           | 1           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 44           | 19  | 11          | 2           | 3           | 5           | 4           | 0             | 0             | 0             | 0      |
| 1966-70 | 合 計   | 84           | 52  | 14          | 1           | 1           | 9           | 2           | 3             | 0             | 1             | 1      |
|         | 0-9   | 2            | 1   | 0           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 8            | 5   | 3           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 5            | 2   | 1           | 0           | 0           | 0           | 1           | 1             | 0             | 0             | 0      |
|         | 30-39 | 15           | 9   | 4           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 29           | 18  | 3           | 0           | 1           | 4           | 1           | 0             | 0             | 1             | 1      |
|         | ≥ 50  | 25           | 17  | 3           | 1           | 0           | 2           | 0           | 2             | 0             | 0             | 0      |
| 1971-75 | 合 計   | 63           | 29  | 18          | 4           | 3           | 4           | 2           | 2             | 0             | 0             | 1      |
|         | 0-9   | 4            | 1   | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 4            | 2   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 5            | 1   | 1           | 1           | 0           | 1           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 11           | 8   | 3           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 23           | 10  | 8           | 2           | 1           | 1           | 0           | 0             | 0             | 0             | 1      |
|         | ≥ 50  | 16           | 7   | 3           | 1           | 2           | 1           | 1           | 1             | 0             | 0             | 0      |
| 1976-80 | 合 計   | 41           | 24  | 9           | 2           | 2           | 1           | 2           | 0             | 0             | 1             | 0      |
|         | 0-9   | 1            | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 1             | 0      |
|         | 10-19 | 5            | 3   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 1            | 0   | 0           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 14           | 9   | 2           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 17           | 9   | 5           | 1           | 0           | 0           | 2           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 3            | 3   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
| 1981-85 | 合 計   | 34           | 13  | 8           | 3           | 1           | 2           | 2           | 5             | 0             | 0             | 0      |
|         | 0-9   | 2            | 1   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 5            | 3   | 0           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 7            | 2   | 2           | 1           | 0           | 1           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 8            | 3   | 2           | 1           | 0           | 0           | 0           | 2             | 0             | 0             | 0      |
|         | 40-49 | 9            | 2   | 2           | 0           | 0           | 1           | 2           | 2             | 0             | 0             | 0      |
|         | ≥ 50  | 3            | 2   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |



付表4C. 感染症による死亡数, 女性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |     |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 639          | 281 | 184         | 27          | 47          | 55          | 26          | 11            | 7             | 1             | 0      |
|         | 0-9   | 23           | 6   | 7           | 1           | 4           | 2           | 3           | 0             | 0             | 0             | 0      |
|         | 10-19 | 101          | 53  | 25          | 3           | 6           | 7           | 3           | 2             | 1             | 1             | 0      |
|         | 20-29 | 118          | 51  | 39          | 3           | 9           | 11          | 2           | 2             | 1             | 0             | 0      |
|         | 30-39 | 109          | 47  | 33          | 3           | 8           | 11          | 3           | 0             | 4             | 0             | 0      |
|         | 40-49 | 138          | 59  | 44          | 8           | 10          | 9           | 4           | 4             | 0             | 0             | 0      |
|         | ≥ 50  | 150          | 65  | 36          | 9           | 10          | 15          | 11          | 3             | 1             | 0             | 0      |
| 1950-55 | 合 計   | 239          | 101 | 76          | 9           | 19          | 20          | 8           | 4             | 1             | 1             | 0      |
|         | 0-9   | 8            | 1   | 2           | 1           | 2           | 0           | 2           | 0             | 0             | 0             | 0      |
|         | 10-19 | 48           | 24  | 16          | 0           | 3           | 2           | 0           | 2             | 0             | 1             | 0      |
|         | 20-29 | 49           | 20  | 17          | 1           | 6           | 4           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 45           | 19  | 13          | 3           | 3           | 5           | 1           | 0             | 1             | 0             | 0      |
|         | 40-49 | 47           | 20  | 18          | 1           | 3           | 5           | 0           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 42           | 17  | 10          | 3           | 2           | 4           | 5           | 1             | 0             | 0             | 0      |
| 1956-60 | 合 計   | 155          | 71  | 37          | 8           | 11          | 18          | 8           | 4             | 4             | 0             | 0      |
|         | 0-9   | 5            | 1   | 2           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 25           | 16  | 3           | 0           | 1           | 2           | 2           | 0             | 1             | 0             | 0      |
|         | 20-29 | 38           | 15  | 11          | 2           | 2           | 5           | 1           | 1             | 1             | 0             | 0      |
|         | 30-39 | 23           | 6   | 8           | 0           | 3           | 3           | 1           | 0             | 2             | 0             | 0      |
|         | 40-49 | 30           | 16  | 6           | 2           | 1           | 2           | 1           | 2             | 0             | 0             | 0      |
|         | ≥ 50  | 34           | 17  | 7           | 2           | 3           | 3           | 1           | 1             | 0             | 0             | 0      |
| 1961-65 | 合 計   | 88           | 38  | 26          | 4           | 7           | 7           | 3           | 2             | 1             | 0             | 0      |
|         | 0-9   | 2            | 0   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 12           | 7   | 1           | 3           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 17           | 8   | 6           | 0           | 1           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 18           | 9   | 6           | 0           | 0           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 21           | 6   | 8           | 0           | 4           | 0           | 1           | 2             | 0             | 0             | 0      |
|         | ≥ 50  | 18           | 8   | 4           | 1           | 1           | 2           | 1           | 0             | 1             | 0             | 0      |
| 1966-70 | 合 計   | 55           | 26  | 15          | 3           | 4           | 4           | 3           | 0             | 0             | 0             | 0      |
|         | 0-9   | 6            | 4   | 0           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 6            | 3   | 1           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 2            | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 8            | 5   | 2           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 12           | 4   | 5           | 2           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 21           | 8   | 7           | 1           | 2           | 2           | 1           | 0             | 0             | 0             | 0      |
| 1971-75 | 合 計   | 51           | 18  | 15          | 2           | 6           | 5           | 4           | 1             | 0             | 0             | 0      |
|         | 0-9   | 2            | 0   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 4            | 0   | 1           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 6            | 1   | 4           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 7            | 4   | 2           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 9            | 6   | 0           | 0           | 1           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 23           | 7   | 6           | 2           | 2           | 3           | 2           | 1             | 0             | 0             | 0      |
| 1976-80 | 合 計   | 25           | 13  | 8           | 1           | 0           | 1           | 1           | 0             | 1             | 0             | 0      |
|         | 0-9   | 0            | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 1            | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 2            | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 4            | 3   | 0           | 0           | 0           | 0           | 0           | 0             | 1             | 0             | 0      |
|         | 40-49 | 12           | 4   | 5           | 1           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 6            | 4   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
| 1981-85 | 合 計   | 26           | 14  | 7           | 2           | 0           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 0-9   | 0            | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 5            | 3   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 4            | 3   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 4            | 1   | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 7            | 3   | 2           | 2           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 6            | 4   | 0           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |

付表 5A. 循環器疾患による死亡数, 男女合計

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |      |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 11164        | 5025 | 2767        | 605         | 775         | 981         | 590         | 273           | 85            | 20            | 43     |
|         | 0-9   | 105          | 52   | 24          | 3           | 10          | 10          | 1           | 2             | 2             | 0             | 1      |
|         | 10-19 | 247          | 116  | 52          | 19          | 19          | 23          | 9           | 5             | 1             | 0             | 3      |
|         | 20-29 | 396          | 186  | 102         | 12          | 28          | 28          | 18          | 14            | 5             | 0             | 3      |
|         | 30-39 | 1379         | 588  | 368         | 80          | 96          | 95          | 86          | 33            | 19            | 6             | 8      |
|         | 40-49 | 3574         | 1577 | 858         | 177         | 276         | 335         | 205         | 95            | 34            | 6             | 11     |
|         | ≥ 50  | 5463         | 2506 | 1363        | 314         | 346         | 490         | 271         | 124           | 24            | 8             | 17     |
| 1950-55 | 合 計   | 1046         | 485  | 286         | 55          | 65          | 76          | 48          | 14            | 8             | 3             | 8      |
|         | 0-9   | 12           | 8    | 4           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 14           | 7    | 1           | 2           | 2           | 1           | 0           | 1             | 0             | 0             | 0      |
|         | 20-29 | 17           | 6    | 5           | 0           | 2           | 2           | 1           | 1             | 0             | 0             | 0      |
|         | 30-39 | 51           | 19   | 12          | 5           | 2           | 4           | 4           | 3             | 1             | 1             | 0      |
|         | 40-49 | 161          | 73   | 40          | 11          | 11          | 14          | 7           | 1             | 4             | 0             | 0      |
|         | ≥ 50  | 791          | 374  | 224         | 37          | 48          | 53          | 38          | 8             | 3             | 2             | 6      |
| 1956-60 | 合 計   | 1320         | 535  | 299         | 76          | 84          | 126         | 52          | 34            | 8             | 1             | 5      |
|         | 0-9   | 12           | 8    | 0           | 0           | 2           | 1           | 0           | 0             | 1             | 0             | 0      |
|         | 10-19 | 15           | 9    | 1           | 1           | 0           | 3           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 17           | 7    | 7           | 0           | 0           | 1           | 2           | 0             | 0             | 0             | 0      |
|         | 30-39 | 60           | 25   | 16          | 2           | 7           | 5           | 4           | 0             | 0             | 0             | 1      |
|         | 40-49 | 261          | 119  | 58          | 17          | 18          | 25          | 13          | 9             | 0             | 1             | 1      |
|         | ≥ 50  | 955          | 467  | 217         | 58          | 57          | 91          | 32          | 25            | 7             | 0             | 3      |
| 1961-65 | 合 計   | 1565         | 680  | 403         | 77          | 101         | 142         | 108         | 33            | 11            | 3             | 7      |
|         | 0-9   | 4            | 1    | 1           | 1           | 0           | 0           | 0           | 1             | 0             | 0             | 0      |
|         | 10-19 | 24           | 6    | 9           | 0           | 2           | 6           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 25           | 14   | 5           | 0           | 2           | 3           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 112          | 45   | 32          | 7           | 5           | 8           | 11          | 2             | 2             | 0             | 0      |
|         | 40-49 | 365          | 167  | 87          | 9           | 27          | 33          | 28          | 5             | 5             | 1             | 3      |
|         | ≥ 50  | 1035         | 447  | 269         | 60          | 65          | 92          | 67          | 25            | 4             | 2             | 4      |
| 1966-70 | 合 計   | 1752         | 797  | 420         | 91          | 128         | 161         | 83          | 48            | 17            | 3             | 4      |
|         | 0-9   | 10           | 5    | 2           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 28           | 15   | 5           | 0           | 4           | 2           | 1           | 1             | 0             | 0             | 0      |
|         | 20-29 | 48           | 19   | 9           | 1           | 7           | 3           | 2           | 5             | 1             | 0             | 1      |
|         | 30-39 | 170          | 76   | 50          | 7           | 12          | 8           | 10          | 1             | 5             | 0             | 1      |
|         | 40-49 | 492          | 230  | 116         | 20          | 33          | 46          | 26          | 13            | 6             | 1             | 1      |
|         | ≥ 50  | 1004         | 452  | 238         | 62          | 71          | 101         | 44          | 28            | 5             | 2             | 1      |
| 1971-75 | 合 計   | 1834         | 857  | 425         | 89          | 134         | 157         | 105         | 50            | 8             | 3             | 6      |
|         | 0-9   | 13           | 6    | 5           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 38           | 25   | 5           | 2           | 1           | 1           | 2           | 1             | 0             | 0             | 1      |
|         | 20-29 | 65           | 33   | 13          | 4           | 8           | 4           | 1           | 2             | 0             | 0             | 0      |
|         | 30-39 | 221          | 92   | 58          | 8           | 21          | 14          | 14          | 7             | 2             | 2             | 3      |
|         | 40-49 | 665          | 311  | 137         | 28          | 51          | 69          | 37          | 25            | 5             | 0             | 2      |
|         | ≥ 50  | 832          | 390  | 207         | 47          | 53          | 67          | 51          | 15            | 1             | 1             | 0      |
| 1976-80 | 合 計   | 1661         | 829  | 444         | 112         | 148         | 151         | 93          | 53            | 21            | 3             | 9      |
|         | 0-9   | 21           | 13   | 2           | 1           | 3           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 50           | 21   | 13          | 3           | 5           | 3           | 1           | 2             | 1             | 0             | 1      |
|         | 20-29 | 107          | 52   | 29          | 1           | 7           | 4           | 7           | 3             | 3             | 0             | 1      |
|         | 30-39 | 318          | 140  | 86          | 26          | 19          | 18          | 15          | 7             | 6             | 1             | 2      |
|         | 40-49 | 818          | 357  | 187         | 47          | 76          | 75          | 45          | 21            | 7             | 1             | 2      |
|         | ≥ 50  | 547          | 246  | 127         | 34          | 36          | 51          | 25          | 20            | 4             | 1             | 3      |
| 1981-85 | 合 計   | 1786         | 742  | 490         | 105         | 117         | 168         | 101         | 41            | 12            | 4             | 6      |
|         | 0-9   | 33           | 13   | 10          | 0           | 4           | 2           | 1           | 1             | 1             | 0             | 1      |
|         | 10-19 | 78           | 33   | 18          | 11          | 5           | 7           | 3           | 0             | 0             | 0             | 1      |
|         | 20-29 | 117          | 55   | 34          | 6           | 2           | 11          | 4           | 3             | 1             | 0             | 1      |
|         | 30-39 | 447          | 191  | 114         | 25          | 30          | 40          | 28          | 13            | 3             | 2             | 1      |
|         | 40-49 | 812          | 320  | 233         | 45          | 60          | 73          | 49          | 21            | 7             | 2             | 2      |
|         | ≥ 50  | 299          | 130  | 81          | 18          | 16          | 35          | 16          | 3             | 0             | 0             | 0      |

