

**A PARALLEL ANALYSIS OF CANCER MORTALITY AMONG ATOMIC BOMB
SURVIVORS AND PATIENTS WITH ANKYLOSING SPONDYLITIS
GIVEN X-RAY THERAPY**

原爆被爆者とX線治療を受けた強直性脊椎炎患者に
おける癌死亡率の平行解析

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In the continued interest of accurately defining the late effects of the atomic bombs, the qualitative and quantitative characteristics of the A-bomb radiation exposure doses are periodically refined. If warranted by future dose assessments, the data reported here will be reanalyzed and subsequently reported.

原爆の後影響を引き続いて正確に究明する目的をもって, 原爆放射線被曝線量の質的・量的特質について定期的に改良を加えている。今後線量評価によって, その必要性が起これば, 本報の資料を再解析の上, 改めて報告する。

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CONTENTS

目次

Summary 要約	1
Introduction 緒言	2
Materials and Methods 材料と方法	2
Data on Patients with Ankylosing Spondylitis 強直性脊椎炎患者に関する資料	2
Data on A-bomb Survivors 原爆被爆者に関する資料	3
Dosimetric Data 線量測定の資料	4
Stratification 層化	6
Disease Groups Used in the Analysis 解析に用いた疾患群	6
Testing for a Relationship Between Radiation and Cancer 放射線と癌の関係についての検定	6
Estimating Relative Risk 相対危険度の推定	7
Modeling Trends in Relative Risk 相対危険度の傾向のモデリング	8
Estimating Excess Risk 過剰リスクの推定	9
Trends in Excess Risk 過剰リスクの傾向	10
Results 結果	10
Overall Levels of Mortality 全般的な死亡率	10
Trends in Radiation-induced Mortality 放射線誘発死亡率の傾向	21
Discussion 考察	36
Methodology 方法	36
Overall Levels of Mortality 全般的な死亡率	39
Trends in Radiation-induced Risk 放射線誘発危険率の傾向	43
References 参考文献	48
Appendix 付録	
Contents of Appendix Tables 附表の目次	51



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SUMMARY

Radiation-induced cancer mortality among atomic bomb survivors with doses of at least 100 rad and patients with ankylosing spondylitis given X-ray therapy have been compared. The estimated average mean bone marrow dose for the spondylitics is more than twice that for A-bomb survivors and yet the spondylitics experienced only half the risk of radiation-induced leukemia of A-bomb survivors. For sites that were heavily irradiated in the spondylitics, provisional estimates indicate comparable doses in the two studies and similar levels of cancer risk were observed. For these sites, when information from the studies was combined there were statistically significant excesses for cancers of the esophagus, stomach, lung, ovaries, multiple myeloma, other lymphomas, and tumors of the spinal cord and nerves. Very high relative risks for tumors of the spinal cord and nerves were observed in both studies. For sites that were lightly irradiated in the spondylitics, in addition to previously documented sites, there was a statistically significant excess of cancers of the liver and gallbladder among A-bomb survivors.

Changes in the rates of radiation-induced cancers with age at exposure, time since exposure, and age at observation were studied and compared using generalized linear modeling of the relative risks and also by examining excess mortality rates. The level of agreement between the two studies was high, and no inconsistencies were

要約

100rad以上の線量を受けた原爆被爆者とX線治療を受けた強直性脊椎炎患者における放射線誘発癌の死亡率を比較した。脊椎炎患者が受けた推定平均骨髄線量は原爆被爆者の2倍以上であるが、前者の放射線誘発白血病のリスクは、後者の半分にすぎなかった。脊椎炎患者が多量の放射線を受けた部位では、暫定推定線量は両群とも同程度であり、癌リスクの値も同様であった。これらの部位に関して二つの研究から得られたデータを合計した場合、食道・胃・肺・卵巣の癌、多発性骨髄腫、リンパ腫、脊髄及び神経の腫瘍は、統計的に有意に増加していた。両研究とも脊髄及び神経の腫瘍に非常に高い相対危険度が観察された。先に述べた部位のほかに、脊椎炎患者が少量の放射線を受けた部位に関しては、原爆被爆者の肝臓癌及び胆嚢癌に統計的に有意な過剰が認められた。

相対危険度の一般線形モデリングを用い、また過剰死亡率の検討をもって、被曝時年齢、被曝後経過年数、及び観察時年齢に伴う放射線誘発癌の率の変化を比較検討した。両研究間の一致度は高く、矛盾は認められなかった。脊椎炎例が多量の放射線を受けた部位から選択した一群の腫瘍に関しては、過剰リスクは、被曝時年齢及び被曝後経過年数に伴って

found. For a group of tumors selected from sites that were heavily irradiated in the spondylitis, excess risk increased with both age at exposure and time since exposure and relative risk decreased with age at exposure, but did not vary with time since exposure between about 5 and at least 30 years following exposure. The finding of constant relative risk with time since exposure did not extend to all neoplasms other than leukemia, as for all remaining neoplasms other than leukemia relative risk increased with time since exposure in A-bomb survivors.

INTRODUCTION

Recent reports of cancer mortality among A-bomb survivors¹ and patients with ankylosing spondylitis given X-ray therapy² have each concentrated on only one of the two study populations. The reports also use slightly different approaches to data analysis, which hinders direct comparison of the two studies. This report presents a parallel analysis of the two studies using as far as possible the same approach for them both. Specific objectives of the analysis are: to examine a series of identical cancer sites in the two data sets, including multiple myeloma and tumors of the spinal cord and nerves; to test for a relationship between radiation and different types of cancer in A-bomb survivors after stratifying finely by time since exposure, as well as age at exposure, sex, and city; to model and compare age- and time-dependent changes in the rates of radiation-induced cancers in the two studies; and to evaluate the usefulness of age at observation as a time scale in the description of radiation-induced cancer.

MATERIALS AND METHODS

Data on Patients with Ankylosing Spondylitis

The data of Smith and Doll² on mortality among patients with ankylosing spondylitis after a single treatment course with X-rays were used. The study population consisted of 14,111 patients who were treated from 1935 to 1954 at one of 87 radiotherapy centers in Great Britain and Northern Ireland. The patients were traced to their death, date of emigration from the United Kingdom, 1 January 1970, or the end of the year after their second treatment course, whichever was the earliest. Observed and expected deaths occurring before the end of the first year after the initial treatment for leukemia,

増加し、相対危険度は被曝時年齢の増加とともに減少したが、被曝後約5年から30年までの間では、被曝後経過年数とともに変動することはなかった。この被曝後経過年数に伴う相対危険度が一定であるという所見は、白血病以外のすべての腫瘍に認められたわけではなく、一方、原爆被爆者においては、白血病を除く他のすべての腫瘍の相対危険度が被曝後経過年数に伴って増加した。

緒言

原爆被爆者¹及びX線治療を受けた強直性脊椎炎患者²における癌死亡率に関する最近の報告は、いずれも各々の調査集団のみを扱っている。これらの報告ではまた、資料解析に対してやや異なるアプローチを用いており、それが両調査の直接的な比較の妨げになっている。本報では、このいずれに対してもできる限り同一のアプローチで実施した両調査の平行解析について述べる。解析の具体的目標は次のとおりである。すなわち、多発性骨髄腫、並びに脊髄及び神経の腫瘍など、二組の資料における一連の同一の癌部位を調べる：原爆被爆者における各種の癌を被曝後経過年数、並びに被曝時年齢、性及び都市別に細かく層化したものと放射線との関係を調べる；両調査における放射線誘発癌の率における年齢依存性変化と時間依存性変化をモデル化し、両者の比較を行う；更に、放射線誘発癌の記述において観察時年齢が時間的基準として有用であるかどうか評価する。

材料と方法

強直性脊椎炎患者に関する資料

単一のX線治療を受けた強直性脊椎炎患者の死亡率に関する Smith 及び Doll² の資料を用いた。調査集団は Great Britain 及び Northern Ireland にある 87 の放射線治療所の一つで 1935 年から 1954 年までに治療を受けた 14,111 人の患者からなる。各患者は、死亡、United Kingdom からの移住年月日、1970 年 1 月 1 日又は第 2 回目の治療後の年末、のいずれか最も早い時点まで追跡した。白血病の場合は初回の治療後の最初の年末以前、またその他の新生物の

and before the end of the second year after the initial treatment for other neoplasms, were excluded from the analysis as it was thought by Smith and Doll that some of these tumors were the cause of the symptoms that led to the treatment. The method of computation of person-years at risk, and the death rates for England and Wales were as described by Smith and Doll.²

Data on A-Bomb Survivors

Data on the mortality of A-bomb survivors in the Life Span Study (LSS) extended sample as described by Kato and Schull¹ were used. The analysis included 79,856 individuals who were present in Hiroshima or Nagasaki at the time of the bomb (ATB), that is 6 August 1945 for Hiroshima and 9 August 1945 for Nagasaki. The sample was selected from residents of the two cities at the time of the 1950 Census, and follow-up was made via the Japanese family registration system. The period of follow-up started on 1 October 1950 and lasted until 31 December 1978.