付表 5B. 循環器疾患による死亡数, 男性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |      |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 4787         | 2278 | 1063        | 289         | 329         | 391         | 250         | 139           | 42            | 12            | 24     |
|         | 0-9   | 65           | 34   | 18          | 1           | 4           | 5           | 1           | 1             | 1             | 0             | 0      |
|         | 10-19 | 143          | 74   | 29          | 11          | 8           | 11          | 6           | 1             | 1             | 0             | 2      |
|         | 20-29 | 151          | 69   | 33          | 5           | 17          | 9           | 7           | 7             | 2             | 0             | 2      |
|         | 30-39 | 527          | 251  | 124         | 24          | 38          | 29          | 36          | 10            | 6             | 4             | 5      |
|         | 40-49 | 1606         | 760  | 335         | 90          | 121         | 134         | 88          | 51            | 19            | 2             | 6      |
|         | ≥ 50  | 2305         | 1090 | 524         | 138         | 141         | 203         | 112         | 69            | 13            | 8             | 9      |
| 1950-55 | 合 計   | 498          | 248  | 119         | 25          | 38          | 32          | 23          | 6             | 3             | 1             | 3      |
|         | 0-9   | 7            | 3    | 4           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 7            | 4    | 0           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 4            | 1    | 0           | 0           | 2           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 20           | 11   | 2           | 0           | 2           | 2           | 1           | 1             | 0             | 1             | 0      |
|         | 40-49 | 74           | 38   | 12          | 5           | 7           | 6           | 3           | 1             | 2             | 0             | 0      |
|         | ≥ 50  | 386          | 191  | 101         | 19          | 26          | 23          | 18          | 4             | 1             | 0             | 3      |
| 1956-60 | 合 計   | 639          | 318  | 129         | 34          | 38          | 63          | 23          | 24            | 7             | 0             | 3      |
|         | 0-9   | 4            | 3    | 0           | 0           | 0           | 0           | 0           | 0             | 1             | 0             | 0      |
|         | 10-19 | 5            | 4    | 0           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 8            | 2    | 5           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 24           | 9    | 6           | 1           | 3           | 3           | 2           | 0             | 0             | 0             | 1      |
|         | 40-49 | 136          | 67   | 24          | 9           | 9           | 13          | 7           | 7             | 0             | 0             | 0      |
|         | ≥ 50  | 462          | 233  | 95          | 24          | 26          | 46          | 13          | 17            | 6             | 0             | 2      |
| 1961-65 | 合 計   | 767          | 345  | 185         | 41          | 47          | 63          | 53          | 20            | 7             | 3             | 3      |
|         | 0-9   | 1            | 0    | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 12           | 4    | 6           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 11           | 5    | 3           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 48           | 22   | 13          | 2           | 2           | 2           | 6           | 1             | 0             | 0             | 0      |
|         | 40-49 | 214          | 103  | 41          | 7           | 14          | 20          | 19          | 4             | 4             | 1             | 1      |
|         | ≥ 50  | 481          | 211  | 121         | 32          | 28          | 39          | 28          | 15            | 3             | 2             | 2      |
| 1966-70 | 合 計   | 788          | 369  | 183         | 39          | 54          | 65          | 38          | 30            | 5             | 2             | 3      |
|         | 0-9   | 6            | 3    | 0           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 21           | 11   | 4           | 0           | 2           | 2           | 1           | 1             | 0             | 0             | 0      |
|         | 20-29 | 20           | 8    | 2           | 1           | 5           | 1           | 0           | 3             | 0             | 0             | 0      |
|         | 30-39 | 79           | 36   | 24          | 1           | 6           | 2           | 5           | 1             | 3             | 0             | 1      |
|         | 40-49 | 250          | 127  | 62          | 9           | 12          | 17          | 13          | 7             | 2             | 0             | 1      |
|         | ≥ 50  | 412          | 184  | 91          | 27          | 28          | 42          | 19          | 18            | 0             | 2             | 1      |
| 1971-75 | 合 計   | 746          | 368  | 156         | 36          | 48          | 64          | 43          | 22            | 2             | 2             | 5      |
|         | 0-9   | 10           | 4    | 4           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 26           | 17   | 4           | 1           | 0           | 1           | 2           | 0             | 0             | 0             | 1      |
|         | 20-29 | 30           | 15   | 6           | 1           | 4           | 2           | 1           | 1             | 0             | 0             | 0      |
|         | 30-39 | 99           | 47   | 26          | 3           | 7           | 6           | 5           | 2             | 0             | 1             | 2      |
|         | 40-49 | 279          | 137  | 55          | 12          | 19          | 30          | 11          | 12            | 1             | 0             | 2      |
|         | ≥ 50  | 302          | 148  | 61          | 19          | 18          | 23          | 24          | 7             | 1             | 1             | 0      |
| 1976-80 | 合 計   | 731          | 353  | 144         | 46          | 55          | 56          | 36          | 22            | 13            | 2             | 4      |
|         | 0-9   | 14           | 10   | 1           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 29           | 15   | 9           | 1           | 2           | 0           | 1           | 0             | 1             | 0             | 0      |
|         | 20-29 | 44           | 23   | 7           | 1           | 4           | 1           | 2           | 3             | 2             | 0             | 1      |
|         | 30-39 | 118          | 60   | 24          | 9           | 5           | 5           | 9           | 1             | 3             | 1             | 1      |
|         | 40-49 | 341          | 155  | 66          | 24          | 32          | 28          | 18          | 12            | 5             | 0             | 1      |
|         | ≥ 50  | 185          | 90   | 37          | 11          | 10          | 21          | 6           | 6             | 2             | 1             | 1      |
| 1981-85 | 合 計   | 628          | 277  | 147         | 48          | 49          | 48          | 34          | 15            | 5             | 2             | 3      |
|         | 0-9   | 23           | 11   | 8           | 0           | 1           | 1           | 1           | 1             | 0             | 0             | 0      |
|         | 10-19 | 43           | 19   | 6           | 8           | 2           | 5           | 2           | 0             | 0             | 0             | 1      |
|         | 20-29 | 34           | 15   | 10          | 2           | 0           | 4           | 2           | 0             | 0             | 0             | 1      |
|         | 30-39 | 139          | 68   | 30          | 8           | 13          | 9           | 8           | 4             | 0             | 1             | 0      |
|         | 40-49 | 312          | 133  | 75          | 24          | 28          | 20          | 17          | 8             | 5             | 1             | 1      |
|         | ≥ 50  | 77           | 33   | 18          | 6           | 5           | 9           | 4           | 2             | 0             | 0             | 0      |

付表 5C. 循環器疾患による死亡数, 女性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |      |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 8387         | 2747 | 1704        | 338         | 446         | 590         | 340         | 134           | 43            | 8             | 19     |
|         | 0-9   | 40           | 18   | 6           | 2           | 6           | 5           | 0           | 1             | 1             | 0             | 1      |
|         | 10-19 | 104          | 42   | 23          | 8           | 11          | 12          | 3           | 4             | 0             | 0             | 1      |
|         | 20-29 | 245          | 117  | 69          | 7           | 11          | 19          | 11          | 7             | 3             | 0             | 1      |
|         | 30-39 | 852          | 337  | 244         | 56          | 58          | 66          | 50          | 23            | 13            | 2             | 3      |
|         | 40-49 | 1998         | 817  | 523         | 87          | 155         | 201         | 117         | 44            | 15            | 4             | 5      |
|         | ≥ 50  | 3158         | 1416 | 839         | 176         | 205         | 287         | 159         | 55            | 11            | 2             | 8      |
| 1950-55 | 合 計   | 548          | 237  | 167         | 30          | 27          | 44          | 25          | 8             | 5             | 2             | 3      |
|         | 0-9   | 5            | 3    | 0           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 7            | 3    | 1           | 1           | 1           | 0           | 0           | 1             | 0             | 0             | 0      |
|         | 20-29 | 13           | 5    | 5           | 0           | 0           | 2           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 31           | 8    | 10          | 5           | 0           | 2           | 3           | 2             | 1             | 0             | 0      |
|         | 40-49 | 87           | 35   | 28          | 6           | 4           | 8           | 4           | 0             | 2             | 0             | 0      |
|         | ≥ 50  | 405          | 183  | 123         | 18          | 22          | 30          | 18          | 4             | 2             | 2             | 3      |
| 1956-60 | 合 計   | 681          | 317  | 170         | 42          | 46          | 63          | 29          | 10            | 1             | 1             | 2      |
|         | 0-9   | 8            | 5    | 0           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 10           | 5    | 1           | 1           | 0           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 9            | 5    | 2           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 36           | 16   | 11          | 1           | 4           | 2           | 2           | 0             | 0             | 0             | 0      |
|         | 40-49 | 125          | 52   | 34          | 8           | 9           | 12          | 6           | 2             | 0             | 1             | 1      |
|         | ≥ 50  | 493          | 234  | 122         | 32          | 31          | 45          | 19          | 8             | 1             | 0             | 1      |
| 1961-65 | 合 計   | 798          | 335  | 218         | 36          | 54          | 79          | 55          | 13            | 4             | 0             | 4      |
|         | 0-9   | 3            | 1    | 0           | 1           | 0           | 0           | 0           | 1             | 0             | 0             | 0      |
|         | 10-19 | 12           | 2    | 3           | 0           | 1           | 5           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 14           | 9    | 2           | 0           | 0           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 64           | 23   | 19          | 5           | 3           | 6           | 5           | 1             | 2             | 0             | 0      |
|         | 40-49 | 151          | 64   | 46          | 2           | 13          | 13          | 9           | 1             | 1             | 0             | 2      |
|         | ≥ 50  | 554          | 236  | 148         | 28          | 37          | 53          | 39          | 10            | 1             | 0             | 2      |
| 1966-70 | 合 計   | 964          | 428  | 237         | 52          | 74          | 98          | 45          | 18            | 12            | 1             | 1      |
|         | 0-9   | 4            | 2    | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 7            | 4    | 1           | 0           | 2           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 28           | 11   | 7           | 0           | 2           | 2           | 2           | 1             | 0             | 0             | 1      |
|         | 30-39 | 91           | 40   | 26          | 6           | 6           | 6           | 5           | 0             | 2             | 0             | 0      |
|         | 40-49 | 242          | 103  | 54          | 11          | 21          | 29          | 13          | 6             | 4             | 1             | 0      |
|         | ≥ 50  | 592          | 268  | 147         | 35          | 43          | 59          | 25          | 10            | 5             | 0             | 0      |
| 1971-75 | 合 計   | 1086         | 489  | 269         | 53          | 88          | 93          | 62          | 28            | 6             | 1             | 1      |
|         | 0-9   | 3            | 2    | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 12           | 8    | 1           | 1           | 1           | 0           | 0           | 1             | 0             | 0             | 0      |
|         | 20-29 | 35           | 18   | 7           | 3           | 4           | 2           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 122          | 45   | 32          | 5           | 14          | 8           | 9           | 5             | 2             | 1             | 1      |
|         | 40-49 | 386          | 174  | 82          | 16          | 32          | 39          | 26          | 13            | 4             | 0             | 0      |
|         | ≥ 50  | 530          | 242  | 146         | 28          | 35          | 44          | 27          | 8             | 0             | 0             | 0      |
| 1976-80 | 合 計   | 1130         | 476  | 300         | 66          | 91          | 95          | 57          | 31            | 8             | 1             | 5      |
|         | 0-9   | 7            | 3    | 1           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 21           | 6    | 4           | 2           | 3           | 3           | 0           | 2             | 0             | 0             | 1      |
|         | 20-29 | 63           | 29   | 22          | 0           | 3           | 3           | 5           | 0             | 1             | 0             | 0      |
|         | 30-39 | 200          | 80   | 62          | 17          | 14          | 11          | 6           | 6             | 3             | 0             | 1      |
|         | 40-49 | 477          | 202  | 121         | 23          | 44          | 47          | 27          | 9             | 2             | 1             | 1      |
|         | ≥ 50  | 362          | 158  | 90          | 23          | 26          | 30          | 19          | 14            | 2             | 0             | 2      |
| 1981-85 | 合 計   | 1158         | 465  | 343         | 57          | 68          | 120         | 67          | 26            | 7             | 2             | 3      |
|         | 0-9   | 10           | 2    | 2           | 0           | 3           | 1           | 0           | 0             | 1             | 0             | 1      |
|         | 10-19 | 35           | 14   | 12          | 3           | 3           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 83           | 40   | 24          | 4           | 2           | 7           | 2           | 3             | 1             | 0             | 0      |
|         | 30-39 | 308          | 125  | 84          | 17          | 17          | 31          | 20          | 9             | 3             | 1             | 1      |
|         | 40-49 | 500          | 187  | 158         | 21          | 32          | 53          | 32          | 13            | 2             | 1             | 1      |
|         | ≥ 50  | 222          | 97   | 63          | 12          | 11          | 26          | 12          | 1             | 0             | 0             | 0      |

付表6A. 呼吸器疾患による死亡数, 男女合計

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |     |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0   | .01<br>-.05 | .05<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 2036         | 888 | 528         | 135         | 162         | 150         | 95          | 45            | 17            | 4             | 12     |
|         | 0-9   | 25           | 11  | 9           | 2           | 3           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 41           | 23  | 5           | 1           | 0           | 4           | 5           | 1             | 0             | 0             | 1      |
|         | 20-29 | 69           | 27  | 20          | 7           | 5           | 4           | 3           | 1             | 1             | 0             | 1      |
|         | 30-39 | 221          | 80  | 56          | 21          | 20          | 23          | 14          | 3             | 1             | 1             | 2      |
|         | 40-49 | 667          | 306 | 160         | 38          | 54          | 47          | 29          | 18            | 8             | 1             | 5      |
|         | ≥ 50  | 1013         | 441 | 277         | 65          | 80          | 72          | 44          | 22            | 7             | 2             | 3      |
| 1950-55 | 合 計   | 167          | 70  | 48          | 11          | 14          | 11          | 7           | 4             | 1             | 0             | 1      |
|         | 0-9   | 2            | 1   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 7            | 5   | 0           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 4            | 3   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 8            | 3   | 3           | 1           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 17           | 6   | 5           | 2           | 0           | 2           | 1           | 0             | 0             | 0             | 1      |
|         | ≥ 50  | 129          | 52  | 38          | 8           | 14          | 7           | 5           | 4             | 1             | 0             | 0      |
| 1956-60 | 合 計   | 216          | 92  | 64          | 9           | 16          | 18          | 7           | 7             | 1             | 1             | 1      |
|         | 0-9   | 6            | 5   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 7            | 2   | 2           | 0           | 0           | 1           | 1           | 1             | 0             | 0             | 0      |
|         | 20-29 | 7            | 3   | 3           | 0           | 0           | 0           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 16           | 7   | 2           | 2           | 1           | 0           | 1           | 1             | 0             | 1             | 1      |
|         | 40-49 | 26           | 12  | 7           | 0           | 4           | 3           | 0           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 154          | 63  | 49          | 7           | 11          | 14          | 5           | 4             | 1             | 0             | 0      |
| 1961-65 | 合 計   | 249          | 117 | 64          | 19          | 13          | 13          | 13          | 5             | 1             | 1             | 3      |
|         | 0-9   | 1            | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 2            | 1   | 0           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 8            | 3   | 3           | 1           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 12           | 3   | 5           | 2           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 40           | 20  | 10          | 1           | 1           | 2           | 3           | 2             | 0             | 0             | 1      |
|         | ≥ 50  | 186          | 90  | 45          | 14          | 12          | 8           | 8           | 3             | 1             | 1             | 2      |
| 1966-70 | 合 計   | 271          | 114 | 80          | 14          | 18          | 21          | 14          | 8             | 1             | 0             | 1      |
|         | 0-9   | 1            | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 2            | 0   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 13           | 5   | 5           | 0           | 1           | 0           | 1           | 0             | 0             | 0             | 1      |
|         | 30-39 | 21           | 10  | 5           | 0           | 2           | 2           | 2           | 0             | 0             | 0             | 0      |
|         | 40-49 | 73           | 28  | 27          | 2           | 6           | 5           | 1           | 3             | 1             | 0             | 0      |
|         | ≥ 50  | 161          | 71  | 41          | 12          | 9           | 14          | 9           | 5             | 0             | 0             | 0      |
| 1971-75 | 合 計   | 321          | 142 | 74          | 24          | 25          | 20          | 17          | 9             | 8             | 1             | 3      |
|         | 0-9   | 5            | 3   | 0           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 9            | 5   | 2           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 1      |
|         | 20-29 | 9            | 3   | 1           | 1           | 2           | 0           | 1           | 0             | 1             | 0             | 0      |
|         | 30-39 | 24           | 7   | 5           | 1           | 2           | 5           | 3           | 1             | 0             | 0             | 0      |
|         | 40-49 | 115          | 57  | 23          | 9           | 9           | 4           | 4           | 7             | 1             | 0             | 1      |
|         | ≥ 50  | 159          | 67  | 43          | 12          | 11          | 11          | 8           | 1             | 4             | 1             | 1      |
| 1976-80 | 合 計   | 402          | 178 | 93          | 31          | 41          | 30          | 22          | 5             | 2             | 0             | 0      |
|         | 0-9   | 6            | 2   | 2           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 11           | 8   | 0           | 0           | 0           | 1           | 2           | 0             | 0             | 0             | 0      |
|         | 20-29 | 10           | 2   | 4           | 3           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 54           | 19  | 16          | 7           | 7           | 2           | 2           | 0             | 1             | 0             | 0      |
|         | 40-49 | 172          | 84  | 32          | 10          | 18          | 15          | 12          | 2             | 1             | 0             | 0      |
|         | ≥ 50  | 149          | 63  | 39          | 10          | 17          | 11          | 6           | 3             | 0             | 0             | 0      |
| 1981-85 | 合 計   | 410          | 175 | 105         | 27          | 35          | 37          | 15          | 7             | 5             | 1             | 3      |
|         | 0-9   | 4            | 0   | 3           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 3            | 2   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 18           | 8   | 3           | 2           | 2           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 86           | 31  | 20          | 8           | 8           | 13          | 4           | 1             | 0             | 0             | 1      |
|         | 40-49 | 224          | 99  | 56          | 15          | 18          | 16          | 8           | 4             | 5             | 1             | 2      |
|         | ≥ 50  | 75           | 35  | 22          | 2           | 6           | 6           | 2           | 2             | 0             | 0             | 0      |