At the time of the analysis, the LSS sample was still classified according to the T65 revised dose (T65DR) estimates although these were known to need revision. Therefore only three broad dose categories were used, with the hope that the results of the analysis will not be greatly affected by future revisions in the dose estimates. Only those for whom explicit dose estimates have been made were included and the dose groups 0-9 rad, 10-99 rad, and 100+ rad used. The boundaries for the dose groups were chosen after a preliminary investigation prior to starting the analysis proper. The data were stratified according to sex, city of residence, calendar year in 3-year groups, and age at observation in 5-year groups. Mortality from leukemia, and from all neoplasms other than leukemia was examined using the methods described in the statistical methods section. The magnitude of the relative risks of the high vs the low dose group decreased rapidly if the boundary of the high dose group was lowered below 100 rad. If it was raised above 100 rad there were very few person-years at risk remaining in the high dose group. Initially it was intended to use only those in the lowest recorded dose category (<0.5 rad) in the low dose group, however there were too few individuals in Nagasaki to give stable estimates of expected rates. Therefore

場合は、初回治療から2年目の年末以前に認められた死亡の観察値、及び期待値を解析から除外したが、これは、Smith及びDollが、これらの腫瘍の幾つかは治療を受けることになった症状の原因であると考えているためである。観察人年の計算法、並びにEngland及びWalesにおける死亡率は、Smith及びDoll²の記述に従った。

原爆被爆者に関する資料

加藤及びSchull¹が報告した寿命調査拡大集団中の原爆被爆者の死亡率に関する資料を用いた。今回の解析は原爆時、すなわち広島では1945年8月6日、長崎では8月9日に広島又は長崎にいた者79,856人を対象とした。この調査集団は1950年国勢調査時に両市の住民から選定したもので、その追跡調査は日本の戸籍制度を利用して行った。追跡調査の期間は1950年10月1日に始まり、1978年12月31日に終わっている。

T65改訂線量(T65DR)推定値に修正が必要であることは分かっていたが、解析時には、依然として寿命調査集団の分類はこれに従って行われた。したがって、解析の結果は将来行われる線量推定値の改訂によって大きく影響されることのないように、わずかに三つの線量群に大別した。明確な線量推定が行われている者のみを含め、0~9 rad, 10~99 rad, 及び100+ radの線量群を用いた。本解析の開始前に予備調査を行った後、線量群の境界を決定した。性、居住都市、3年間隔の暦年、及び5歳間隔の観察時年齢によって、資料の層化を行った。統計的方法の項で述べる方法を用いて、白血病による死亡率、及び白血病以外のすべての新生物による死亡率を調べた。高線量群の境界を100 rad未満に下げた場合は、高線量群対低線量群の相対危険度の大きさは急速に減少した。またそれを100 rad以上に上げた場合は、高線量群に含まれる観察人年のごくわずかであった。最初は、低線量群のなかで記録された最低の線量カテゴリー(<0.5 rad)の者のみを用いるつもりであったが、安定した推定期待値(率)を得るには長崎の対象者数が少な過ぎた

individuals with doses from 1 to 9 rad were included in the low dose group. This only increased the mean dose to 1.4 rad while almost doubling the numbers in Nagasaki. Including individuals with doses of 1-9 rad in the low dose group did not diminish the relative risks of the high compared with the low dose group. If doses in excess of 600 rad are reduced to 600 rad, as is usual in analyses of the LSS, the average total T65DR in the three dose groups is 1.4 rad, 32.2 rad, and 242.2 rad. In tests for trend, where it was necessary to attach a numerical value to the doses in each of the three groups, the round numbers 1, 25, and 250 rad were used, reflecting the rough nature of the dose information.

Also included in the LSS are 26,518 individuals who were not in the city (NIC) ATB. These were excluded from the present analysis after comparing their mortality with those who were in the city, but whose estimated doses were less than 0.5 rad. Those NIC ATB had significantly lower relative risk of mortality from leukemia (relative risk = .47, $p < .01$). The relative risk for those with doses of 1-9 rad compared with those having doses under 0.5 rad was only 0.70. Therefore it seems unlikely that the higher risk for those with doses under 0.5 rad compared with those NIC was due to cases of radiogenic leukemia occurring in the under 0.5 rad group. It seems more likely that there are differences in the underlying disease rate or its degree of ascertainment which render those NIC unsuitable as a control group.

For mortality from all neoplasms other than leukemia, the overall relative risk of the NIC compared with the <0.5 rad group was not significantly different from 1.0, but there was evidence of heterogeneity of relative risk according to age at observation ($\chi^2_5 = 12.00$, $p < .05$), with high relative risks for those aged under 30 in the NIC group (Table 1).

Dosimetric Data

For the spondylitics estimated mean bone marrow doses have been given by Smith and Doll,² and for some other organs temporary estimates of mean doses have been given in the BEIR report.³ For the LSS, revised estimates of the average free-in-air dose and mean bone marrow doses for ranges of T65DR have been published⁴ and some organ-specific ratios of

ので、1～9 rad の線量を受けた者は低線量群へ含めた。これによって平均線量は1.4 rad まで増加したにすぎなかったが、長崎の対象者数はほぼ3倍になった。1～9 rad の線量を受けた者を最低線量群へ含めても、高線量群の低線量群に対する相対危険度は減少しなかった。寿命調査の解析で通常行われているように、600 rad 以上の線量を600 rad に下げると、三つの線量群における平均総T65DRは1.4 rad, 32.2 rad, 及び242.2 rad となる。三つの線量群の各々の線量へ数値の付与を要する傾向に関する検定では、線量資料の大まかな特質を考慮して、1 rad, 25 rad, 及び250 rad の概数を用いた。

寿命調査集団には原爆時市内不在者26,518人も含まれている。これらの者は、市内にいて推定線量が0.5 rad 未満であった者との間で死亡率の比較を行った後に、本解析の対象から除外した。これら原爆時市内不在者では、白血病死亡率の相対危険度が有意に低かった(相対危険度.47, $p < .01$)。0.5 rad 未満の線量を有する者に対する1～9 rad の線量を有する者の相対危険度は、わずか0.70であった。したがって、0.5 rad 未満の線量を有する者が市内不在者に比べてリスクが高いのは、前者に発生した放射線性白血病例に起因したという可能性はないように思われる。原疾病率又はその確認度に差があつて、それが市内不在者を対照群として不適当なものにしている可能性が強いように思われる。

白血病以外のすべての新生物による死亡率については、 <0.5 rad 群に対する市内不在者群の総相対危険度は、1.0と有意に異ならなかったが、観察時年齢による相対危険度には不均一性が認められ($\chi^2_5 = 12.00$, $p < .05$)、市内不在者群における30歳未満の者の相対危険度は高かった(表1)。

線量測定資料

脊椎炎患者についてはSmith及びDoll²によって推定平均骨髄線量が示されており、その他の幾つかの臓器については、BEIR報告³に平均線量の暫定推定値が示されている。寿命調査集団については、平均自由空気線量及びT65DRの範囲に限って平均骨髄線量の改訂推定値が発表されており、⁴ 空気中の

TABLE 1 RELATIVE RISK OF MORTALITY FROM ALL NEOPLASMS OTHER THAN LEUKEMIA FOR NOT-IN-CITY GROUP VS <0.5RAD GROUP IN THE LIFE SPAN STUDY SAMPLE, BY AGE AT OBSERVATION

表1 寿命調査集団中の市内不在者群対<0.5rad群に関する白血病以外のすべての新生物による死亡率の相対危険度、観察時年齢別

Age at observation	Relative risk of NIC group vs <0.5 rad group
<30	3.42
30-39	0.86
40-49	1.09
50-59	1.01
60-69	.98
70+	.86

mean absorbed dose to tissue kerma in air have also been given.⁵ These were used to calculate temporary estimates of mean organ doses for the high dose group in the LSS. Table 2 shows temporary organ dose estimates for all organs where it was possible to make an estimate for both studies. For bone marrow the mean dose in the spondylitics was about 2.5 times that in the LSS. For sites which were heavily irradiated in the spondylitics, such as stomach, pancreas and lung (bronchus), the mean organ dose estimates were similar in the two studies. For sites which were lightly irradiated in the spondylitics such as kidney and bladder, the mean organ dose estimates in the spondylitics were one-quarter to one-third those in the LSS.

組織 kerma に対する平均吸収線量の臓器別比率も幾つか示されている。⁵ これらは、寿命調査集団中の高線量群における平均臓器線量の暫定的推定値の算定に用いた。表2は、両調査に関する推定が可能であったすべての臓器の暫定的臓器線量推定値を示す。骨髄については、脊椎炎患者の平均線量は寿命調査集団のその約2.5倍であった。胃、膵臓及び肺(気管支)など、脊椎炎例における高線量被曝部位については、平均臓器線量推定値は両調査とも同様であった。腎及び膀胱など、脊椎炎例における低線量被曝部位については、脊椎炎例の平均臓器線量推定値は寿命調査集団のその1/4から1/3であった。

TABLE 2 TEMPORARY ESTIMATED MEAN ORGAN DOSES IN RAD FOR THE SPONDYLITIS SERIES AND THE LIFE SPAN STUDY SAMPLE (T65DR 100+ RAD GROUP)

表2 脊椎炎調査及び寿命調査集団(T65DR 100+rad群)に関する暫定的推定平均臓器線量(rad単位)

Organ	Ankylosing Spondylitis Series	Life Span Study Sample (T65DR 100+ rad group)
Bone marrow	335 ^a	125
Stomach	67 ^b	106
	89	
Pancreas	90	90
Lung	197 ^c	114
Kidney	46	118
Bladder	31	102

a - final estimate from Smith and Doll²

Smith及びDoll²に基づく最終推定値

b - two estimates of the dose to the stomach are given in BEIR,³ based on different assumptions

BEIR³には、異なる仮定に基づいて胃の線量に関する二つの推定値が示されている。

c - dose to the bronchus 気管支の線量

Stratification

For the spondylitis data the computation of expected deaths used strata defined by sex, and age at observation and calendar year in 5-year groups as described by Smith and Doll.²

For the LSS data, stratification was made on the basis of city, sex, age ATB in 5-year groups, and the calendar periods 1950-53, 1954-56, 1957-59, 1960-62, 1963-65, 1966-68, 1969-71, 1972-74, 1975-78. For studying age at observation, as opposed to age at exposure, each calendar period-age ATB group was indexed by the midpoint of the range of possible ages attained halfway through the calendar period.

Disease Groups Used in the Analysis

In both studies the deaths were classified according to the underlying cause of death given on the death certificate. For the spondylitics these were coded according to the seventh revision of the International Classification of Diseases, Injuries and Causes of Death (ICD).⁶ For the LSS deaths up to 1967 were coded according to the seventh, and deaths after that were coded according to the eighth revision of the ICD.⁷ The disease groups used in the analysis were as follows: a) leukemia; b) all the individual cancer sites that had been designated as heavily irradiated in the spondylitics,² except that for neoplasms of lymphatic and hematopoietic tissue other than leukemia, the two groups (multiple myeloma and other lymphomas) were used, rather than Hodgkin's disease and other lymphomas which had been used in previous analyses of the spondylitics; and c) all the remaining cancer sites which have been examined in the spondylitics. A full list of disease groups and the corresponding ICD codes is given in the Appendix. For a detailed comparison of trends in radiation-induced risk, a group of solid tumors was selected from sites that had been heavily irradiated in the spondylitics. The group consisted of cancers of the pharynx, esophagus, stomach, pancreas, larynx, lung, ovaries, skin, and bones (excluding jaw and nose). This group will be referred to as selected tumors common to both series.

Testing for a Relationship Between Radiation and Cancer

In the spondylitics, the method of testing for a relationship between radiation and cancer used by Smith and Doll² is formally equivalent to

層化

脊椎炎資料の場合、期待死亡数の算定には、Smith 及び Doll² が記述したように、性別、観察時年齢及び5歳間隔群の暦年別に分類された層を用いた。

寿命調査資料の場合は、都市、性、5歳間隔群における原爆時年齢並びに1950～53年、1954～56年、1957～59年、1960～62年、1963～65年、1966～68年、1969～71年、1972～74年、1975～78年の各暦年期間に基づいて層化を行った。被爆時年齢に対立するものとして観察時年齢を調査する場合は、暦年期間の中間に達した年齢範囲の中間点によって各暦年期間-原爆時年齢群を示した。

解析に用いた疾患群

両調査とも、死亡診断書に記載された原因死によって死亡分類を行った。脊椎炎例については、「国際疾病、傷害および死因統計分類」(ICD)⁶の第7回修正版に従って死亡をコードした。寿命調査集団については、1967年までの死亡は第7回修正版に従い、それ以後の死亡は第8回修正版に従ってコードした。⁷ 解析に用いた疾患群は次のとおりであった：a) 白血病；b) 脊椎炎例において高線量に被曝したことが明示されている癌部位のすべて²；ただし、白血病以外のリンパ組織及び造血組織の新生物の場合に、以前の脊椎炎例の解析で用いられている Hodgkin 病及びその他のリンパ腫の代わりに二つの群(多発性骨髄腫及びその他のリンパ腫)を用いた。c) 脊椎炎例において、これまで調べられたその他の癌部位のすべて。疾患群及びそれに相当する ICD コードの完全なリストを付録に示した。放射線誘発危険率における傾向の詳細な比較については、脊椎炎例における高線量被曝部位から一群の充実性腫瘍を選定した。この群は、咽頭、食道、胃、膵臓、喉頭、肺、卵巣、皮膚、及び骨(顎及び鼻を除く)の癌からなっていた。この群は両調査に共通の特定腫瘍として言及する。

放射線と癌の関係についての検定

脊椎炎例においては、Smith 及び Doll² が用いた放射線と癌の関係についての検定方法は形式上次の

assuming that O_i , the number of observed deaths from any particular cause, has a Poisson distribution with expected value $P_i e^{\alpha_i + \gamma}$, where the index i runs over the strata, P_i is the person-years at risk in the study population, e^{α_i} is the death rate in the absence of exposure to radiation, which is assumed to be equal to the national mortality rate, and γ is an unknown parameter representing the effect of the radiation. For testing the hypothesis $\gamma=0$, the efficient score⁸ evaluated at $\gamma=0$ is given by $U = \sum O_i - \sum P_i e^{\alpha_i}$. The exact distribution of U is available from the Poisson distribution.

For the LSS, if the number of deaths from any particular cause in the i -th stratum of the high dose group is denoted by O_i^H , then a similar approach to that used for the spondylitics assumes that O_i^H has a Poisson distribution with expected value $P_i^H e^{\alpha_i + \gamma}$, where P_i^H are the person-years in the i -th stratum of the high dose group. Rather than assuming the e^{α_i} to be equal to the national mortality rates, there is direct information about the values they take in the LSS by assuming that the numbers of observed deaths in the low dose group O_i^L have Poisson distributions with expectations $P_i^L e^{\alpha_i}$, where the P_i^L are the person-years for the low dose group. For testing $\gamma=0$, U , the efficient score at $\gamma=0$, and its asymptotic variance were derived and significance levels calculated using a normal approximation to the distribution of U with continuity correction. The test was extended to three or more dose groups by assuming the expected number of deaths in the j -th stratum in the group assigned dose value x to be proportional to $e^{\alpha_j + \beta x}$, where β is an unknown regression coefficient. For testing $\beta=0$, the efficient score was used as above, leading to the familiar Mantel test⁹ for trend.

To test for radiation-related mortality jointly in both data sets, the models described above were both used to construct the joint likelihood, and the efficient score at $\gamma=0$ and its asymptotic variance were derived. Significance levels were calculated using a normal approximation with continuity correction.

Estimating Relative Risk

The relative risk associated with the radiation exposure is given by e^γ . For the spondylitics the maximum likelihood estimator is $\sum O_i / \sum e^{\alpha_i} P_i$. This is the familiar ratio of observed to expected

ような仮定と等しい；特定の死因による観察死亡例数 O_i は期待値 $P_i e^{\alpha_i + \gamma}$ となる Poisson 分布を示す。ここで、指標 i は層を示し、 P_i は調査集団の観察人年、 e^{α_i} は放射線被曝のない場合の死亡率（これは全国死亡率に等しいと想定される）、 γ は放射線の影響を表す未知のパラメーターである。仮説 $\gamma=0$ の検定については、 $\gamma=0$ で評価した有効スコア⁸ は $U = \sum O_i - \sum P_i e^{\alpha_i}$ によって示される。 U の正確な分布は Poisson 分布によって得られる。

寿命調査については、高線量群の第 i 層における特定の原因による死亡例数を O_i^H で示すとすれば、脊椎炎例に用いたものと同様のアプローチにより、 O_i^H は期待値が $P_i^H e^{\alpha_i + \gamma}$ となる Poisson 分布を示すと想定される。このとき、 P_i^H は高線量群の第 i 層における人年である。 e^{α_i} が全国死亡率に等しいと想定するよりも、 P_i^L が低線量群の人年であるとき、低線量群 O_i^L における観察死亡例数は期待値が $P_i^L e^{\alpha_i}$ となる Poisson 分布を示すと仮定することにより、寿命調査でその死亡率がとる値についての直接の資料が得られる。 $\gamma=0$ の検定の場合は、連続訂正を施した U の分布に対する正規近似値を用いて $\gamma=0$ における有効スコア U 、及びその漸近的分散を求め、有意水準を計算した。 β が未知の回帰係数であるとき、線量値 x を割り当てられた群の第 j 層における期待死亡例数は $e^{\alpha_j + \beta x}$ に比例すると仮定して、検定対象を三つ以上の線量群に拡大した。 $\beta=0$ の検定を行う場合には、上記のように有効スコアを用い、その上で、よく知られている Mantel 検定⁹ を行い傾向を調べた。

二組の資料群における放射線関連性の死亡率を同時に調べるため、上記の両モデルを用いて同時尤度を構築し、 $\gamma=0$ における有効スコア及びその漸近的分散を得た。連続訂正を施した正規近似値を用いて、有意水準を算定した。

相対危険度の推定

放射線被曝と関連のある相対危険度は e^γ で示した。脊椎炎例の最大尤度推定量は $\sum O_i / \sum e^{\alpha_i} P_i$ である。これは死亡数の観察値と期待値との比率で、よく知ら

deaths. Confidence intervals for the ratio were obtained directly from the Poisson distribution.