付表 6B. 呼吸器疾患による死亡数, 男性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |     |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 1025         | 454 | 246         | 83          | 96          | 70          | 49          | 25            | 8             | 4             | 10     |
|         | 0-9   | 14           | 5   | 7           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 25           | 13  | 4           | 0           | 0           | 2           | 4           | 1             | 0             | 0             | 1      |
|         | 20-29 | 29           | 12  | 9           | 3           | 3           | 1           | 0           | 0             | 0             | 0             | 1      |
|         | 30-39 | 108          | 43  | 25          | 9           | 15          | 6           | 5           | 2             | 0             | 1             | 2      |
|         | 40-49 | 361          | 177 | 75          | 19          | 29          | 28          | 16          | 10            | 3             | 1             | 3      |
|         | ≥ 50  | 488          | 204 | 126         | 31          | 48          | 33          | 24          | 12            | 5             | 2             | 3      |
| 1950-55 | 合 計   | 88           | 33  | 23          | 8           | 10          | 6           | 5           | 2             | 0             | 0             | 1      |
|         | 0-9   | 1            | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 2            | 1   | 0           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 4            | 3   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 3            | 1   | 1           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 9            | 3   | 1           | 1           | 0           | 2           | 1           | 0             | 0             | 0             | 1      |
|         | ≥ 50  | 69           | 25  | 19          | 6           | 10          | 3           | 4           | 2             | 0             | 0             | 0      |
| 1956-60 | 合 計   | 118          | 47  | 31          | 4           | 14          | 11          | 4           | 4             | 1             | 1             | 1      |
|         | 0-9   | 2            | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 6            | 2   | 2           | 0           | 0           | 0           | 1           | 1             | 0             | 0             | 0      |
|         | 20-29 | 2            | 1   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 6            | 2   | 0           | 0           | 1           | 0           | 0           | 1             | 0             | 1             | 1      |
|         | 40-49 | 17           | 9   | 2           | 0           | 3           | 3           | 0           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 85           | 31  | 26          | 4           | 10          | 8           | 3           | 2             | 1             | 0             | 0      |
| 1961-65 | 合 計   | 122          | 64  | 27          | 7           | 5           | 7           | 4           | 3             | 1             | 1             | 3      |
|         | 0-9   | 1            | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 1            | 1   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 4            | 2   | 1           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 6            | 1   | 3           | 1           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 27           | 16  | 7           | 0           | 0           | 0           | 1           | 2             | 0             | 0             | 1      |
|         | ≥ 50  | 83           | 44  | 15          | 5           | 5           | 6           | 3           | 1             | 1             | 1             | 2      |
| 1966-70 | 合 計   | 146          | 67  | 37          | 7           | 11          | 12          | 6           | 4             | 1             | 0             | 1      |
|         | 0-9   | 1            | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 1            | 0   | 0           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 3            | 0   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 1      |
|         | 30-39 | 16           | 9   | 2           | 0           | 2           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 41           | 19  | 14          | 2           | 3           | 2           | 0           | 0             | 1             | 0             | 0      |
|         | ≥ 50  | 84           | 39  | 18          | 5           | 6           | 8           | 4           | 4             | 0             | 0             | 0      |
| 1971-75 | 合 計   | 169          | 70  | 38          | 12          | 15          | 8           | 12          | 7             | 4             | 1             | 2      |
|         | 0-9   | 3            | 2   | 0           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 6            | 3   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 1      |
|         | 20-29 | 3            | 2   | 0           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 13           | 6   | 3           | 1           | 0           | 0           | 2           | 1             | 0             | 0             | 0      |
|         | 40-49 | 68           | 30  | 13          | 5           | 7           | 3           | 3           | 6             | 1             | 0             | 0      |
|         | ≥ 50  | 76           | 27  | 21          | 5           | 7           | 5           | 6           | 0             | 3             | 1             | 1      |
| 1976-80 | 合 計   | 191          | 88  | 42          | 16          | 21          | 12          | 10          | 2             | 0             | 0             | 0      |
|         | 0-9   | 4            | 1   | 2           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 8            | 6   | 0           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 4            | 1   | 2           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 23           | 7   | 6           | 4           | 6           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 86           | 47  | 12          | 5           | 7           | 9           | 6           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 66           | 26  | 20          | 6           | 7           | 2           | 3           | 2             | 0             | 0             | 0      |
| 1981-85 | 合 計   | 191          | 85  | 48          | 9           | 20          | 14          | 8           | 3             | 1             | 1             | 2      |
|         | 0-9   | 2            | 0   | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 1            | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 9            | 3   | 2           | 1           | 2           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 41           | 17  | 10          | 2           | 6           | 3           | 2           | 0             | 0             | 0             | 1      |
|         | 40-49 | 113          | 53  | 26          | 6           | 9           | 9           | 5           | 2             | 1             | 1             | 1      |
|         | ≥ 50  | 25           | 12  | 7           | 0           | 3           | 1           | 1           | 1             | 0             | 0             | 0      |

付表6C. 呼吸器疾患による死亡数, 女性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |     |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 1011         | 434 | 282         | 72          | 66          | 80          | 46          | 20            | 9             | 0             | 2      |
|         | 0-9   | 11           | 6   | 2           | 1           | 2           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 16           | 10  | 2           | 1           | 0           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 40           | 15  | 11          | 4           | 2           | 3           | 3           | 1             | 1             | 0             | 0      |
|         | 30-39 | 113          | 37  | 31          | 12          | 5           | 17          | 9           | 1             | 1             | 0             | 0      |
|         | 40-49 | 306          | 129 | 85          | 20          | 25          | 19          | 13          | 8             | 5             | 0             | 2      |
|         | ≥ 50  | 525          | 237 | 151         | 34          | 32          | 39          | 20          | 10            | 2             | 0             | 0      |
| 1950-55 | 合 計   | 79           | 37  | 25          | 3           | 4           | 5           | 2           | 2             | 1             | 0             | 0      |
|         | 0-9   | 1            | 1   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 5            | 4   | 0           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 0            | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 5            | 2   | 2           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 8            | 3   | 4           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 60           | 27  | 19          | 2           | 4           | 4           | 1           | 2             | 1             | 0             | 0      |
| 1956-60 | 合 計   | 98           | 45  | 33          | 5           | 2           | 7           | 3           | 3             | 0             | 0             | 0      |
|         | 0-9   | 4            | 3   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 1            | 0   | 0           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 5            | 2   | 2           | 0           | 0           | 0           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 10           | 5   | 2           | 2           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 9            | 3   | 5           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 69           | 32  | 23          | 3           | 1           | 6           | 2           | 2             | 0             | 0             | 0      |
| 1961-65 | 合 計   | 127          | 53  | 37          | 12          | 8           | 6           | 9           | 2             | 0             | 0             | 0      |
|         | 0-9   | 0            | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 1            | 0   | 0           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 4            | 1   | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 6            | 2   | 2           | 1           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 13           | 4   | 3           | 1           | 1           | 2           | 2           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 103          | 46  | 30          | 9           | 7           | 3           | 6           | 2             | 0             | 0             | 0      |
| 1966-70 | 合 計   | 125          | 47  | 43          | 7           | 7           | 9           | 8           | 4             | 0             | 0             | 0      |
|         | 0-9   | 0            | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 1            | 0   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 10           | 5   | 3           | 0           | 1           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 5            | 1   | 3           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 32           | 9   | 13          | 0           | 3           | 3           | 1           | 3             | 0             | 0             | 0      |
|         | ≥ 50  | 77           | 32  | 23          | 7           | 3           | 6           | 5           | 1             | 0             | 0             | 0      |
| 1971-75 | 合 計   | 152          | 72  | 36          | 12          | 10          | 12          | 5           | 2             | 2             | 0             | 1      |
|         | 0-9   | 2            | 1   | 0           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 3            | 2   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 6            | 1   | 1           | 1           | 1           | 0           | 1           | 0             | 1             | 0             | 0      |
|         | 30-39 | 11           | 1   | 2           | 0           | 2           | 5           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 47           | 27  | 10          | 4           | 2           | 1           | 1           | 1             | 0             | 0             | 1      |
|         | ≥ 50  | 83           | 40  | 22          | 7           | 4           | 6           | 2           | 1             | 1             | 0             | 0      |
| 1976-80 | 合 計   | 211          | 90  | 51          | 15          | 20          | 18          | 12          | 3             | 2             | 0             | 0      |
|         | 0-9   | 2            | 1   | 0           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 3            | 2   | 0           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 6            | 1   | 2           | 2           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 31           | 12  | 10          | 3           | 1           | 2           | 2           | 0             | 1             | 0             | 0      |
|         | 40-49 | 86           | 37  | 20          | 5           | 9           | 6           | 6           | 2             | 1             | 0             | 0      |
|         | ≥ 50  | 83           | 37  | 19          | 4           | 10          | 9           | 3           | 1             | 0             | 0             | 0      |
| 1981-85 | 合 計   | 219          | 90  | 57          | 18          | 15          | 23          | 7           | 4             | 4             | 0             | 1      |
|         | 0-9   | 2            | 0   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 2            | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 9            | 5   | 1           | 1           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 45           | 14  | 10          | 6           | 2           | 10          | 2           | 1             | 0             | 0             | 0      |
|         | 40-49 | 111          | 46  | 30          | 9           | 9           | 7           | 3           | 2             | 4             | 0             | 1      |
|         | ≥ 50  | 50           | 23  | 15          | 2           | 3           | 5           | 1           | 1             | 0             | 0             | 0      |