For the LSS the estimation procedure is more complex. Fitting the models described in the previous section by maximum likelihood, using techniques such as iterative weighted least squares, involves the inversion of matrices with dimension equal to the number of unknown parameters. For the LSS, in which there is an unknown parameter for each stratum and several hundred strata, fitting the models directly is clearly infeasible. The difficulty can be avoided, however, by conditioning on the total number of observed deaths in each stratum and noting that O_i^H has a binomial distribution with parameters $(O_i^H + O_i^L)$ and $\{P_i^H e^\gamma / (P_i^L + P_i^H e^\gamma)\}$ when considering two dose groups, and the corresponding multinomial model for three dose groups. These models involve only the number of parameters necessary to represent the radiogenic risk and were easily fitted by maximum likelihood using the GLIM computer package.¹⁰ As the stratum totals are ancillary statistics, estimates of the radiogenic risk and its standard error are unaffected by the conditioning. Approximate confidence intervals were calculated using maximum likelihood theory.

To estimate the joint relative risk in the two studies the models described above were used and the joint likelihood maximized. Confidence intervals were based on maximum likelihood theory.

Modeling Trends in Relative Risk

In both studies a step-up modeling procedure was used to study trends in radiogenic risk. Models were fitted in which γ varied according to sex, city (LSS only), age at exposure (10-year groups), time since exposure (3-year groups), and age at observation (10-year groups). Models with linear and both linear and quadratic trends in γ according to age at exposure, time since exposure, and age at observation were also fitted. The terms which offered the most significant reduction in residual deviance were selected and the process repeated with the selected terms always included in the model. When no further terms offered significant reductions in the residual deviance, models with first order interactions between each pair of factors were fitted. Finally the model was

れたものである。この比率の信頼区間は、Poisson分布から直接に得た。

寿命調査の場合の推定方法は更に複雑である。繰り返し加重最小二乗法のような技法を用いて、最大尤度によって前節で述べたモデルを適合させることは、未知パラメーターの数に等しい次元のマトリックスの反転を伴う。各層及び数百の層に不明のパラメーターがある寿命調査の場合、モデルを直接に適合させることは明らかに不可能である。しかし、各層における総観察死亡数に条件を付与し、また、二つの線量群を考えた場合に、 O_i^H は、パラメーターが $(O_i^H + O_i^L)$ 及び $\{P_i^H e^\gamma / (P_i^L + P_i^H e^\gamma)\}$ となる二項分布を示し、三つの線量群の場合は、それに対応する多項モデルとなることに留意すれば困難は避けられる。これらのモデルは、放射線によるリスクを示すために必要なパラメーターの数のみに関するもので、GLIMコンピューター・パッケージ¹⁰を用いる最大尤度によって容易に適合した。層の合計は補助統計量であるから、放射線によるリスクの推定値及びその標準誤差は、この条件付けによって影響されることはない。近似信頼区間は最大尤度理論を用いて算定した。

両調査における同時相対危険度の推定は、上記のモデルを用いて最尤推定値によった。信頼区間は最大尤度法に基づいた。

相対危険度の傾向のモデリング

両調査とも、段階的モデリング法を用いて、放射線によるリスクの傾向を調べた。性、都市(寿命調査のみ)、被曝時年齢(10歳間隔群)、被曝後経過年数(3年間隔群)及び観察時年齢(10歳間隔群)によって γ が変わるモデルを適合させた。また、被曝時年齢、被曝後経過年数、及び観察時年齢によって、 γ が線形傾向を示したモデル並びに線形、二次両傾向を示したモデルも適合させた。残余偏差に最も有意な減少をもたらした項を選定し、その選定した項を常にモデルに含めて、この過程を繰り返した。残余偏差に有意な減少をもたらす項が他になくなった場合は、各対の因子間で一次の相互作用を示すモデルを

examined for terms whose exclusion did not cause a significant increase in the residual deviance.

Estimating Excess Risk

A simple formulation of radogenic risk by means of an additive risk model assumes that ΣO_i , the total number of observed deaths from any cause in the exposed group, has a Poisson distribution with expected value $\Sigma P_i(e^{\alpha_i + \delta})$, where as before e^{α_i} is the death rate in the i -th stratum in the absence of exposure to radiation, P_i is the person-years for the exposed group in the i -th stratum, and δ represents the effect of the radiation. For the spondylitics, if the e^{α_i} are set equal to the national mortality rates, then the maximum likelihood estimator of δ is $(\Sigma O_i - \Sigma E_i) / \Sigma P_i$, where $E_i = P_i e^{\alpha_i}$ is the expected deaths in each stratum. This estimator is the familiar excess death rate. Confidence intervals were obtained directly from the Poisson distribution.

A corresponding formulation for the LSS assumes that the total number of observed deaths from any cause in the high dose group, ΣO_i^H , has a Poisson distribution with expected value $\Sigma P_i^H(e^{\alpha_i + \delta})$, while in each stratum of the low dose group the number of observed deaths O_i^L has a Poisson distribution with expectation $P_i^L e^{\alpha_i}$. The maximum likelihood estimator of δ is $(\Sigma O_i^H - \Sigma E_i^H) / \Sigma P_i^H$, where $E_i^H = P_i^H O_i^L / P_i^L$. Thus ΣE_i^H is the number of deaths that would be expected in the high dose group, if the stratum-specific death rates for the low dose group were operating there. It forms a quantity which is comparable to the expected deaths based on national rates for the spondylitics. Approximate confidence intervals were based on maximum likelihood theory.

Excess risk in the two studies was estimated jointly by forming a weighted mean of the separate estimates, with weights proportional to the inverse of their approximate variances. For the spondylitics the approximate variance of δ is given by $\Sigma O_i / (\Sigma P_i)^2$, which is equal to zero when there are no deaths. In this case, $\Sigma E_i / (\Sigma P_i)^2$ was used instead. For the LSS the approximate variance of δ is given by $(\Sigma O_i^H + \Sigma (P_i^H / P_i^L)^2 O_i^L) / (\Sigma P_i^H)^2$.

適合させた。最後に、除外しても残余偏差に有意な増加をもたらさなかった項についてそのモデルを調べた。

過剰リスクの推定

相加リスクモデルの方法によって放射線によるリスクを単純に公式化し、被曝群におけるなんらかの原因による総観察死亡数 ΣO_i は、期待値が $\Sigma P_i(e^{\alpha_i + \delta})$ となる Poisson 分布を示すと仮定した。この場合、以前と同様 e^{α_i} は、放射線被曝がない場合の第 i 層における死亡率、 P_i は第 i 層の被曝群の年人、 δ は放射線の影響を表す。脊椎炎に関しては、 e^{α_i} を全国死亡率と同じ値にすると、 δ の最大尤度推定量は $(\Sigma O_i - \Sigma E_i) / \Sigma P_i$ となる。ただし、 $E_i = P_i e^{\alpha_i}$ は各層における期待死亡数である。この推定量はよく知られている過剰死亡率である。信頼区間は Poisson 分布から直接得た。

これに対応する寿命調査に関する公式では、高線量群におけるなんらかの原因による総観察死亡数 ΣO_i^H は、期待値が $\Sigma P_i^H(e^{\alpha_i + \delta})$ となる Poisson 分布を示すが、低線量群の各層における観察死亡数 O_i^L は期待値が $P_i^L e^{\alpha_i}$ となる Poisson 分布を示すと想定される。 δ の最大尤度推定量は $(\Sigma O_i^H - \Sigma E_i^H) / \Sigma P_i^H$ であり、このとき $E_i^H = P_i^H O_i^L / P_i^L$ である。したがって、低線量群の層別死亡率がそこで作用していたとすれば、 ΣE_i^H は高線量群に期待される死亡数である。これは、脊椎炎例の全国的比率に基づく期待死亡数に匹敵する量である。近似信頼区間は最大尤度理論に基づいた。

近似分散に反比例する加重値によって、別々の推定値から加重平均値を求め、両調査における過剰リスクを同時に推定した。脊椎炎例においては、 δ の近似分散は $\Sigma O_i / (\Sigma P_i)^2$ によって示したが、これは死亡がない場合はゼロに等しい。この場合は代わりに $\Sigma E_i / (\Sigma P_i)^2$ を用いた。寿命調査に関しては、 δ の近似分散は $(\Sigma O_i^H + \Sigma (P_i^H / P_i^L)^2 O_i^L) / (\Sigma P_i^H)^2$ によって示した。

Trends in Excess Risk

Weighted linear regressions with weights inversely proportional to the approximate variance were fitted to excess risks by sex, age at exposure, time since exposure, and age at observation. To correct for the effect of age at exposure, while examining excess risks by time since exposure and vice versa, the risks were standardized by the direct method. For each study the overall distribution of person-years for that study was used as a standardizing distribution. Tests for trend were two-sided tests.

RESULTS

Overall Levels of Mortality

Leukemia and cancers of sites which were heavily irradiated in the spondylitics

In the spondylitics, there was a fivefold increase in deaths from leukemia occurring two or more years since first treatment (Smith and Doll² and Table 3; $p < .001$). For cancers of all heavily irradiated sites, there was a 53% increase occurring three or more years since first treatment ($p < .001$), and for the individual sites there were statistically significant increases for cancers of the esophagus, stomach, lung, lymphomas other than multiple myeloma, and tumors of the spinal cord and nerves. For the miscellaneous group 'other heavily irradiated sites', there was also a statistically significant increase, but out of 21 deaths, 8 were coded as ICD 199, 7th Revision: malignant neoplasm of other and unspecified sites; no other code in this group had more than two deaths attributed to it. For selected tumors common to both series there was a 43% increase in mortality ($p < .001$). For multiple myeloma the number of observed deaths exceeded those expected, but the difference was not significant ($p > .10$). Death rates from multiple myeloma in England and Wales are not available prior to 1950, and so the expected number of deaths given in Table 3 was calculated by applying the rates for 1951-56 to the period 1935-50. To ensure that such a procedure did not conceal an increase of multiple myeloma deaths by overestimating the national rates for the period 1935-50, the expected deaths were recalculated omitting any contribution for this period, thus providing a lower bound to the true value. The recalculated value was 1.65, and the number of observed deaths from multiple myeloma was not significantly greater than this ($p > .10$).

過剰リスクの傾向

加重値が近似分散に反比例する加重線形回帰を、性、被曝時年齢、被曝後経過年数、及び観察時年齢別に過剰リスクへ適合させた。被曝後経過年数によって過剰リスクを調べ、またその逆を行う場合、被曝時年齢の影響を訂正するため、直接法によってリスクの標準化を行った。各調査ごとに、標準分布としてその調査に関する人年の総分布を用いた。傾向を調べる検定は両側検定であった。

結果

全般的にみた死亡率

白血病並びに脊椎炎調査高線量被曝部位癌

脊椎炎例においては、初回の治療から2年以上後に発現した白血病の死亡率に5倍の増加がみられた (Smith 及び Doll,² 並びに表3; $p < .001$)。すべての高線量被曝部位の癌については、初回の治療から3年以上後に53%の増加が認められ ($p < .001$)、また各部位については、食道、胃、肺の各癌、並びに多発性骨髄腫以外のリンパ腫、並びに脊髄及び神経の腫瘍に統計的に有意な増加が認められた。雑群、すなわち“その他の高線量被曝部位”についても、統計的に有意な増加が見られたが、21例の死亡のうち8例は第7回修正版のICD 199: “その他の部位及び不明な部位の悪性新生物”としてコードしてあった。この雑群のうちのその他のコードには、2例以上の死亡はなかった。両調査に共通の特定腫瘍については、死亡率に43%の増加が認められた ($p < .001$)。多発性骨髄腫については、観察死亡数は期待数を超えたが、その差は有意なものではなかった ($p > .10$)。England 及び Wales における多発性骨髄腫の死亡率は1950年以前は得られていないので、表3に示した期待死亡数は、1951~56年の率を1935~50年の期間に当てはめて算定した。この方法では、1935~50年の期間の全国の死亡率を過大評価して多発性骨髄腫による死亡の増加が隠蔽されることはなかったことを保証するために、この期間における寄与を除外して期待死亡数を再計算し、それによって真の値に下限を設けた。再算定値は1.65であり、多発性骨髄腫による観察死亡例数はこれより有意に大きいものではなかった ($p > .10$)。

TABLE 3 OBSERVED AND EXPECTED DEATHS, RELATIVE RISKS, EXCESS RISKS, AND 90% CONFIDENCE INTERVALS FOR LEUKEMIA AND CANCERS OF SITES WHICH WERE HEAVILY IRRADIATED IN THE SPONDYLITIS SERIES

表3 白血病, 並びに脊椎炎調査における高線量被曝部位の癌に関する観察及び期待死亡数, 相対危険度, 過剰リスク, 並びに90%信頼区間

Cause of death	Ankylosing Spondylitis Series				Life Span Study Sample			
	Observed deaths 3 or more years since 1st treat- ment	Expected deaths from national rates	Relative risk	Excess risk (per 10 ⁵ year)	Observed deaths in 100+ rad group	Expected deaths calculated from 0-9 rad group	Relative risk	Excess risk (per 10 ⁵ year)
Leukemia	†28***	5.85	4.79 (3.40, 6.56)	19.61 (12.44, 28.80)	66***	7.84	9.38 (7.00, 12.57)	39.48 (30.35, 48.61)
Cancers of sites which were heavily irradiated in the spondylitis series:								
Pharynx	3	1.29	2.32 (0.63, 6.01)	1.69 (-0.47, 6.37)	1	1.15	0.87 (0.14, 5.24)	-1.0 (-1.37, 1.17)
Esophagus	10*	4.90	2.04 (1.11, 3.46)	5.03 (0.52, 11.89)	16*	9.92	1.68 (1.07, 2.64)	4.13 (-0.53, 8.79)
Stomach	39*	29.12	1.34 (1.01, 1.75)	9.74 (0.21, 21.51)	142*	120.54	1.21 (1.04, 1.40)	14.57 (0.27, 28.86)
Pancreas	13	8.48	1.53 (0.91, 2.44)	4.46 (-0.78, 12.02)	11	10.83	0.98 (0.58, 1.65)	0.11 (-3.83, 4.05)
Larynx	3	2.25	1.33 (0.36, 3.44)	0.74 (-1.41, 5.42)	4	3.07	1.37 (0.56, 3.34)	0.63 (-1.72, 2.99)
Lung	111***	78.68	1.41 (1.20, 1.65)	31.86 (15.36, 50.55)	63***	32.88	1.94 (1.53, 2.45)	20.45 (11.24, 29.66)
Ovaries	4	2.92	1.37 (0.47, 3.13)	6.39 (-9.17, 36.84)	12***	3.84	3.52 (2.01, 6.15)	9.62 (2.76, 16.47)
Skin	0	1.88	0.00 (0.00, 1.60)	-1.85 (-1.85, 1.10)	2	1.32	1.53 (0.45, 5.21)	0.46 (-1.15, 2.08)

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TABLE 3 CONTINUED 表3 続き

Cause of death	Ankylosing Spondylitis Series				Life Span Study Sample			
	Observed deaths 3 or more years since 1st treat- ment	Expected deaths from national rates	Relative risk	Excess risk (per 10 ⁵ year)	Observed deaths in 100+ rad group	Expected deaths calculated from 0-9 rad group	Relative risk	Excess risk (per 10 ⁵ year)
Bones (excluding jaw and nose)	3	0.96	3.13 (0.85, 8.07)	2.01 (-0.14, 6.69)	2	1.23	1.62 (0.44, 6.00)	0.53 (-1.13, 2.18)
Multiple myeloma	3	1.69	1.78 (0.48, 4.59)	1.29 (-0.86, 5.97)	4	1.40	2.77 (1.02, 7.48)	1.77 (-0.52, 4.06)
Other lymphomas	12*	6.17	1.94 (1.12, 3.15)	5.75 (0.74, 13.08)	8	7.25	1.15 (0.61, 2.18)	0.51 (-2.93, 3.95)
CNS tumors (spinal cord and nerves)	4**	0.51	7.84 (2.69, 17.94)	3.44 (0.85, 8.52)	3**	0.13	18.15 (3.80, 86.80)	1.95 (0.02, 3.88)
Others	21**	8.74	2.40 (1.61, 3.45)	12.09 (5.25, 21.19)	39	29.23	1.33 (1.00, 1.77)	6.63 (-0.71, 13.98)
All spondylitis heavily irradiated sites	226***	147.59	1.53 (1.37, 1.71)	77.30 (53.49, 103.26)	307***	222.77	1.40 (1.27, 1.55)	57.18 (36.46, 77.89)
Selected tumors common to both series††	186***	130.49	1.43 (1.26, 1.61)	54.72 (33.18, 78.43)	253***	184.77	1.40 (1.25, 1.57)	46.32 (27.49, 65.15)

*p<.05, **p<.01, ***p<.001 (one-sided values 片側検定の値)

†2 or more years since first treatment for leukemia 初回白血病治療から2年以降

††Cancers of pharynx, esophagus, stomach, pancreas, larynx, lung, ovaries, skin, bones (excluding jaw and nose)
咽頭, 食道, 胃, 膵臓, 喉頭, 肺, 卵巣, 皮膚, 骨(顎及び鼻を除く)の癌

For the LSS, the risk of death from leukemia was increased ninefold among those whose T65DR was at least 100 rad when compared with those with doses of 0-9 rad ($p < .001$). For cancers of all sites which were heavily irradiated in the spondylitics, and also for selected tumors common to both series, there were 40% increases in risk ($p < .001$) in the LSS, and for the individual sites there were statistically significant increases for cancers of the esophagus, stomach, lung, ovaries, and tumors of the spinal cord and nerves. For tumors of the spinal cord and nerves, the increase evaluated by the continuity-corrected score test was highly significant ($p < .001$). However, the analysis included a total of only five deaths, and it is known that tests relying on asymptotic distributional properties may exaggerate significance levels in small samples.¹¹ The exact significance level of the test statistic was therefore calculated for tumors of the spinal cord and nerves, and it took the value 0.006. For multiple myeloma, the exact significance level of the test statistic was also calculated and it took the value 0.097.