付表7A. 消化器疾患による死亡数, 男女合計

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |      |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 2149         | 1002 | 510         | 105         | 142         | 194         | 98          | 63            | 14            | 8             | 13     |
|         | 0-9   | 55           | 28   | 13          | 1           | 2           | 9           | 3           | 1             | 0             | 0             | 0      |
|         | 10-19 | 157          | 70   | 38          | 11          | 1           | 11          | 14          | 4             | 2             | 1             | 5      |
|         | 20-29 | 127          | 68   | 18          | 7           | 8           | 14          | 6           | 3             | 0             | 2             | 1      |
|         | 30-39 | 282          | 119  | 76          | 9           | 22          | 26          | 14          | 13            | 1             | 0             | 2      |
|         | 40-49 | 587          | 270  | 130         | 35          | 44          | 48          | 29          | 21            | 5             | 3             | 2      |
|         | ≥ 50  | 941          | 440  | 235         | 42          | 85          | 86          | 32          | 21            | 6             | 2             | 3      |
| 1950-55 | 合 計   | 383          | 187  | 99          | 14          | 28          | 32          | 21          | 10            | 2             | 0             | 0      |
|         | 0-9   | 10           | 5    | 1           | 0           | 0           | 3           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 6            | 3    | 1           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 8            | 2    | 1           | 0           | 2           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 26           | 11   | 9           | 0           | 2           | 1           | 3           | 0             | 0             | 0             | 0      |
|         | 40-49 | 79           | 41   | 18          | 3           | 6           | 3           | 3           | 4             | 1             | 0             | 0      |
|         | ≥ 50  | 264          | 125  | 69          | 11          | 18          | 22          | 12          | 6             | 1             | 0             | 0      |
| 1956-60 | 合 計   | 327          | 160  | 73          | 14          | 23          | 33          | 9           | 10            | 1             | 2             | 2      |
|         | 0-9   | 5            | 2    | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 13           | 9    | 2           | 1           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 13           | 8    | 1           | 0           | 0           | 2           | 0           | 2             | 0             | 0             | 0      |
|         | 30-39 | 29           | 12   | 7           | 1           | 3           | 5           | 0           | 0             | 0             | 0             | 1      |
|         | 40-49 | 57           | 25   | 11          | 4           | 6           | 5           | 2           | 2             | 1             | 1             | 0      |
|         | ≥ 50  | 210          | 104  | 50          | 8           | 14          | 20          | 6           | 6             | 0             | 1             | 1      |
| 1961-65 | 合 計   | 310          | 145  | 77          | 18          | 23          | 24          | 13          | 6             | 2             | 1             | 1      |
|         | 0-9   | 2            | 2    | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 8            | 0    | 4           | 1           | 0           | 1           | 0           | 2             | 0             | 0             | 0      |
|         | 20-29 | 15           | 9    | 2           | 0           | 1           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 31           | 12   | 9           | 3           | 3           | 1           | 2           | 1             | 0             | 0             | 0      |
|         | 40-49 | 80           | 38   | 23          | 5           | 2           | 4           | 5           | 3             | 0             | 0             | 0      |
|         | ≥ 50  | 174          | 84   | 39          | 9           | 17          | 16          | 5           | 0             | 2             | 1             | 1      |
| 1966-70 | 合 計   | 299          | 130  | 77          | 14          | 16          | 32          | 11          | 12            | 4             | 1             | 2      |
|         | 0-9   | 6            | 2    | 2           | 0           | 1           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 18           | 8    | 6           | 0           | 0           | 3           | 0           | 1             | 2             | 0             | 0      |
|         | 20-29 | 17           | 10   | 3           | 0           | 1           | 3           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 36           | 19   | 12          | 0           | 3           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 95           | 35   | 16          | 8           | 6           | 13          | 8           | 5             | 1             | 1             | 2      |
|         | ≥ 50  | 127          | 58   | 38          | 6           | 5           | 11          | 2           | 6             | 1             | 0             | 0      |
| 1971-75 | 合 計   | 268          | 110  | 65          | 20          | 18          | 21          | 20          | 8             | 3             | 1             | 2      |
|         | 0-9   | 4            | 2    | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 33           | 14   | 10          | 2           | 0           | 2           | 4           | 0             | 0             | 0             | 1      |
|         | 20-29 | 19           | 9    | 3           | 2           | 1           | 0           | 2           | 1             | 0             | 1             | 0      |
|         | 30-39 | 38           | 15   | 8           | 4           | 3           | 3           | 3           | 4             | 0             | 0             | 0      |
|         | 40-49 | 93           | 36   | 27          | 6           | 8           | 7           | 6           | 2             | 1             | 0             | 0      |
|         | ≥ 50  | 81           | 34   | 18          | 6           | 6           | 9           | 4           | 1             | 2             | 0             | 1      |
| 1976-80 | 合 計   | 300          | 150  | 68          | 13          | 24          | 21          | 10          | 10            | 1             | 1             | 2      |
|         | 0-9   | 15           | 7    | 4           | 0           | 0           | 3           | 0           | 1             | 0             | 0             | 0      |
|         | 10-19 | 35           | 20   | 8           | 4           | 0           | 0           | 2           | 0             | 0             | 0             | 1      |
|         | 20-29 | 33           | 16   | 5           | 4           | 3           | 2           | 2           | 0             | 0             | 0             | 1      |
|         | 30-39 | 56           | 20   | 19          | 0           | 4           | 4           | 3           | 5             | 1             | 0             | 0      |
|         | 40-49 | 97           | 55   | 17          | 3           | 12          | 5           | 1           | 3             | 0             | 1             | 0      |
|         | ≥ 50  | 64           | 32   | 15          | 2           | 5           | 7           | 2           | 1             | 0             | 0             | 0      |
| 1981-85 | 合 計   | 252          | 120  | 51          | 12          | 10          | 31          | 14          | 7             | 1             | 2             | 4      |
|         | 0-9   | 13           | 6    | 3           | 1           | 1           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 44           | 18   | 7           | 3           | 1           | 4           | 6           | 1             | 0             | 1             | 3      |
|         | 20-29 | 22           | 14   | 3           | 1           | 0           | 3           | 0           | 0             | 0             | 1             | 0      |
|         | 30-39 | 66           | 30   | 14          | 1           | 4           | 10          | 3           | 3             | 0             | 0             | 1      |
|         | 40-49 | 86           | 40   | 18          | 6           | 4           | 11          | 4           | 2             | 1             | 0             | 0      |
|         | ≥ 50  | 21           | 12   | 6           | 0           | 0           | 1           | 1           | 1             | 0             | 0             | 0      |



付表 7B. 消化器疾患による死亡数, 男性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |     |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0   | .01<br>-.05 | .05<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 1108         | 543 | 234         | 51          | 66          | 105         | 54          | 33            | 8             | 3             | 11     |
|         | 0-9   | 44           | 20  | 10          | 1           | 2           | 8           | 2           | 1             | 0             | 0             | 0      |
|         | 10-19 | 119          | 58  | 29          | 6           | 1           | 7           | 10          | 2             | 2             | 1             | 5      |
|         | 20-29 | 66           | 36  | 9           | 4           | 4           | 7           | 5           | 0             | 0             | 0             | 1      |
|         | 30-39 | 139          | 60  | 32          | 5           | 11          | 15          | 6           | 8             | 1             | 0             | 1      |
|         | 40-49 | 280          | 141 | 54          | 17          | 18          | 22          | 15          | 10            | 2             | 0             | 1      |
|         | ≥ 50  | 460          | 230 | 100         | 18          | 30          | 46          | 16          | 12            | 3             | 2             | 3      |
| 1950-55 | 合 計   | 208          | 107 | 43          | 6           | 13          | 23          | 9           | 6             | 1             | 0             | 0      |
|         | 0-9   | 7            | 3   | 0           | 0           | 0           | 3           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 4            | 2   | 1           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 4            | 0   | 1           | 0           | 0           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 12           | 8   | 2           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 43           | 23  | 9           | 1           | 4           | 2           | 2           | 1             | 1             | 0             | 0      |
|         | ≥ 50  | 138          | 71  | 30          | 5           | 9           | 14          | 4           | 5             | 0             | 0             | 0      |
| 1956-60 | 合 計   | 181          | 92  | 38          | 7           | 8           | 19          | 7           | 6             | 1             | 1             | 2      |
|         | 0-9   | 5            | 2   | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 8            | 6   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 6            | 4   | 1           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 17           | 6   | 4           | 1           | 1           | 4           | 0           | 0             | 0             | 0             | 1      |
|         | 40-49 | 30           | 14  | 3           | 3           | 2           | 4           | 1           | 2             | 1             | 0             | 0      |
|         | ≥ 50  | 115          | 60  | 27          | 3           | 5           | 9           | 5           | 4             | 0             | 1             | 1      |
| 1961-65 | 合 計   | 159          | 77  | 32          | 11          | 12          | 13          | 8           | 3             | 1             | 1             | 1      |
|         | 0-9   | 2            | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 3            | 0   | 3           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 5            | 3   | 0           | 0           | 1           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 18           | 7   | 4           | 2           | 2           | 1           | 2           | 0             | 0             | 0             | 0      |
|         | 40-49 | 47           | 24  | 12          | 3           | 1           | 1           | 3           | 3             | 0             | 0             | 0      |
|         | ≥ 50  | 84           | 41  | 13          | 6           | 8           | 11          | 2           | 0             | 1             | 1             | 1      |
| 1966-70 | 合 計   | 142          | 66  | 29          | 7           | 11          | 14          | 5           | 6             | 3             | 0             | 1      |
|         | 0-9   | 3            | 1   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 14           | 6   | 3           | 0           | 0           | 2           | 0           | 1             | 2             | 0             | 0      |
|         | 20-29 | 7            | 4   | 1           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 16           | 10  | 3           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 52           | 23  | 7           | 5           | 3           | 6           | 3           | 4             | 0             | 0             | 1      |
|         | ≥ 50  | 50           | 22  | 14          | 2           | 4           | 4           | 2           | 1             | 1             | 0             | 0      |
| 1971-75 | 合 計   | 136          | 63  | 30          | 8           | 8           | 9           | 13          | 2             | 1             | 0             | 2      |
|         | 0-9   | 4            | 2   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 28           | 11  | 9           | 2           | 0           | 2           | 3           | 0             | 0             | 0             | 1      |
|         | 20-29 | 11           | 4   | 2           | 2           | 1           | 0           | 2           | 0             | 0             | 0             | 0      |
|         | 30-39 | 22           | 11  | 1           | 2           | 2           | 2           | 2           | 2             | 0             | 0             | 0      |
|         | 40-49 | 35           | 17  | 8           | 1           | 3           | 2           | 4           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 36           | 18  | 9           | 1           | 2           | 3           | 1           | 0             | 1             | 0             | 1      |
| 1976-80 | 合 計   | 160          | 81  | 36          | 7           | 9           | 15          | 3           | 6             | 1             | 0             | 2      |
|         | 0-9   | 13           | 5   | 4           | 0           | 0           | 3           | 0           | 1             | 0             | 0             | 0      |
|         | 10-19 | 26           | 16  | 7           | 2           | 0           | 0           | 0           | 0             | 0             | 0             | 1      |
|         | 20-29 | 22           | 13  | 2           | 2           | 1           | 2           | 1           | 0             | 0             | 0             | 1      |
|         | 30-39 | 29           | 8   | 11          | 0           | 3           | 2           | 0           | 4             | 1             | 0             | 0      |
|         | 40-49 | 39           | 24  | 6           | 2           | 3           | 3           | 1           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 31           | 15  | 6           | 1           | 2           | 5           | 1           | 1             | 0             | 0             | 0      |
| 1981-85 | 合 計   | 122          | 57  | 26          | 5           | 5           | 12          | 9           | 4             | 0             | 1             | 3      |
|         | 0-9   | 10           | 5   | 2           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 38           | 15  | 5           | 2           | 1           | 2           | 6           | 1             | 0             | 1             | 3      |
|         | 20-29 | 11           | 8   | 2           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 25           | 10  | 7           | 0           | 1           | 4           | 1           | 2             | 0             | 0             | 0      |
|         | 40-49 | 34           | 16  | 9           | 2           | 2           | 4           | 1           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 6            | 3   | 1           | 0           | 0           | 0           | 1           | 1             | 0             | 0             | 0      |

付表 7C. 消化器疾患による死亡数, 女性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |     |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 1041         | 459 | 278         | 54          | 76          | 89          | 44          | 30            | 6             | 5             | 2      |
|         | 0-9   | 11           | 6   | 3           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 38           | 14  | 9           | 5           | 0           | 4           | 4           | 2             | 0             | 0             | 0      |
|         | 20-29 | 61           | 32  | 9           | 3           | 4           | 7           | 1           | 3             | 0             | 2             | 0      |
|         | 30-39 | 143          | 59  | 44          | 4           | 11          | 11          | 8           | 5             | 0             | 0             | 1      |
|         | 40-49 | 307          | 129 | 76          | 18          | 26          | 28          | 14          | 11            | 3             | 3             | 1      |
|         | ≥ 50  | 481          | 219 | 135         | 24          | 35          | 40          | 16          | 9             | 3             | 0             | 0      |
| 1950-55 | 合 計   | 185          | 80  | 58          | 8           | 15          | 9           | 12          | 4             | 1             | 0             | 0      |
|         | 0-9   | 3            | 2   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 2            | 1   | 0           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 4            | 2   | 0           | 0           | 2           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 14           | 3   | 7           | 0           | 2           | 0           | 2           | 0             | 0             | 0             | 0      |
|         | 40-49 | 36           | 18  | 9           | 2           | 2           | 1           | 3           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 126          | 54  | 39          | 6           | 9           | 8           | 8           | 1             | 1             | 0             | 0      |
| 1956-60 | 合 計   | 146          | 68  | 35          | 7           | 15          | 14          | 2           | 4             | 0             | 1             | 0      |
|         | 0-9   | 0            | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 5            | 3   | 1           | 1           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 7            | 4   | 0           | 0           | 0           | 1           | 0           | 2             | 0             | 0             | 0      |
|         | 30-39 | 12           | 6   | 3           | 0           | 2           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 27           | 11  | 8           | 1           | 4           | 1           | 1           | 0             | 0             | 1             | 0      |
|         | ≥ 50  | 95           | 44  | 23          | 5           | 9           | 11          | 1           | 2             | 0             | 0             | 0      |
| 1961-65 | 合 計   | 151          | 68  | 45          | 7           | 11          | 11          | 5           | 3             | 1             | 0             | 0      |
|         | 0-9   | 0            | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 5            | 0   | 1           | 1           | 0           | 1           | 0           | 2             | 0             | 0             | 0      |
|         | 20-29 | 10           | 6   | 2           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 13           | 5   | 5           | 1           | 1           | 0           | 0           | 1             | 0             | 0             | 0      |
|         | 40-49 | 33           | 14  | 11          | 2           | 1           | 3           | 2           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 90           | 43  | 26          | 3           | 9           | 5           | 3           | 0             | 1             | 0             | 0      |
| 1966-70 | 合 計   | 157          | 84  | 48          | 7           | 5           | 18          | 6           | 6             | 1             | 1             | 1      |
|         | 0-9   | 3            | 1   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 4            | 0   | 3           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 10           | 6   | 2           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 20           | 9   | 9           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 43           | 12  | 9           | 3           | 3           | 7           | 5           | 1             | 1             | 1             | 1      |
|         | ≥ 50  | 77           | 36  | 24          | 4           | 1           | 7           | 0           | 5             | 0             | 0             | 0      |
| 1971-75 | 合 計   | 132          | 47  | 35          | 12          | 10          | 12          | 7           | 6             | 2             | 1             | 0      |
|         | 0-9   | 0            | 0   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 5            | 3   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 8            | 5   | 1           | 0           | 0           | 0           | 0           | 1             | 0             | 1             | 0      |
|         | 30-39 | 16           | 4   | 5           | 2           | 1           | 1           | 1           | 2             | 0             | 0             | 0      |
|         | 40-49 | 58           | 19  | 19          | 5           | 5           | 5           | 2           | 2             | 1             | 0             | 0      |
|         | ≥ 50  | 45           | 16  | 9           | 5           | 4           | 6           | 3           | 1             | 1             | 0             | 0      |
| 1976-80 | 合 計   | 140          | 69  | 32          | 6           | 15          | 6           | 7           | 4             | 0             | 1             | 0      |
|         | 0-9   | 2            | 2   | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 9            | 4   | 1           | 2           | 0           | 0           | 2           | 0             | 0             | 0             | 0      |
|         | 20-29 | 11           | 3   | 3           | 2           | 2           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 27           | 12  | 8           | 0           | 1           | 2           | 3           | 1             | 0             | 0             | 0      |
|         | 40-49 | 58           | 31  | 11          | 1           | 9           | 2           | 0           | 3             | 0             | 1             | 0      |
|         | ≥ 50  | 33           | 17  | 9           | 1           | 3           | 2           | 1           | 0             | 0             | 0             | 0      |
| 1981-85 | 合 計   | 130          | 63  | 25          | 7           | 5           | 18          | 5           | 3             | 1             | 1             | 1      |
|         | 0-9   | 3            | 1   | 1           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 8            | 3   | 2           | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 11           | 6   | 1           | 1           | 0           | 2           | 0           | 0             | 0             | 1             | 0      |
|         | 30-39 | 41           | 20  | 7           | 1           | 3           | 6           | 2           | 1             | 0             | 0             | 1      |
|         | 40-49 | 52           | 24  | 9           | 4           | 2           | 7           | 3           | 2             | 1             | 0             | 0      |
|         | ≥ 50  | 15           | 9   | 5           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |

付表8A. その他の疾患による死亡数, 男女合計

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |      |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 4015         | 1924 | 987         | 200         | 247         | 345         | 185         | 97            | 23            | 8             | 9      |
|         | 0-9   | 88           | 50   | 16          | 6           | 5           | 8           | 2           | 0             | 1             | 0             | 0      |
|         | 10-19 | 172          | 88   | 46          | 7           | 4           | 12          | 6           | 8             | 1             | 0             | 0      |
|         | 20-29 | 153          | 76   | 38          | 9           | 6           | 13          | 1           | 6             | 2             | 0             | 2      |
|         | 30-39 | 340          | 171  | 71          | 24          | 18          | 25          | 22          | 6             | 3             | 0             | 0      |
|         | 40-49 | 799          | 361  | 189         | 39          | 54          | 76          | 47          | 24            | 5             | 2             | 2      |
|         | ≥ 50  | 2463         | 1178 | 627         | 115         | 160         | 211         | 107         | 43            | 11            | 6             | 5      |
| 1950-55 | 合 計   | 791          | 392  | 196         | 41          | 39          | 61          | 35          | 13            | 5             | 4             | 5      |
|         | 0-9   | 15           | 7    | 3           | 0           | 1           | 3           | 0           | 0             | 1             | 0             | 0      |
|         | 10-19 | 35           | 21   | 11          | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 32           | 14   | 7           | 4           | 3           | 1           | 0           | 1             | 0             | 0             | 2      |
|         | 30-39 | 34           | 18   | 6           | 1           | 0           | 4           | 4           | 1             | 0             | 0             | 0      |
|         | 40-49 | 74           | 37   | 16          | 4           | 1           | 8           | 6           | 1             | 1             | 0             | 0      |
|         | ≥ 50  | 601          | 295  | 153         | 31          | 34          | 43          | 25          | 10            | 3             | 4             | 3      |
| 1956-60 | 合 計   | 803          | 391  | 210         | 40          | 47          | 73          | 24          | 14            | 1             | 1             | 2      |
|         | 0-9   | 8            | 3    | 2           | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 26           | 14   | 4           | 0           | 0           | 5           | 2           | 1             | 0             | 0             | 0      |
|         | 20-29 | 23           | 11   | 5           | 0           | 3           | 3           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 36           | 21   | 7           | 4           | 1           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 81           | 39   | 22          | 4           | 6           | 7           | 1           | 2             | 0             | 0             | 0      |
|         | ≥ 50  | 629          | 303  | 170         | 31          | 37          | 54          | 20          | 10            | 1             | 1             | 2      |
| 1961-65 | 合 計   | 648          | 293  | 177         | 28          | 44          | 55          | 27          | 18            | 4             | 1             | 1      |
|         | 0-9   | 16           | 13   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 25           | 8    | 10          | 2           | 0           | 1           | 0           | 3             | 1             | 0             | 0      |
|         | 20-29 | 20           | 9    | 7           | 2           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 28           | 12   | 7           | 4           | 2           | 2           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 67           | 30   | 16          | 3           | 5           | 5           | 4           | 3             | 0             | 0             | 1      |
|         | ≥ 50  | 493          | 221  | 136         | 17          | 36          | 46          | 21          | 12            | 3             | 1             | 0      |
| 1966-70 | 合 計   | 497          | 238  | 119         | 20          | 34          | 41          | 26          | 17            | 1             | 0             | 1      |
|         | 0-9   | 16           | 11   | 2           | 1           | 2           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 24           | 11   | 6           | 1           | 3           | 1           | 1           | 1             | 0             | 0             | 0      |
|         | 20-29 | 18           | 12   | 5           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 35           | 17   | 8           | 2           | 3           | 4           | 0           | 1             | 0             | 0             | 0      |
|         | 40-49 | 110          | 46   | 27          | 4           | 8           | 11          | 4           | 9             | 0             | 0             | 1      |
|         | ≥ 50  | 294          | 141  | 71          | 12          | 18          | 24          | 21          | 6             | 1             | 0             | 0      |
| 1971-75 | 合 計   | 451          | 222  | 95          | 25          | 26          | 43          | 27          | 7             | 5             | 1             | 0      |
|         | 0-9   | 12           | 5    | 2           | 3           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 31           | 14   | 9           | 2           | 0           | 2           | 2           | 2             | 0             | 0             | 0      |
|         | 20-29 | 20           | 13   | 4           | 0           | 0           | 3           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 60           | 27   | 13          | 2           | 4           | 4           | 9           | 1             | 0             | 0             | 0      |
|         | 40-49 | 111          | 55   | 20          | 7           | 7           | 11          | 6           | 1             | 3             | 1             | 0      |
|         | ≥ 50  | 217          | 108  | 47          | 11          | 15          | 22          | 9           | 3             | 2             | 0             | 0      |
| 1976-80 | 合 計   | 428          | 207  | 95          | 22          | 33          | 38          | 20          | 10            | 2             | 1             | 0      |
|         | 0-9   | 13           | 7    | 2           | 1           | 1           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 15           | 8    | 4           | 1           | 0           | 0           | 1           | 1             | 0             | 0             | 0      |
|         | 20-29 | 20           | 8    | 6           | 2           | 0           | 4           | 0           | 1             | 1             | 0             | 0      |
|         | 30-39 | 68           | 42   | 14          | 3           | 3           | 4           | 0           | 2             | 0             | 0             | 0      |
|         | 40-49 | 159          | 72   | 39          | 7           | 13          | 12          | 10          | 5             | 0             | 1             | 0      |
|         | ≥ 50  | 153          | 72   | 30          | 8           | 16          | 16          | 9           | 1             | 1             | 0             | 0      |
| 1981-85 | 合 計   | 397          | 181  | 95          | 24          | 24          | 34          | 26          | 8             | 5             | 0             | 0      |
|         | 0-9   | 9            | 4    | 4           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 16           | 12   | 2           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 20           | 11   | 4           | 1           | 0           | 0           | 0           | 3             | 1             | 0             | 0      |
|         | 30-39 | 79           | 34   | 16          | 8           | 5           | 5           | 7           | 1             | 3             | 0             | 0      |
|         | 40-49 | 197          | 82   | 49          | 10          | 14          | 22          | 18          | 3             | 1             | 0             | 0      |
|         | ≥ 50  | 76           | 38   | 20          | 5           | 4           | 6           | 2           | 1             | 0             | 0             | 0      |

付表 8B. その他の疾患による死亡数, 男性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |     |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|-----|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0   | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 1640         | 824 | 359         | 84          | 97          | 136         | 72          | 48            | 8             | 6             | 6      |
|         | 0-9   | 48           | 25  | 10          | 5           | 3           | 5           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 76           | 40  | 21          | 4           | 2           | 4           | 1           | 3             | 1             | 0             | 0      |
|         | 20-29 | 37           | 19  | 5           | 4           | 3           | 4           | 1           | 1             | 0             | 0             | 0      |
|         | 30-39 | 145          | 78  | 26          | 8           | 5           | 13          | 10          | 4             | 1             | 0             | 0      |
|         | 40-49 | 319          | 149 | 73          | 15          | 17          | 33          | 18          | 12            | 1             | 1             | 2      |
|         | ≥ 50  | 1015         | 513 | 224         | 48          | 67          | 77          | 44          | 28            | 5             | 5             | 4      |
| 1950-55 | 合 計   | 354          | 191 | 83          | 13          | 17          | 24          | 13          | 6             | 2             | 3             | 2      |
|         | 0-9   | 9            | 4   | 2           | 0           | 1           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 13           | 11  | 2           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 6            | 3   | 0           | 1           | 2           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 12           | 8   | 2           | 0           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 35           | 19  | 7           | 1           | 0           | 3           | 4           | 0             | 1             | 0             | 0      |
|         | ≥ 50  | 279          | 146 | 70          | 11          | 14          | 18          | 8           | 6             | 1             | 3             | 2      |
| 1956-60 | 合 計   | 352          | 185 | 78          | 17          | 18          | 36          | 9           | 6             | 0             | 1             | 2      |
|         | 0-9   | 6            | 2   | 1           | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 9            | 3   | 2           | 0           | 0           | 3           | 1           | 0             | 0             | 0             | 0      |
|         | 20-29 | 8            | 5   | 1           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 17           | 12  | 2           | 1           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 41           | 19  | 11          | 1           | 3           | 6           | 1           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 271          | 144 | 61          | 14          | 14          | 23          | 6           | 6             | 0             | 1             | 2      |
| 1961-65 | 合 計   | 268          | 130 | 56          | 13          | 20          | 20          | 14          | 10            | 3             | 1             | 1      |
|         | 0-9   | 9            | 7   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 11           | 2   | 5           | 2           | 0           | 0           | 0           | 1             | 1             | 0             | 0      |
|         | 20-29 | 4            | 2   | 1           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 30-39 | 16           | 7   | 3           | 3           | 1           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 30           | 15  | 5           | 1           | 2           | 3           | 2           | 1             | 0             | 0             | 1      |
|         | ≥ 50  | 198          | 97  | 41          | 7           | 16          | 15          | 11          | 8             | 2             | 1             | 0      |
| 1966-70 | 合 計   | 206          | 98  | 45          | 11          | 13          | 16          | 12          | 9             | 1             | 0             | 1      |
|         | 0-9   | 5            | 3   | 0           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 11           | 5   | 4           | 1           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 5            | 4   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 22           | 9   | 6           | 1           | 2           | 3           | 0           | 1             | 0             | 0             | 0      |
|         | 40-49 | 49           | 20  | 12          | 3           | 2           | 5           | 2           | 4             | 0             | 0             | 1      |
|         | ≥ 50  | 114          | 57  | 22          | 5           | 7           | 8           | 10          | 4             | 1             | 0             | 0      |
| 1971-75 | 合 計   | 185          | 87  | 36          | 10          | 14          | 21          | 10          | 6             | 1             | 0             | 0      |
|         | 0-9   | 7            | 4   | 1           | 2           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 16           | 6   | 6           | 1           | 0           | 1           | 0           | 2             | 0             | 0             | 0      |
|         | 20-29 | 5            | 2   | 1           | 0           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 28           | 13  | 4           | 1           | 1           | 3           | 5           | 1             | 0             | 0             | 0      |
|         | 40-49 | 47           | 26  | 7           | 2           | 4           | 6           | 2           | 0             | 0             | 0             | 0      |
|         | ≥ 50  | 82           | 36  | 17          | 4           | 9           | 9           | 3           | 3             | 1             | 0             | 0      |
| 1976-80 | 合 計   | 152          | 76  | 35          | 11          | 9           | 9           | 6           | 5             | 0             | 1             | 0      |
|         | 0-9   | 5            | 2   | 1           | 1           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 7            | 6   | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 5            | 1   | 1           | 2           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 25           | 17  | 5           | 1           | 0           | 1           | 0           | 1             | 0             | 0             | 0      |
|         | 40-49 | 59           | 25  | 19          | 3           | 3           | 3           | 1           | 4             | 0             | 1             | 0      |
|         | ≥ 50  | 51           | 25  | 8           | 4           | 6           | 3           | 5           | 0             | 0             | 0             | 0      |
| 1981-85 | 合 計   | 123          | 57  | 26          | 9           | 6           | 10          | 8           | 6             | 1             | 0             | 0      |
|         | 0-9   | 7            | 3   | 4           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 9            | 7   | 1           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 4            | 2   | 0           | 1           | 0           | 0           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 25           | 12  | 4           | 1           | 1           | 2           | 3           | 1             | 1             | 0             | 0      |
|         | 40-49 | 58           | 25  | 12          | 4           | 3           | 7           | 4           | 3             | 0             | 0             | 0      |
|         | ≥ 50  | 20           | 8   | 5           | 3           | 1           | 1           | 1           | 1             | 0             | 0             | 0      |