The significance levels reported for the LSS in Table 3 refer to a comparison of individuals whose T65DR was at least 100 rad with those for whom it was under 10 rad, and individuals with T65DR between 10 and 99 rad are omitted. When a test for trend using individuals in all three dose categories was carried out there was evidence of a radiation-related trend for multiple myeloma ($\chi^2_1 = 3.14$; $p < .05$) and the miscellaneous group consisting of other sites which were heavily irradiated in the spondylitics ($\chi^2_1 = 3.49$; $p < .05$). For all other disease groups shown in Table 3, the significance levels did not differ from those obtained when just high and low dose groups were compared.

Comparing the results of the two studies, the estimates of both relative and excess risks of leukemia mortality in the high dose group for the LSS are approximately double the corresponding values for the spondylitics, and the differences are statistically significant ($p < .01$, two-sided test, for both relative and excess risks). For cancers of all spondylitis heavily irradiated sites combined, the trend is reversed, and estimates of both relative and excess risks are slightly higher for the spondylitics than the LSS, although the differences are not

寿命調査については、T65DR が少なくとも 100 rad である者における白血病による死亡のリスクは、0～9 rad の線量を有する者と比較して 9 倍増加した ($p < .001$)。脊椎炎例におけるすべての高線量被曝部位の癌、また両調査に共通の特定腫瘍についても、寿命調査におけるリスクには 40% の増加 ($p < .001$) がみられ、また、その各部位については、食道、胃、肺、及び卵巣の癌、並びに脊髄及び神経の腫瘍に統計的に有意な増加が認められた。脊髄及び神経の腫瘍の場合、連続訂正スコア検定によって評価した増加は極めて有意なものであった ($p < .001$)。しかし、この解析は合計 5 例のみの死亡を対象にしたもので、漸近的分布の特性に依存する検定は、小規模な調査集団では有意水準を過大評価することもあることが知られている。¹¹ したがって、脊髄及び神経の腫瘍について検定統計量の正確な有意水準を算定し、0.006 の値を得た。多発性骨髄腫についても、検定統計量の正確な有意水準を算定し、0.097 の値を得た。

寿命調査に関して報告した表 3 の有意水準は、T65DR が少なくとも 100 rad であった者と 10 rad 未満であった者との比較を示したもので、T65DR が 10～99 rad である者は除外した。三つの線量群すべてにおける対象者を用いて傾向に関する検定を行ったところ、脊椎炎例では多発性骨髄腫 ($\chi^2_1 = 3.14$; $p < .05$) 及びその他の高線量被曝部位からなる雑群 ($\chi^2_1 = 3.49$; $p < .05$) に放射線と関連のある傾向が認められた。表 3 に示したその他すべての疾患群については、その有意水準は、ただ高線量群と低線量群との比較を行った場合に得られたものと異ならなかった。

両調査の結果を比較すると、寿命調査の高線量群における白血病死亡率の相対危険度及び過剰リスクの推定値は、それに対応する脊椎炎例の値の約 2 倍であり、その差は統計的に有意なものである (相対危険度及び過剰リスクに関する両側検定では、いずれも $p < .01$)。脊椎炎全高線量被曝部位癌においては、傾向は逆であり、相対危険度及び過剰リスクの推定値は寿命調査集団よりも脊椎炎例の方がやや高いが、その差は統計的に有意なものではない ($p > .10$)。

statistically significant ($p > .10$). For selected tumors common to both series, the estimates of both relative and excess risks take similar values in the two studies.

For cancers of sites that were heavily irradiated in the spondylitics, not only is the size of the overall radiation-related risk similar in the two studies, whether measured on an absolute or relative scale, but also the temporary estimates of organ dose take similar values. Therefore it is appropriate to combine the results of the two studies. For cancers of the esophagus, stomach, lung, and tumors of the spinal cord and nerves, where there were significant increases in each data set examined separately, there are statistically significant increases when the data sets are examined jointly (Table 4), and for cancers of the esophagus and stomach, and tumors of the spinal cord and nerves, the level of statistical significance is increased. For cancers of the ovaries, lymphomas other than multiple myeloma, and other spondylitis heavily irradiated sites, where separate examination of the data sets led to different conclusions, joint analysis indicates significant increases, and for multiple myeloma where the excess in either study examined separately was not significant, joint analysis also indicates a significant increase ($p < .05$). (For cancer of the bones, excluding jaw and nose, the score statistic does not indicate a significant increase ($.10 > p > .05$), although the approximate 90% confidence interval for the relative risk does not include one. As the confidence interval involves the greater degree of approximation, inference has been based on the score statistic).

Cancer of the colon and sites which were lightly irradiated in the spondylitics

Among the spondylitics, there was a significant increase of colon cancer (Table 5). The colon has not been included among either the lightly or the heavily irradiated sites, as colon cancer may be associated with spondylitis through the increased risk of ulcerative colitis among spondylitics.² For the lightly irradiated sites, there were no significant increases in the spondylitics.

In the LSS, when individuals whose T65DR was at least 100 rad were compared with those in the 0-9 rad range, there were statistically significant increases for cancers of the colon,

両調査に共通の特定腫瘍においては、相対危険度及び過剰リスクの双方の推定値は、両調査で同様の値を示す。

脊椎炎例で高線量被曝部位である癌については、絶対基準と相対基準のいずれで測定しても、放射線関連危険率全体の大きさは両調査とも同様であるばかりでなく、臓器線量の暫定的推定値も同様の値を示す。したがって、両調査の結果を合計するのが妥当である。別々に調べた各資料群に有意な増加が認められた食道、胃、肺の各癌、並びに脊髄及び神経の各腫瘍においては、その資料群を同時に調べると統計的に有意な増加が見られ(表4)、更に食道及び胃の癌、並びに脊髄及び神経の腫瘍においては、統計的有意性の水準は増加する。資料群を別々に調べることによって異なる結論が得られた卵巣の癌、多発性骨髄腫以外のリンパ腫、並びにその他の脊椎炎調査高線量被曝部位癌においては、同時解析では有意な増加を示し、また別々に調べた調査でいずれも過剰が有意でなかった多発性骨髄腫においても、同時解析では有意な増加($p < .05$)を示す。(顎及び鼻を除く骨の癌については、スコア統計量は有意な増加を示さないが($.10 > p > .05$)、相対危険度の近似90%信頼区間にはその統計量は含まれない。その信頼区間はより大規模な近似を使うので、推定はスコア統計量に基づいて行っている)。

結腸癌及び脊椎炎調査低線量被曝部位癌

脊椎炎例では、結腸癌に有意な増加が認められた(表5)。脊椎炎例に潰瘍性大腸炎のリスクの増加が認められることにより、結腸癌は脊椎炎と関係があるかもしれないので、結腸は低線量又は高線量被曝部位のいずれにも含まれていない。² 低線量被曝部位については、脊椎炎例に有意な増加はなかった。

寿命調査では、T65DRが少なくとも100 radであった者を0~9 radの範囲の者と比べた場合、結腸、肝臓及び胆嚢、乳房、並びに膀胱の各癌に統計的に

TABLE 4 RELATIVE RISKS, EXCESS RISKS, AND APPROXIMATE 90% CONFIDENCE INTERVALS FOR CANCERS OF SITES WHICH WERE HEAVILY IRRADIATED IN THE SPONDYLITIS SERIES, ESTIMATED JOINTLY FROM THE LIFE SPAN STUDY SAMPLE (100+ vs 0-9 rad) AND THE SPONDYLITIS SERIES

表4 脊椎炎調査における高線量被曝部位の癌に関する相対危険度、過剰リスク、及び近似90%信頼区間。寿命調査集団(100+rad群対0~9rad群)及び脊椎炎調査の両者から推定したもの。

Site	Relative risk	Excess risk (per 10 ⁵ year)
Pharynx	1.76 (0.73, 4.22)	0.20 (-0.95, 1.36)
Esophagus	1.82** (1.29, 2.57)	4.54 (1.09, 7.99)
Stomach	1.24** (1.09, 1.41)	11.35 (3.07, 19.62)
Pancreas	1.24 (0.87, 1.76)	1.47 (-1.80, 4.74)
Larynx	1.35 (0.70, 2.59)	0.68 (-1.14, 2.49)
Lung	1.54*** (1.36, 1.76)	23.03 (14.90, 31.16)
Ovaries	2.39*** (1.54, 3.72)	9.26 (2.78, 15.74)
Skin	0.61 (0.19, 1.98)	-0.34 (-1.64, 0.97)
Bones (excluding jaw and nose)	2.40 (1.08, 5.34)	0.91 (-0.52, 2.34)
Multiple myeloma	2.16* (1.11, 4.20)	1.58 (-0.20, 3.36)
Other lymphomas	1.58* (1.07, 2.33)	1.95 (0.99, 4.89)
CNS tumors (spinal cord and nerves)	9.31*** (4.72, 18.37)	2.34 (0.68, 4.01)
Others	1.62*** (1.28, 2.03)	9.34 (4.11, 14.57)
All spondylitis heavily irradiated sites	1.46*** (1.35, 1.57)	65.65 (49.83, 81.46)
Selected tumors common to both series	1.41*** (1.30, 1.53)	49.86 (35.50, 64.22)

*p<.05, **p<.01, ***p<.001 (one-sided values 片側検定の値)

TABLE 5 OBSERVED AND EXPECTED DEATHS, RELATIVE RISKS, EXCESS RISKS, AND 90% CONFIDENCE INTERVALS FOR CANCER OF THE COLON AND SITES WHICH WERE LIGHTLY IRRADIATED IN THE SPONDYLITIS SERIES

表5 結腸癌、並びに脊椎炎調査における低線量被曝部位の癌に関する観察及び期待死亡数、相対危険度、過剰リスク、及び90%信頼区間

	Ankylosing Spondylitis Series				Life Span Study Sample			
	Observed deaths 3 or more years since 1st treatment	Expected deaths from national rates	Relative risk	Excess risk (per 10 ⁵ year)	Observed deaths in 100+ rad group	Expected deaths calculated from 0-9 rad group	Relative risk	Excess risk (per 10 ⁵ year)
Colon	22*	14.78	1.49 (1.01, 2.13)	7.12 (0.11, 16.40)	19**	9.38	2.06 (1.35, 3.13)	6.53 (1.52, 11.54)
Cancers of sites which were lightly irradiated in the spondylitis series:								
Brain	10	7.98	1.25 (0.68, 2.13)	1.99 (-2.51, 8.85)	3	2.78	1.03 (0.37, 2.87)	0.15 (-1.92, 2.23)
Mouth	2	0.90	2.22 (0.39, 7.00)	1.08 (-0.54, 5.32)	0	0.59	0.00	-0.40 (-0.65, -0.15)
Tongue	0	0.82	0.00 (0.00, 3.66)	-0.81 (-0.81, 2.15)	0	1.34	0.00	-0.91 (-1.47, -0.35)
Liver and gallbladder	1	4.15	0.24 (0.01, 1.14)	-3.11 (-4.04, 0.58)	53**	35.91	1.47 (1.15, 1.89)	11.60 (3.05, 20.16)
Rectum	13	10.55	1.23 (0.73, 1.96)	2.42 (-2.82, 9.98)	8	10.62	0.74 (0.40, 1.36)	-1.78 (-5.19, 1.63)
Breast	14	8.67	1.61 (0.98, 2.53)	31.52 (-1.24, 78.18)	21***	6.81	3.06 (2.02, 4.64)	16.72 (7.69, 25.74)
Uterus	4	3.68	1.09 (0.37, 2.49)	1.89 (-13.66, 32.35)	23	21.03	1.09 (0.76, 1.57)	2.32 (-7.55, 12.19)
Prostate	6	6.38	0.94 (0.41, 1.86)	-0.45 (-4.46, 6.46)	3	2.80	1.07 (0.38, 3.00)	0.33 (-4.61, 5.27)

(Continue 続)

TABLE 5 CONTINUED 表 5 続き

	Ankylosing Spondylitis Series				Life Span Study Sample			
	Observed deaths 3 or more years since 1st treat- ment	Expected deaths from national rates	Relative risk	Excess risk (per 10 ⁵ year)	Observed deaths in 100+ rad group	Expected deaths calculated from 0-9 rad group	Relative risk	Excess risk (per 10 ⁵ year)
Testis	0	1.02	0.00 (0.00, 2.94)	-1.21 (-1.21, 2.34)	0	0.17	0.00	-0.28 (-0.55, 0.00)
Kidney	7	3.59	1.95 (0.92, 3.66)	3.36 (-0.30, 9.42)	3	1.76	1.81 (0.65, 5.06)	0.84 (-1.15, 2.84)
Urinary bladder	11	6.82	1.61 (0.90, 2.67)	4.12 (-0.64, 11.23)	11**	3.53	2.96 (1.69, 5.18)	5.07 (1.32, 8.81)
Other spondylitis lightly irradiated sites†	0	1.68	0.00 (0.00, 1.79)	-1.66 (-1.66, 1.30)	2	5.33	0.37 (0.11, 1.20)	-2.26 (-4.16, -0.36)
All spondylitis lightly irradiated sites	68	56.26	1.21 (0.98, 1.48)	11.57 (-1.21, 26.57)	127***	92.67	1.37 (1.17, 1.60)	23.31 (10.08, 36.53)

*p<.05, **p<.01, ***p<.001 (one-sided values 片側検定の値)

†Lip, vulva and vagina, penis and scrotum, jaw and nose
唇, 外陰及び陰茎, 陰茎及び陰囊, 顎及び鼻

liver and gallbladder, breast, and urinary bladder. When a test for trend with radiation dose using all three dose groups was performed, identical significance levels were obtained for all sites except cancer of the liver and gallbladder and all spondylitis lightly irradiated sites combined. For these the significance levels reduced slightly to the 0.05 level.

Among those with at least 100 rad in the LSS, the relative risk for all spondylitis lightly irradiated sites combined was very similar to that for all spondylitis heavily irradiated sites combined, although the excess risk was significantly lower ($p < .05$). For the spondylitis lightly irradiated sites, both relative and excess risks were higher in the LSS than in the spondylitis, although the differences between the two studies were not significant ($p > .10$ for both relative and excess risks).

Variation in excess and relative risks with cancer site

In Figure 1 the site-specific excess risk for the exposed group in each of the two studies is shown plotted against the expected death rate, that is the death rate that would be observed if the stratum-specific rates in the low dose group for the LSS, or the national population for the spondylitis, were operating in the exposed group. For cancers other than leukemia there was a tendency for the excess risk to increase as the expected rate increased in both studies. (For the LSS the slope and standard error, SE, of the regression coefficient $b=0.21$, $SE=0.06$, $p < .001$, and for the spondylitis $b=0.38$, $SE=0.04$, $p < .001$, excluding leukemia from the calculations.) In contrast the site-specific relative risk showed no clear trend with expected rate (Figure 2). (For the LSS $b=-0.03$, $SE=0.04$, $p > .10$, and for the spondylitis $b=-0.02$, $SE=0.03$, $p > .10$, excluding leukemia.)

In their analysis of the spondylitis, Smith and Doll² examined the variation in the relative risk for cancers of heavily irradiated sites and found evidence of heterogeneity ($\chi^2_{12}=29.93$; $p < .01$), but this was due only to the large excess of tumors of the spinal cord and nerves, which at that time seemed likely to be a spurious result. The variation between the remaining sites was not significant despite the likely variation in dose due to the nonuniform nature of the radiation ($\chi^2_{11}=16.86$; $p > .10$). When similar calculations

有意な増加が認められた。三つの線量群すべてを用い、放射線量に伴う傾向を調べる検定を行ったところ、肝臓及び胆嚢の癌を除くすべての部位、並びに脊椎炎調査全低線量被曝部位について同一の有意水準を得た。これらの場合、有意値はやや減少して0.05の値になった。

寿命調査で少なくとも100 radの線量を受けた者においては、脊椎炎調査全低線量被曝部位癌の相対危険度と、同調査全高線量被曝部位癌のそれは酷似していた。ただし、過剰リスクは有意に低かった ($p < .05$)。脊椎炎調査低線量被曝部位については、寿命調査集団と脊椎炎例との間の相対危険度及び過剰リスクの両方とも寿命調査集団の方が脊椎炎例よりも高かったが、両調査間の差は有意ではなかった (相対危険度及び過剰リスクとも $p > .10$)。

癌部位による過剰リスク及び相対危険度の変動

図1は、両調査の各々について被曝群の部位別過剰リスクを期待死亡率(寿命調査集団では低線量群の層別比率、脊椎炎例では全国集団における層別比率が被曝群に影響をもっているとすれば観察されるであろうと思われる死亡率)に対してプロットしたものである。白血病以外の癌の場合は、過剰リスクは両調査で期待率が増加するのに伴い増加する傾向があった。(白血病を計算から除外すれば、寿命調査集団の場合は、回帰係数の勾配及び標準誤差 SE は $b=0.21$, $SE=0.06$ で $p < .001$ となり、脊椎炎例の場合は $b=0.38$, $SE=0.04$, $p < .001$ となる)。これに対して、部位別の相対危険度では期待率に伴う明白な傾向は認められなかった(図2)。(白血病を除けば、寿命調査の場合は $b=-0.03$, $SE=0.04$, $p > .10$ であり、脊椎炎例の場合は $b=-0.02$, $SE=0.03$, $p > .10$ である)。