付表8C. その他の疾患による死亡数, 女性

| 期 間     | 被爆時年齢 | 放 射 線 量 (Gy) |      |             |             |             |             |             |               |               |               |        |
|---------|-------|--------------|------|-------------|-------------|-------------|-------------|-------------|---------------|---------------|---------------|--------|
|         |       | 合 計          | 0    | .01<br>-.05 | .06<br>-.09 | .10<br>-.19 | .20<br>-.49 | .50<br>-.99 | 1.00<br>-1.99 | 2.00<br>-2.99 | 3.00<br>-3.99 | ≥ 4.00 |
| 合 計     | 合 計   | 2375         | 1100 | 628         | 116         | 150         | 209         | 113         | 39            | 15            | 2             | 3      |
|         | 0-9   | 40           | 25   | 6           | 1           | 2           | 3           | 2           | 0             | 1             | 0             | 0      |
|         | 10-19 | 96           | 48   | 25          | 3           | 2           | 8           | 5           | 5             | 0             | 0             | 0      |
|         | 20-29 | 116          | 57   | 33          | 5           | 3           | 9           | 0           | 5             | 2             | 0             | 2      |
|         | 30-39 | 195          | 93   | 45          | 16          | 13          | 12          | 12          | 2             | 2             | 0             | 0      |
|         | 40-49 | 480          | 212  | 116         | 24          | 37          | 43          | 31          | 12            | 4             | 1             | 0      |
|         | ≥ 50  | 1448         | 665  | 403         | 67          | 93          | 134         | 63          | 15            | 6             | 1             | 1      |
| 1950-55 | 合 計   | 437          | 201  | 113         | 28          | 22          | 37          | 22          | 7             | 3             | 1             | 3      |
|         | 0-9   | 6            | 3    | 1           | 0           | 0           | 1           | 0           | 0             | 1             | 0             | 0      |
|         | 10-19 | 22           | 10   | 9           | 1           | 0           | 2           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 26           | 11   | 7           | 3           | 1           | 1           | 0           | 1             | 0             | 0             | 2      |
|         | 30-39 | 22           | 10   | 4           | 1           | 0           | 3           | 3           | 1             | 0             | 0             | 0      |
|         | 40-49 | 39           | 18   | 9           | 3           | 1           | 5           | 2           | 1             | 0             | 0             | 0      |
|         | ≥ 50  | 322          | 149  | 83          | 20          | 20          | 25          | 17          | 4             | 2             | 1             | 1      |
| 1956-60 | 合 計   | 451          | 206  | 132         | 23          | 29          | 37          | 15          | 8             | 1             | 0             | 0      |
|         | 0-9   | 2            | 1    | 1           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 17           | 11   | 2           | 0           | 0           | 2           | 1           | 1             | 0             | 0             | 0      |
|         | 20-29 | 15           | 6    | 4           | 0           | 2           | 2           | 0           | 1             | 0             | 0             | 0      |
|         | 30-39 | 19           | 9    | 5           | 3           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 40           | 20   | 11          | 3           | 3           | 1           | 0           | 2             | 0             | 0             | 0      |
|         | ≥ 50  | 358          | 159  | 109         | 17          | 23          | 31          | 14          | 4             | 1             | 0             | 0      |
| 1961-65 | 合 計   | 380          | 163  | 121         | 15          | 24          | 35          | 13          | 8             | 1             | 0             | 0      |
|         | 0-9   | 6            | 6    | 0           | 0           | 0           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 14           | 6    | 5           | 0           | 0           | 1           | 0           | 2             | 0             | 0             | 0      |
|         | 20-29 | 16           | 7    | 6           | 2           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 12           | 5    | 4           | 1           | 1           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 40-49 | 37           | 15   | 11          | 2           | 3           | 2           | 2           | 2             | 0             | 0             | 0      |
|         | ≥ 50  | 295          | 124  | 95          | 10          | 20          | 31          | 10          | 4             | 1             | 0             | 0      |
| 1966-70 | 合 計   | 291          | 140  | 74          | 9           | 21          | 25          | 14          | 8             | 0             | 0             | 0      |
|         | 0-9   | 11           | 8    | 2           | 0           | 1           | 0           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 13           | 6    | 2           | 0           | 2           | 1           | 1           | 1             | 0             | 0             | 0      |
|         | 20-29 | 13           | 8    | 4           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 13           | 8    | 2           | 1           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 40-49 | 61           | 26   | 15          | 1           | 6           | 6           | 2           | 5             | 0             | 0             | 0      |
|         | ≥ 50  | 180          | 84   | 49          | 7           | 11          | 16          | 11          | 2             | 0             | 0             | 0      |
| 1971-75 | 合 計   | 266          | 135  | 59          | 15          | 12          | 22          | 17          | 1             | 4             | 1             | 0      |
|         | 0-9   | 5            | 1    | 1           | 1           | 0           | 1           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 15           | 8    | 3           | 1           | 0           | 1           | 2           | 0             | 0             | 0             | 0      |
|         | 20-29 | 15           | 11   | 3           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 30-39 | 32           | 14   | 9           | 1           | 3           | 1           | 4           | 0             | 0             | 0             | 0      |
|         | 40-49 | 64           | 29   | 13          | 5           | 3           | 5           | 4           | 1             | 3             | 1             | 0      |
|         | ≥ 50  | 135          | 72   | 30          | 7           | 6           | 13          | 6           | 0             | 1             | 0             | 0      |
| 1976-80 | 合 計   | 276          | 131  | 60          | 11          | 24          | 29          | 14          | 5             | 2             | 0             | 0      |
|         | 0-9   | 8            | 5    | 1           | 0           | 1           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 10-19 | 8            | 2    | 3           | 1           | 0           | 0           | 1           | 1             | 0             | 0             | 0      |
|         | 20-29 | 15           | 5    | 5           | 0           | 0           | 3           | 0           | 1             | 1             | 0             | 0      |
|         | 30-39 | 43           | 25   | 9           | 2           | 3           | 3           | 0           | 1             | 0             | 0             | 0      |
|         | 40-49 | 100          | 47   | 20          | 4           | 10          | 9           | 9           | 1             | 0             | 0             | 0      |
|         | ≥ 50  | 102          | 47   | 22          | 4           | 10          | 13          | 4           | 1             | 1             | 0             | 0      |
| 1981-85 | 合 計   | 274          | 124  | 69          | 15          | 18          | 24          | 18          | 2             | 4             | 0             | 0      |
|         | 0-9   | 2            | 1    | 0           | 0           | 0           | 0           | 1           | 0             | 0             | 0             | 0      |
|         | 10-19 | 7            | 5    | 1           | 0           | 0           | 1           | 0           | 0             | 0             | 0             | 0      |
|         | 20-29 | 16           | 9    | 4           | 0           | 0           | 0           | 0           | 2             | 1             | 0             | 0      |
|         | 30-39 | 54           | 22   | 12          | 7           | 4           | 3           | 4           | 0             | 2             | 0             | 0      |
|         | 40-49 | 139          | 57   | 37          | 6           | 11          | 15          | 12          | 0             | 1             | 0             | 0      |
|         | ≥ 50  | 56           | 30   | 15          | 2           | 3           | 5           | 1           | 0             | 0             | 0             | 0      |

付表 9. 被爆時年齢 40 歳以上の LQ モデル\* の期間別回帰係数

| 期 間     | 被 爆 時 年 齢  |            |            |            |            |            |
|---------|------------|------------|------------|------------|------------|------------|
|         | ≥ 4 0      |            | 4 0-4 9    |            | ≥ 5 0      |            |
|         | $\alpha_1$ | $\alpha_2$ | $\alpha_1$ | $\alpha_2$ | $\alpha_1$ | $\alpha_2$ |
| 1950-55 | -0.2400    | 0.0715     | -0.1162    | 0.0113     | -0.2707    | 0.0875     |
| 1956-60 | -0.1986    | 0.0379     | -0.0199    | -0.0201    | -0.2463    | 0.0549     |
| 1961-65 | -0.0420    | 0.0330     | -0.0227    | 0.0333     | -0.0472    | 0.0318     |
| 1966-70 | 0.1615     | -0.0326    | 0.1700     | -0.0058    | 0.1547     | -0.0505    |
| 1971-75 | 0.0836     | -0.0171    | 0.1448     | -0.0179    | 0.0335     | -0.0190    |
| 1976-80 | 0.0362     | -0.0075    | 0.0058     | -0.0100    | 0.0938     | -0.0049    |
| 1981-85 | 0.0635     | -0.0199    | 0.1877     | -0.0324    | -0.3716    | 0.0342     |

\* 相対リスク =  $1 + \alpha_1 d + \alpha_2 d^2$  ただし,  $d$  は放射線量 (グレイ)。

付表10. 腫瘍および血液疾患を除く全疾患の回帰モデルの推定係数

| モデル       | 被爆時年齢<br>(年) | $\alpha_1$ | $\alpha_2$ | $\alpha_3$ | $\beta_1$ | $\beta_2$ | Deviance | df   |
|-----------|--------------|------------|------------|------------|-----------|-----------|----------|------|
| Null      |              |            |            |            |           |           | 2372.2   | 2681 |
| Model 1   |              | 0.0288     |            |            |           |           | 2368.7   | 2680 |
| Model 2   |              | -0.0309    | 0.0189     |            |           |           | 2364.0   | 2679 |
| Model 3   |              |            | 0.0115     |            |           |           | 2365.0   | 2680 |
| Model 4   |              |            | 0.0042     |            | 1.976     |           | 2359.0   | 2679 |
| Model 5-1 |              | -0.1208    | 0.0149     | 0.0214     |           |           | 2357.9   | 2678 |
| Model 5-2 |              | -0.0641    | 0.0123     | 0.0079     | 0.8490    |           | 2356.5   | 2677 |
| Model 5-3 |              | -0.1177    | 0.0123     | 0.0218     | 0.8397    | -2.649    | 2354.1   | 2676 |
| Model 5-4 | <40          | 0.0606     | 0.0425     | -0.0537    |           |           | 2346.0   | 2675 |
|           | ≥40          | -0.1597    | 0.0008     | 0.0461     |           |           |          |      |
| Model 5-5 | <50          | -0.0058    | 0.0259     | -0.0231    |           |           | 2345.8   | 2675 |
|           | ≥50          | -0.1905    | -0.0113    | 0.0698     |           |           |          |      |
| Model 5-6 | <40          | 0.0606     | 0.0425     | -0.0537    |           |           | 2341.7   | 2672 |
|           | 40-49        | -0.0665    | 0.0110     | 0.0044     |           |           |          |      |
|           | ≥50          | -0.1905    | -0.0113    | 0.0698     |           |           |          |      |
| Model 6-1 |              | -0.1701    | 0.0141     | 0.0328     |           |           | 2355.7   | 2678 |
| Model 6-2 |              | -0.1556    | 0.0136     | 0.0299     | 0.2310    |           | 2355.6   | 2677 |
| Model 6-3 |              | -0.2594    | 0.0054     | 0.0671     | 1.789     | -4.503    | 2346.7   | 2676 |
| Model 6-4 | <40          | 0.0499     | 0.0319     | -0.0223    |           |           | 2347.4   | 2675 |
|           | ≥40          | -0.2181    | 0.0062     | 0.0479     |           |           |          |      |
| Model 6-5 | <50          | -0.0145    | 0.0222     | -0.0171    |           |           | 2347.1   | 2675 |
|           | ≥50          | -0.2590    | -0.0016    | 0.0732     |           |           |          |      |
| Model 6-6 | <40          | 0.0499     | 0.0319     | -0.0223    |           |           | 2342.3   | 2672 |
|           | 40-49        | -0.0709    | 0.0138     | -0.0177    |           |           |          |      |
|           | ≥ 50         | -0.2590    | -0.0016    | 0.0732     |           |           |          |      |
| Model 7-1 |              | -0.1067    | 0.0149     | 0.0110     |           |           | 2358.6   | 2678 |
| Model 7-2 |              | -0.0532    | 0.0136     | 0.0017     | 0.6912    |           | 2357.9   | 2677 |

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付表 10. つづき

| モデル       | 被爆時年齢<br>(年) | $\alpha_1$ | $\alpha_2$ | $\alpha_3$ | $\beta_1$ | $\beta_2$ | Deviance | df   |
|-----------|--------------|------------|------------|------------|-----------|-----------|----------|------|
| Model 7-3 |              | -0.1071    | 0.0131     | 0.0082     | 0.7357    | -237.4    | 2356.0   | 2676 |
| Model 7-4 | <40          | 0.1733     | 0.0425     | -0.0703    |           |           | 2339.7   | 2675 |
|           | ≥40          | -0.1683    | 0.0008     | 0.0363     |           |           |          |      |
| Model 7-5 | <50          | -0.0041    | 0.0259     | -0.0239    |           |           | 2345.8   | 2675 |
|           | ≥50          | -0.1879    | -0.0113    | 0.0575     |           |           |          |      |
| Model 7-6 | <40          | 0.1733     | 0.0425     | -0.0703    |           |           | 2335.4   | 2672 |
|           | 40-49        | -0.1407    | 0.0110     | 0.0061     |           |           |          |      |
|           | ≥50          | -0.1879    | -0.0113    | 0.0575     |           |           |          |      |

モデルの定義は次のとおり。

Models 1,2,3, and 4:  $RR = 1 + (\alpha_1 \cdot d + \alpha_2 \cdot d^2) \cdot \exp [\beta_1 I(A < 40)]$ .

Models 5-1 to 3:  $RR = 1 + [\alpha_1 \cdot d \cdot I(T \leq 1965) + \alpha_2 \cdot d^2 + \alpha_3 \cdot d^2 \cdot I(T \leq 1965)] \cdot \exp(\beta_1 \cdot I(A < 40) + \beta_2 \cdot I(A < 50) \cdot I(T \leq 1960))$ .

Models 6-1 to 3:  $RR = 1 + [\alpha_1 \cdot d \cdot I(T \leq 1960) + \alpha_2 \cdot d^2 + \alpha_3 \cdot d^2 \cdot I(T \leq 1960)] \cdot \exp(\beta_1 \cdot I(A < 40) + \beta_2 \cdot I(A < 50) \cdot I(T \leq 1960))$ .

Models 7-1 to 3:  $RR = 1 + [\alpha_1 \cdot d \cdot I(T \leq 1960) + \alpha_2 \cdot d^2 + \alpha_3 \cdot d^2 \cdot I(T \leq 1965)] \cdot \exp(\beta_1 \cdot I(A < 40) + \beta_2 \cdot I(A < 50) \cdot I(T \leq 1960))$ .

Models 5-4 to 6:  $RR = 1 + \alpha_{1j} \cdot d \cdot I(T \leq 1965) + \alpha_{2j} \cdot d^2 + \alpha_{3j} \cdot d^2 \cdot I(T \leq 1965)$ .

Models 6-4 to 6:  $RR = 1 + \alpha_{1j} \cdot d \cdot I(T \leq 1960) + \alpha_{2j} \cdot d^2 + \alpha_{3j} \cdot d^2 \cdot I(T \leq 1960)$ .

Models 7-4 to 6:  $RR = 1 + \alpha_{1j} \cdot d \cdot I(T \leq 1960) + \alpha_{2j} \cdot d^2 + \alpha_{3j} \cdot d^2 \cdot I(T \leq 1965)$ .

ただし、 $j$ は被爆時年齢の区分、 $d$ はグレイ単位。1950-60年の期間では $I(T \leq 1960) = 1$ 、1961-85年の期間では0である。被爆時年齢が40歳未満の場合、 $I(A < 40) = 1$ 、40歳以上の場合は0。また1950-65年の期間では $I(T \geq 1965) = 1$ で、1966-85年の期間では0である。被爆時年齢50歳未満の場合、 $I(A < 50) = 1$ で50歳以上の場合は0である。



付表 11. 死因別回帰モデルの推定係数

| 死 因   | Model*    | 被爆時年齢<br>(年) | $\alpha_1$ | $\alpha_2$ | $\alpha_3$ | Deviance | df   |
|-------|-----------|--------------|------------|------------|------------|----------|------|
| 循環器疾患 | Null      |              |            |            |            | 1881.9   | 2681 |
|       | Model 1   |              | 0.0464     |            |            | 1877.4   | 2680 |
|       | Model 2   |              | 0.0233     | 0.0073     |            | 1877.1   | 2679 |
|       | Model 3   |              |            | 0.0129     |            | 1877.3   | 2680 |
|       | Model 5-1 |              | -0.0716    | 0.0118     | 0.0199     | 1876.4   | 2678 |
|       | Model 5-4 | < 40         | 0.3204     | 0.0513     | -0.1264    | 1864.3   | 2675 |
|       |           | ≥ 40         | -0.1134    | -0.0043    | 0.0485     |          |      |
| 脳卒中   | Null      |              |            |            |            | 1450.5   | 2681 |
|       | Model 1   |              | 0.0260     |            |            | 1449.7   | 2680 |
|       | Model 2   |              | -0.0199    | 0.0145     |            | 1448.8   | 2679 |
|       | Model 3   |              |            | 0.0098     |            | 1448.9   | 2680 |
|       | Model 5-1 |              | -0.1114    | 0.0067     | 0.0335     | 1447.3   | 2678 |
|       | Model 5-4 | < 40         | 0.5546     | 0.0567     | -0.1521    | 1435.3   | 2675 |
|       |           | ≥ 40         | -0.1657    | -0.0139    | 0.0649     |          |      |
| 心疾患   | Null      |              |            |            |            | 1546.7   | 2681 |
|       | Model 1   |              | 0.0733     |            |            | 1542.0   | 2680 |
|       | Model 2   |              | 0.0782     | -0.0016    |            | 1542.0   | 2679 |
|       | Model 3   |              |            | 0.0169     |            | 1543.4   | 2680 |
|       | Model 5-1 |              | -0.0034    | 0.0172     | -0.0002    | 1543.4   | 2678 |
|       | Model 5-4 | < 40         | 0.0566     | 0.0390     | -0.0762    | 1539.1   | 2675 |
|       |           | ≥ 40         | -0.0180    | 0.0057     | 0.0259     |          |      |
| 呼吸器疾患 | Null      |              |            |            |            | 1055.1   | 2681 |
|       | Model 1   |              | 0.0595     |            |            | 1053.5   | 2680 |
|       | Model 2   |              | -0.1562    | 0.0683     |            | 1047.8   | 2679 |
|       | Model 3   |              |            | 0.0304     |            | 1050.1   | 2680 |
|       | Model 5-1 |              | -0.2442    | 0.0238     | 0.0827     | 1048.1   | 2678 |
|       | Model 5-4 | < 40         | -0.1109    | 0.0405     | 0.0648     | 1047.5   | 2675 |
|       |           | ≥ 40         | -0.2629    | 0.0168     | 0.0878     |          |      |

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付表 11. つづき

| 死 因    | Model*    | 被爆時年齢<br>(年) | $\alpha_1$ | $\alpha_2$ | $\alpha_3$ | Deviance | df   |
|--------|-----------|--------------|------------|------------|------------|----------|------|
| 消化器疾患  | Null      |              |            |            |            | 1449.0   | 2681 |
|        | Model 1   |              | 0.0958     |            |            | 1445.0   | 2680 |
|        | Model 2   |              | -0.0316    | 0.0420     |            | 1442.9   | 2679 |
|        | Model 3   |              |            | 0.0340     |            | 1443.0   | 2680 |
|        | Model 5-1 |              | -0.1052    | 0.0719     | -0.0526    | 1436.8   | 2678 |
|        | Model 5-4 | < 40         | 0.0677     | 0.0956     | -0.1142    | 1435.6   | 2675 |
|        |           | ≥ 40         | -0.1407    | 0.0437     | -0.0143    |          |      |
| その他の疾患 | Null      |              |            |            |            | 1438.0   | 2681 |
|        | Model 1   |              | -0.0543    |            |            | 1435.4   | 2680 |
|        | Model 2   |              | -0.1270    | 0.0222     |            | 1433.9   | 2679 |
|        | Model 3   |              |            | -0.0076    |            | 1437.3   | 2680 |
|        | Model 5-1 |              | -0.2942    | -0.0263    | 0.1031     | 1424.0   | 2678 |
|        | Model 5-4 | < 40         | -0.3091    | -0.0276    | 0.1059     | 1423.9   | 2675 |
|        |           | ≥ 40         | -0.2852    | -0.0276    | 0.1041     |          |      |

\*モデルの定義については付表 10 参照。

付表 12. 血液および造血器官の疾患と診断された死亡例の血液学的検討結果, 1950-82年

| 放射線量 (Gy) | 観察年       | 血液疾患と診断された死亡例の総数 |       | 白血病登録になかった者 | 白血病登録による診断 |     |       |       |     |        |
|-----------|-----------|------------------|-------|-------------|------------|-----|-------|-------|-----|--------|
|           |           | 観察値              | 期待値   |             | 合計         | 白血病 | その他の癌 | 血液疾患  |     | その他の疾患 |
|           |           |                  |       |             |            |     |       | 観察値   | 期待値 |        |
| 0         | 918,564   | 42               | 59.0  | 21          | 2          | 2   | 9     | 9.46  | 8   |        |
| 0.01-0.99 | 1,040,366 | 71               | 66.8  | 36          | 1          | 5   | 11    | 10.71 | 18  |        |
| ≥1.00     | 80,876    | 18               | 5.2   | 7           | 6          | 1   | 1     | 0.83  | 3   |        |
| 合計        | 2,039,806 | 131              | 131.0 | 64          | 9          | 8   | 21    | 21.00 | 29  |        |

注：死亡期待数は線量と関連しないという帰無仮説に基づいて計算した。

付表 13. 癌以外の死因の正確性, 1950-85 年

| 疾 患      | 剖検に記載されている主要死因 |               |      |            | 剖検に記載されている主要死因または関連死因 |                    |      |            |            |
|----------|----------------|---------------|------|------------|-----------------------|--------------------|------|------------|------------|
|          | 死亡診断書          | 剖 検<br>(主要死因) | 一 致  | 確診率<br>(%) | 発見率<br>(%)            | 剖 検<br>(いずれかとしてあり) | 一 致  | 確診率<br>(%) | 発見率<br>(%) |
| 循環器疾患    | 2072           | 2036          | 1475 | 71.2       | 72.4                  | 5227               | 2025 | 97.7       | 38.7       |
| 心疾患      | 806            | 836           | 317  | 39.3       | 37.9                  | 4464               | 739  | 91.7       | 16.6       |
| 冠動脈性心疾患  | 322            | 245           | 92   | 28.6       | 37.6                  | 2134               | 222  | 68.9       | 10.4       |
| 脳卒中      | 1214           | 730           | 495  | 40.8       | 67.8                  | 2778               | 1047 | 86.2       | 37.7       |
| その他      | 52             | 470           | 14   | 26.9       | 3.0                   | 3919               | 41   | 78.8       | 1.0        |
| 老衰       | 249            | 6             | 2    | 0.8        | 33.3                  | 45                 | 10   | 4.0        | 22.2       |
| 感染症      | 319            | 375           | 180  | 56.4       | 48.0                  | 1553               | 231  | 72.4       | 14.9       |
| 結核       | 255            | 316           | 161  | 63.1       | 50.9                  | 1170               | 200  | 78.4       | 17.1       |
| その他      | 64             | 59            | 12   | 18.8       | 20.3                  | 473                | 22   | 34.4       | 4.7        |
| 血液疾患     | 54             | 31            | 21   | 38.9       | 67.7                  | 1534               | 39   | 72.2       | 2.5        |
| 肺炎       | 215            | 224           | 39   | 18.1       | 17.4                  | 2881               | 156  | 72.6       | 5.4        |
| 肝硬変      | 198            | 200           | 106  | 53.5       | 53.0                  | 1082               | 164  | 82.8       | 15.2       |
| 腎炎、ネフローゼ | 79             | 35            | 17   | 21.5       | 48.6                  | 343                | 19   | 24.1       | 5.5        |

資料源: Tokunaga et al.<sup>27</sup>

付表 14. 2 Gy 以上を被曝し成人健康調査の検診を受けた死亡者のうち臨床診断によって確認された者の割合

| 死 因   | 死亡数 |      |             |                 |
|-------|-----|------|-------------|-----------------|
|       | 合 計 | 未決定* | 臨床診断と比較したもの | 臨床診断で確認したもの     |
| 合 計   | 125 | 59   | 66          | 55<br>( 83.3 %) |
| 結 核   | 2   | —    | 2           | 2<br>(100.0 %)  |
| 脳卒中   | 34  | 22   | 12          | 12<br>(100.0 %) |
| 心疾患   | 42  | 23   | 19          | 17<br>( 89.5 %) |
| 消化器疾患 | 18  | 3    | 15          | 12<br>( 80.0 %) |
| その他   | 29  | 11   | 18          | 12<br>( 66.7 %) |

注：2 Gy 以上で被曝し成人健康調査の検診を受けた死亡者の総数は 140 人である。このうち 7 人が血液疾患で死亡し、8 人の死因の診断が不適切であった。これを除いた 125 人の死亡について表にした。

\* これらの死亡者は突然の死(脳卒中または心疾患)の可能性があったか、最終の成人健康調査受診と死亡の間に長期間(10 年以上)が経過していたため除外した。

付表 15. 成人健康調査対象者(広島)の死亡診断書に記載された肝硬変の確認

|                            |    |
|----------------------------|----|
| A. すべての情報を用いた場合            |    |
| 肝硬変の総数                     | 77 |
| 1. 剖検(病理診断)により確認           | 19 |
| 2. 成人健康調査の診断で肝硬変と確認        | 18 |
| 3. 成人健康調査の診断で慢性肝炎と確認       | 10 |
| 4. 成人健康調査の診断で肝硬変の可能性ありと確認  | 4  |
| 5. 成人健康調査の診断で慢性肝炎の可能性ありと確認 | 1  |
| 6. 疫学的調査票に記載の病歴により確認       | 5  |
| B. 剖検所見を用いた場合              |    |
| 肝硬変による死亡 77 人中の剖検総数        | 23 |
| 病理診断の主要死因により確認             | 16 |

付表 16A. 死因と剖検診断の比較、腫瘍および血液疾患を除く全疾患

| 放射線量<br>(Gy)          | 人年        | 症例数    |          | 剖検数  | 剖検率<br>(%) | 剖検で発見された癌 |      |             |      |
|-----------------------|-----------|--------|----------|------|------------|-----------|------|-------------|------|
|                       |           | 観察値    | 期待値*     |      |            | 主要診断      |      | 主要診断または関連診断 |      |
|                       |           |        |          |      |            | 例数        | %    | 例数          | %    |
| 全校爆時年齢群, 1950-85年     |           |        |          |      |            |           |      |             |      |
| 合 計                   | 2,185,336 | 20,777 | —        | 2610 | 12.6       | 251       | 9.6  | 490         | 18.8 |
| 0                     | 984,271   | 9490   | 9509.9   | 908  | 9.6        | 102       | 11.2 | 177         | 19.5 |
| 0.01-0.99             | 1,114,651 | 10,507 | 10,509.4 | 1561 | 14.9       | 124       | 7.9  | 275         | 17.6 |
| 1.00-1.99             | 55,261    | 506    | 528.7    | 93   | 18.4       | 19        | 20.4 | 28          | 30.1 |
| 2.00-2.99             | 18,311    | 149    | 131.9    | 24   | 16.2       | 4         | 16.7 | 5           | 20.8 |
| 3.00-3.99             | 5923      | 45     | 39.0     | 11   | 24.4       | 0         | —    | 2           | 18.2 |
| ≥4.00                 | 6919      | 80     | 58.1     | 13   | 16.3       | 2         | 15.4 | 3           | 23.1 |
| 被爆時年齢40歳未満群, 1966-85年 |           |        |          |      |            |           |      |             |      |
| 合 計                   | 935,269   | 3109   | —        | 312  | 10.0       | 27        | 8.7  | 53          | 17.0 |
| 0                     | 422,205   | 1417   | 1420.7   | 120  | 8.5        | 13        | 10.8 | 19          | 15.8 |
| 0.01-0.99             | 476,220   | 1543   | 1559.0   | 169  | 11.0       | 12        | 7.1  | 30          | 17.8 |
| 1.00-1.99             | 23,133    | 82     | 86.4     | 13   | 15.9       | 2         | 15.4 | 3           | 23.1 |
| ≥2.00                 | 13,711    | 67     | 42.9     | 10   | 14.9       | 0         | —    | 1           | 10.0 |

\* 期待死亡数は、都市、性、被爆時年齢群、および追跡期間による差を Mantel-Haenzel 法により調整し、放射線による影響はないという帰無仮説に基づき計算した。

付表 16B. 死因と剖検診断の比較, 心疾患

| 放射線量<br>(Gy)          | 人年        | 症例数  |        | 剖検数 | 剖検率<br>(%) | 剖検で発見された癌 |      |             |      |
|-----------------------|-----------|------|--------|-----|------------|-----------|------|-------------|------|
|                       |           | 観察値  | 期待値*   |     |            | 主要診断      |      | 主要診断または関連診断 |      |
|                       |           |      |        |     |            | 例数        | %    | 例数          | %    |
| 全被爆時年齢群, 1950-85年     |           |      |        |     |            |           |      |             |      |
| 合 計                   | 2,185,336 | 4962 | —      | 570 | 11.5       | 40        | 7.0  | 100         | 17.5 |
| 0                     | 984,271   | 2209 | 2249.7 | 199 | 9.0        | 21        | 10.6 | 41          | 20.6 |
| 0.01-0.99             | 1,114,651 | 2565 | 2533.7 | 338 | 13.2       | 17        | 5.0  | 52          | 15.4 |
| 1.00-1.99             | 55,261    | 117  | 125.0  | 19  | 16.2       | 2         | 10.5 | 5           | 26.3 |
| ≥2.00                 | 31,153    | 71   | 53.5   | 14  | 19.7       | 0         | —    | 2           | 14.3 |
| ≥1.00                 | 86,413    | 188  | 178.5  | 33  | 17.6       | 2         | 6.1  | 7           | 21.2 |
| 被爆時年齢40歳未満群, 1966-85年 |           |      |        |     |            |           |      |             |      |
| 合 計                   | 935,269   | 880  | —      | 75  | 8.5        | 5         | 6.7  | 9           | 12.0 |
| 0                     | 422,205   | 382  | 397.3  | 23  | 6.0        | 2         | 8.7  | 3           | 13.0 |
| 0.01-0.99             | 476,220   | 454  | 446.6  | 42  | 9.3        | 2         | 4.8  | 5           | 11.9 |
| 1.00-1.99             | 23,133    | 25   | 24.4   | 5   | 20.0       | 1         | 20.0 | 1           | 20.0 |
| ≥2.00                 | 13,711    | 19   | 11.7   | 5   | 26.3       | 0         | —    | 0           | —    |
| ≥1.00                 | 36,844    | 44   | 36.1   | 10  | 22.7       | 1         | 10.0 | 1           | 10.0 |

\* 期待死亡数は, 都市, 性, 被爆時年齢群, および追跡期間による差を Mantel-Haenzel 法により調整し, 放射線による影響はないという帰無仮説に基づき計算した。





付表 16D. 死因と剖検診断の比較, 循環器疾患

| 放射線量<br>(Gy)          | 人年        | 症例数    |        | 剖検数  | 剖検率<br>(%) | 剖検で発見された癌 |      |             |      |
|-----------------------|-----------|--------|--------|------|------------|-----------|------|-------------|------|
|                       |           | 観察値    | 期待値*   |      |            | 主要診断      |      | 主要診断または関連診断 |      |
|                       |           |        |        |      |            | 例数        | %    | 例数          | %    |
| 全被爆時年齢群, 1950-85年     |           |        |        |      |            |           |      |             |      |
| 合 計                   | 2,185,336 | 11,164 | —      | 1368 | 12.3       | 84        | 6.1  | 212         | 15.5 |
| 0                     | 984,271   | 5025   | 5083.2 | 474  | 9.4        | 38        | 8.0  | 83          | 17.5 |
| 0.01-0.99             | 1,114,651 | 5718   | 5678.7 | 821  | 14.4       | 40        | 4.9  | 116         | 14.1 |
| 1.00-1.99             | 55,261    | 273    | 282.1  | 45   | 16.5       | 3         | 6.7  | 8           | 17.8 |
| ≥2.00                 | 31,153    | 148    | 119.8  | 28   | 18.9       | 3         | 10.7 | 5           | 17.9 |
| ≥1.00                 | 86,413    | 421    | 401.9  | 78   | 18.5       | 6         | 7.7  | 13          | 16.7 |
| 被爆時年齢40歳未満群, 1966-85年 |           |        |        |      |            |           |      |             |      |
| 合 計                   | 935,269   | 1764   | —      | 151  | 8.6        | 8         | 5.3  | 16          | 10.6 |
| 0                     | 422,205   | 789    | 798.9  | 58   | 7.4        | 4         | 6.9  | 6           | 10.3 |
| 0.01-0.99             | 476,220   | 887    | 892.4  | 81   | 9.1        | 3         | 3.7  | 9           | 11.1 |
| 1.00-1.99             | 23,133    | 46     | 49.2   | 6    | 13.0       | 1         | 16.7 | 1           | 16.7 |
| ≥2.00                 | 13,711    | 42     | 23.4   | 6    | 14.3       | 0         | —    | 0           | —    |
| ≥1.00                 | 36,844    | 88     | 72.6   | 12   | 13.6       | 1         | 8.3  | 1           | 8.3  |

\*期待死亡数は, 都市, 性, 被爆時年齢群, および追跡期間による差を Mantel-Haenzel 法により調整し, 放射線による影響はないという帰無仮説に基づき計算した。

付表 16E. 死因と剖検診断の比較, 冠状動脈性心疾患

| 放射線量<br>(Gy)          | 人年        | 症例数  |       | 剖検数 | 剖検率<br>(%) | 剖検で発見された癌 |     |             |      |
|-----------------------|-----------|------|-------|-----|------------|-----------|-----|-------------|------|
|                       |           | 観察値  | 期待値*  |     |            | 主要診断      |     | 主要診断または関連診断 |      |
|                       |           |      |       |     |            | 例数        | %   | 例数          | %    |
| 全被爆時年齢群, 1950-85年     |           |      |       |     |            |           |     |             |      |
| 合 計                   | 2,185,336 | 1765 | —     | 205 | 11.6       | 12        | 5.9 | 36          | 17.6 |
| 0                     | 984,271   | 744  | 788.1 | 71  | 9.5        | 7         | 9.9 | 16          | 22.5 |
| 0.01-0.99             | 1,114,651 | 954  | 911.0 | 121 | 12.7       | 5         | 4.1 | 17          | 14.0 |
| 1.00-1.99             | 55,261    | 40   | 46.0  | 6   | 15.0       | 0         | —   | 2           | 33.3 |
| ≥2.00                 | 31,153    | 27   | 20.0  | 7   | 25.9       | 0         | —   | 1           | 14.3 |
| ≥1.00                 | 86,413    | 67   | 66.0  | 13  | 19.4       | 0         | —   | 3           | 23.1 |
| 被爆時年齢40歳未満群, 1966-85年 |           |      |       |     |            |           |     |             |      |
| 合 計                   | 935,269   | 363  | —     | 29  | 8.0        | 1         | 3.4 | 4           | 13.8 |
| 0                     | 422,205   | 136  | 162.1 | 6   | 4.4        | 0         | —   | 1           | 16.7 |
| 0.01-0.99             | 476,220   | 209  | 185.7 | 20  | 9.6        | 1         | 5.0 | 3           | 15.0 |
| 1.00-1.99             | 23,133    | 8    | 10.4  | 1   | 12.5       | 0         | —   | 0           | —    |
| ≥2.00                 | 13,711    | 10   | 4.8   | 2   | 20.0       | 0         | —   | 0           | —    |
| ≥1.00                 | 36,844    | 18   | 15.2  | 3   | 16.7       | 0         | —   | 0           | —    |

\*期待死亡数は、都市、性、被爆時年齢群、および追跡期間による差を Mantel-Haenzel 法により調整し、放射線による影響はないという帰無仮説に基づき計算した。

付表 16F. 死因と剖検診断の比較, 脳卒中

| 放射線量<br>(Gy)            | 人年        | 症例数  |        | 剖検数 | 剖検率<br>(%) | 剖検で発見された病 |      |             |      |
|-------------------------|-----------|------|--------|-----|------------|-----------|------|-------------|------|
|                         |           | 観察値  | 期待値*   |     |            | 主要診断      |      | 主要診断または関連診断 |      |
|                         |           |      |        |     |            | 例数        | %    | 例数          | %    |
| 全被爆時年齢群, 1950-85年       |           |      |        |     |            |           |      |             |      |
| 合 計                     | 2,185,336 | 6202 | —      | 798 | 12.9       | 44        | 5.5  | 112         | 14.0 |
| 0                       | 984,271   | 2816 | 2833.5 | 275 | 9.8        | 17        | 6.2  | 42          | 15.3 |
| 0.01-0.99               | 1,114,651 | 3153 | 3145.0 | 483 | 15.3       | 23        | 4.8  | 64          | 13.3 |
| 1.00-1.99               | 55,261    | 156  | 157.1  | 26  | 16.7       | 1         | 3.8  | 3           | 11.5 |
| ≥2.00                   | 31,153    | 77   | 66.3   | 14  | 18.2       | 3         | 21.4 | 3           | 21.4 |
| ≥1.00                   | 86,413    | 233  | 223.4  | 40  | 17.2       | 4         | 10.0 | 6           | 15.0 |
| 被爆時年齢 40 歳未満群, 1966-85年 |           |      |        |     |            |           |      |             |      |
| 合 計                     | 935,269   | 884  | —      | 76  | 8.6        | 3         | 3.9  | 7           | 9.2  |
| 0                       | 422,205   | 407  | 401.6  | 35  | 8.6        | 2         | 5.7  | 3           | 8.6  |
| 0.01-0.99               | 476,220   | 433  | 445.8  | 39  | 9.0        | 1         | 2.6  | 4           | 10.3 |
| 1.00-1.99               | 23,133    | 21   | 24.8   | 1   | 4.8        | 0         | —    | 0           | —    |
| ≥2.00                   | 13,711    | 23   | 11.7   | 1   | 4.3        | 0         | —    | 0           | —    |
| ≥1.00                   | 36,844    | 44   | 36.5   | 2   | 4.5        | 0         | —    | 0           | —    |

\* 期待死亡数は、都市、性、被爆時年齢群、および追跡期間による差を Mantel-Haenszel 法により調整し、放射線による影響はないという帰無仮説に基づき計算した。

付表 17A. 死亡診断書で癌以外の死因によると記載された死亡のうち  
広島・長崎の腫瘍登録に癌症例と報告された者の割合, 線量別

| 放射線量<br>(Gy)             | 死亡数    | 腫瘍登録に報告されていた癌* |     |
|--------------------------|--------|----------------|-----|
|                          |        | 症例数            | %   |
| 全被爆時年齢群, 1950-85 年       |        |                |     |
| 合 計                      | 20,777 | 889            | 4.3 |
| 0                        | 9490   | 353            | 3.7 |
| 0.01-0.99                | 10,507 | 476            | 4.5 |
| 1.00-1.99                | 506    | 39             | 7.7 |
| ≥ 2.00                   | 274    | 21             | 7.7 |
| 被爆時年齢 40 歳未満群, 1966-85 年 |        |                |     |
| 合 計                      | 3109   | 179            | 5.8 |
| 0                        | 1417   | 73             | 5.2 |
| 0.01-0.99                | 1543   | 96             | 6.2 |
| 1.00-1.99                | 82     | 5              | 6.1 |
| ≥ 2.00                   | 67     | 5              | 7.5 |

\*潜在癌を除く。

付表 17B. 死亡診断書で癌以外の死因によると記載された死亡のうち広島・長崎の腫瘍登録で癌症例と報告された者の割合, 死因別

| 死 因                     | 死亡数    | 腫瘍登録に報告されていた癌* |      |
|-------------------------|--------|----------------|------|
|                         |        | 症例数            | %    |
| 全被爆時年齢群, 1950-85年       |        |                |      |
| 腫瘍および血液疾患を除く全疾患         | 20,777 | 889            | 4.3  |
| 循環器疾患                   | 11,164 | 431            | 3.9  |
| 脳卒中                     | 6202   | 208            | 3.4  |
| 心疾患                     | 4962   | 223            | 4.5  |
| 呼吸器疾患                   | 2036   | 120            | 5.9  |
| 消化器疾患                   | 2149   | 156            | 7.3  |
| 肝硬変                     | 697    | 63             | 9.0  |
| 被爆時年齢 40 歳未満群, 1966-85年 |        |                |      |
| 腫瘍および血液疾患を除く全疾患         | 3109   | 179            | 5.8  |
| 循環器疾患                   | 1764   | 76             | 4.3  |
| 脳卒中                     | 884    | 38             | 4.3  |
| 心疾患                     | 880    | 38             | 4.3  |
| 呼吸器疾患                   | 276    | 22             | 8.0  |
| 消化器疾患                   | 455    | 48             | 10.5 |
| 肝硬変                     | 281    | 27             | 9.6  |

注: 感染症およびその他の疾患は示さなかった。

\* 潜在癌は除いた。

付表 18A. 病院で死亡した者の割合(%), 放射線量, 被爆時年齢, 期間, および死因別

| 死因<br>線量 (Gy) | 全被爆時年齢群     |              |              |             | 被爆時年齢 40 歳未満群 |             |             |             | 被爆時年齢 40 歳以上群 |         |         |         |
|---------------|-------------|--------------|--------------|-------------|---------------|-------------|-------------|-------------|---------------|---------|---------|---------|
|               | 1950-65     | 1966-75      | 1976-85      | 1950-65     | 1966-75       | 1976-85     | 1950-65     | 1966-75     | 1976-85       | 1950-65 | 1966-75 | 1976-85 |
| 癌以外の疾患        |             |              |              |             |               |             |             |             |               |         |         |         |
| 0             | 16<br>(656) | 39<br>(1071) | 58<br>(1557) | 36<br>(236) | 61<br>(333)   | 73<br>(645) | 12<br>(420) | 33<br>(738) | 51<br>(912)   |         |         |         |
| ≥2.0          | 28<br>(33)  | 59<br>(47)   | 76<br>(68)   | 41<br>(11)  | 84<br>(21)    | 85<br>(40)  | 24<br>(22)  | 48<br>(26)  | 65<br>(28)    |         |         |         |
| 白血病           |             |              |              |             |               |             |             |             |               |         |         |         |
| 0             | 85<br>(17)  | 94<br>(15)   | 95<br>(21)   | 100<br>(8)  | 91<br>(10)    | 100<br>(14) | 75<br>(9)   | 100<br>(5)  | 88<br>(7)     |         |         |         |
| ≥2.0          | 74<br>(14)  | 100<br>(6)   | 80<br>(4)    | 69<br>(9)   | 100<br>(5)    | 67<br>(2)   | 83<br>(5)   | 100<br>(1)  | 100<br>(2)    |         |         |         |
| 白血病を除くすべての癌   |             |              |              |             |               |             |             |             |               |         |         |         |
| 0             | 37<br>(298) | 71<br>(538)  | 87<br>(759)  | 62<br>(82)  | 81<br>(214)   | 93<br>(477) | 32<br>(216) | 65<br>(324) | 78<br>(282)   |         |         |         |
| ≥2.0          | 48<br>(19)  | 74<br>(29)   | 89<br>(47)   | 92<br>(12)  | 73<br>(16)    | 97<br>(36)  | 26<br>(7)   | 76<br>(13)  | 69<br>(11)    |         |         |         |

注: 括弧内の数字は病院で死亡した者の数。

付表 18B. 死亡場所別の主要死因による死亡の 1 Gy の相対リスク

| 死 因         | 死亡場所              |                   |
|-------------|-------------------|-------------------|
|             | 病 院               | 家                 |
| 癌以外の疾患      | 1.20 (1.15, 1.26) | 0.96 (0.93, 1.02) |
| 脳卒中         | 1.18 (1.08, 1.29) | 0.96 (0.91, 1.02) |
| 心疾患         | 1.30 (1.18, 1.44) | 0.96 (0.91, 1.03) |
| 消化器疾患       | 1.23 (1.11, 1.38) | 0.95 (0.87, 1.06) |
| その他         | 1.07 (0.99, 1.17) | 0.95 (0.90, 1.00) |
| 白血病         | 4.61 (3.57, 6.07) | 7.92 (4.02, 18.7) |
| 白血病を除くすべての癌 | 1.38 (1.29, 1.47) | 1.14 (1.05, 1.25) |

注：括弧内の数値は 90 % 信頼限界。

付表 18C. 死亡場所別の死亡診断書記載死因の正確性

| 死 因        | 死亡場所 | 確診率 (%) | 発見率 (%) | 死亡診断書の正確性に対する補正係数 |
|------------|------|---------|---------|-------------------|
| 脳卒中        | 病 院  | 48.9    | 62.2    | 0.79              |
|            | 家    | 35.7    | 70.1    | 0.51              |
| 心疾患        | 病 院  | 39.7    | 52.2    | 0.76              |
|            | 家    | 39.9    | 32.6    | 1.22              |
| 肝硬変        | 病 院  | 58.5    | 60.2    | 0.97              |
|            | 家    | 34.1    | 35.9    | 0.95              |
| 結核         | 病 院  | 63.4    | 64.5    | 0.98              |
|            | 家    | 60.0    | 30.3    | 1.98              |
| 白血病        | 病 院  | 82.9    | 90.6    | 0.92              |
|            | 家    | 100.0   | 100.0   | 1.00              |
| 白血病を除く悪性腫瘍 | 病 院  | 92.7    | 81.5    | 1.14              |
|            | 家    | 93.5    | 64.8    | 1.44              |

資料源 Yamamoto et al.<sup>28</sup>



付表18D. 死亡場所について調整した後の放射線の影響

| 死 因      | 線量(Gy) | 死亡場所別死亡数 |                  |       |                  |                  |       |
|----------|--------|----------|------------------|-------|------------------|------------------|-------|
|          |        | 合 計      |                  |       | 補正死亡数            |                  |       |
|          |        | 観察値      | 期待値 <sup>a</sup> | 相対リスク | 観察値 <sup>b</sup> | 期待値 <sup>a</sup> | 相対リスク |
| 心疾患      |        |          |                  |       |                  |                  |       |
| 合 計      | 0      | 2209     | 2246.1           | 1.0   | 2344             | 2357.5           | 1.0   |
|          | ≥2.0   | 71       | 54.6             | 1.34  | 71               | 56.6             | 1.26  |
| 被爆時年齢    |        |          |                  |       |                  |                  |       |
| 40歳未満    | 0      | 382      | 395.5            | 1.0   | 363              | 375.9            | 1.0   |
| 1966-85年 | ≥2.0   | 19       | 12               | 1.64  | 17               | 11.3             | 1.56  |
| 肝硬変      |        |          |                  |       |                  |                  |       |
| 合 計      | 0      | 328      | 322.6            | 1.0   | 316              | 310.5            | 1.0   |
|          | ≥2.0   | 16       | 9.5              | 1.66  | 15               | 9.2              | 1.60  |
| 被爆時年齢    |        |          |                  |       |                  |                  |       |
| 40歳未満    | 0      | 132      | 131.7            | 1.0   | 128              | 127.4            | 1.0   |
| 1966-85年 | ≥2.0   | 11       | 4.7              | 2.34  | 11               | 4.5              | 2.43  |

<sup>a</sup>都市, 性, 被爆時年齢, および期間について調整。

<sup>b</sup>死亡場所別死亡診断書の正確性に対する補正係数を用いて計算。