脊椎炎例の解析において Smith 及び Doll² は、高線量被曝部位の癌の相対危険度の変動を調べ、不均一性 ($\chi^2_{12}=29.93$; $p < .01$) を認めたが、これは単に、その当時仮の結果であると思われた脊髄及び神経の腫瘍の過剰によるものであった。放射線の一様でない線質によって線量に変動が起こると考えられるにもかかわらず、その他の部位間にみられる変動は有意なものではなかった ($\chi^2_{11}=16.86$; $p > .10$)。寿命調査

FIGURE 1 EXCESS RISK AMONG THOSE EXPOSED TO RADIATION AND EXPECTED DEATH RATE FOR DIFFERENT CANCER SITES

図1 放射線被曝者における異なる癌部位に関する過剰リスク及び期待死亡率

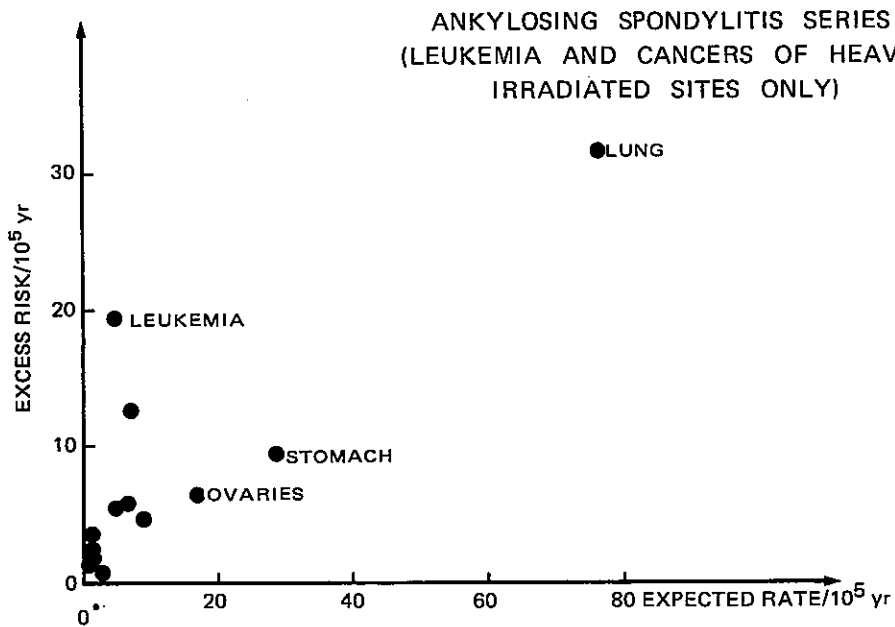
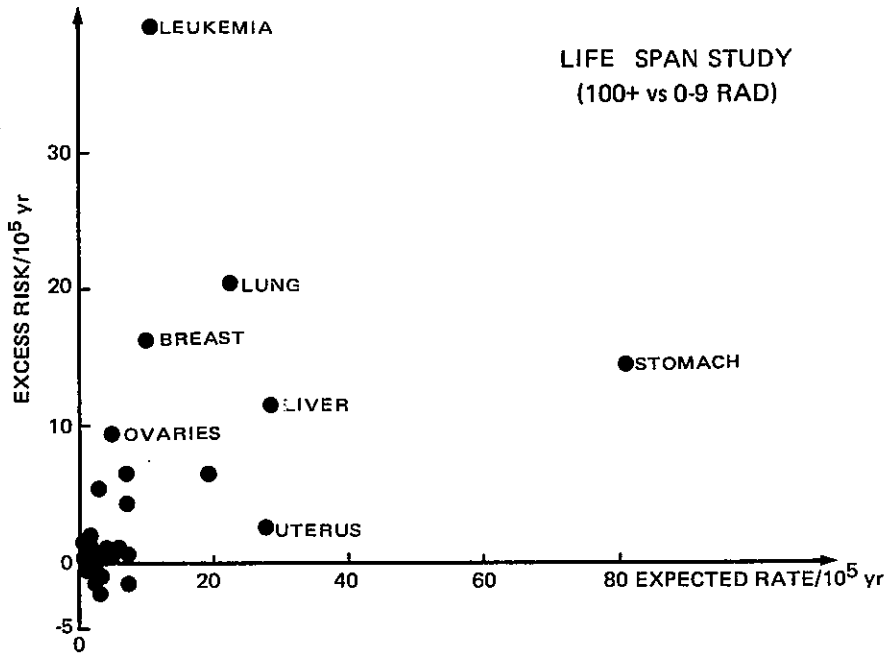
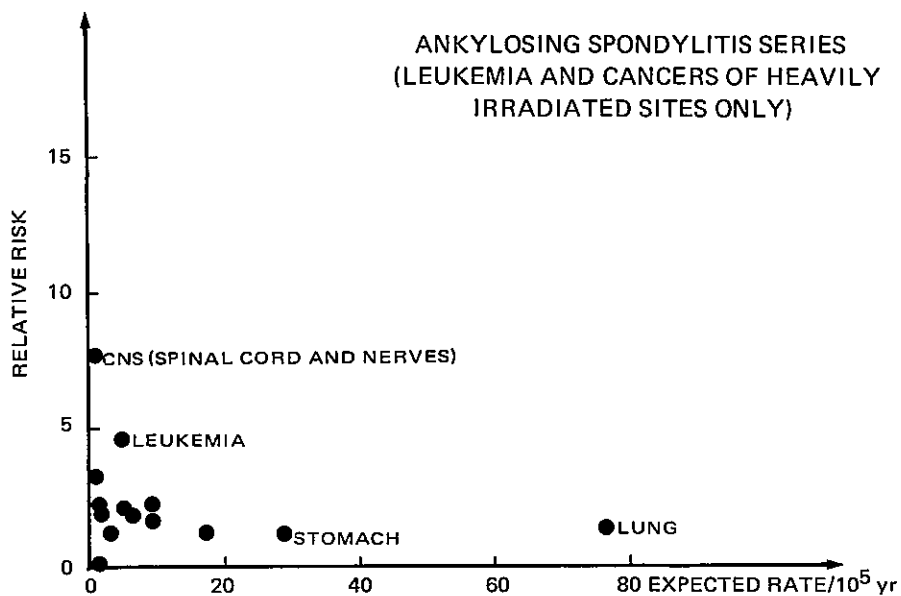
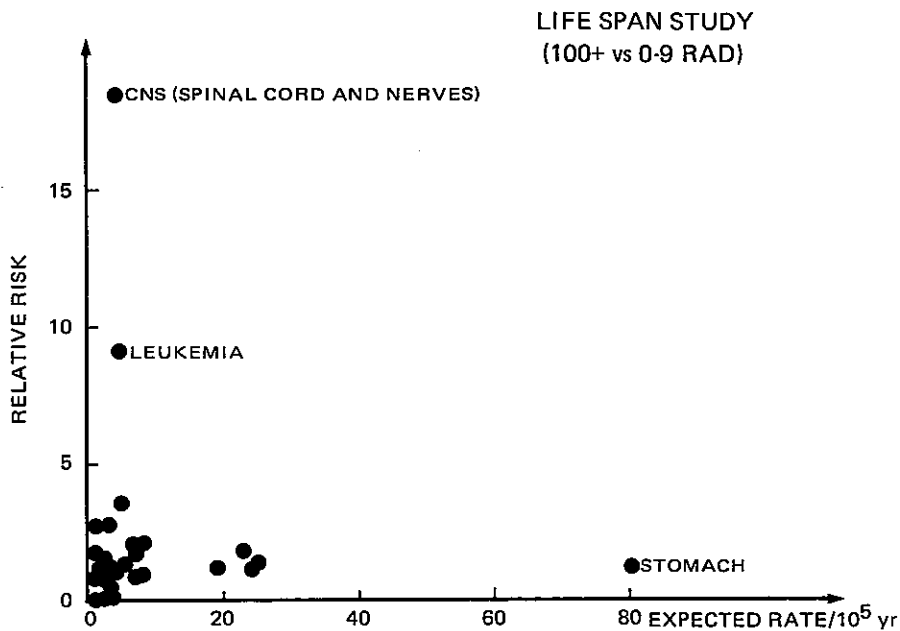


FIGURE 2 RELATIVE RISK AMONG THOSE EXPOSED TO RADIATION AND EXPECTED DEATH RATE FOR DIFFERENT CANCER SITES

図2 放射線被曝者における異なる癌部位に関する相対危険度及び期待死亡率



were made for the LSS there was statistically significant heterogeneity of relative risk among all sites which were heavily irradiated in the spondylitics ($\chi^2_{12}=25.85$; $p<.05$), and among all cancer sites other than leukemia ($\chi^2_{25}=49.91$; $p<.01$). When tumors of the spinal cord and nerves were excluded from the calculations there was still some evidence of heterogeneity ($\chi^2_{11}=18.74$; $.10>p>.05$ for remaining spondylitis heavily irradiated sites, $\chi^2_{24}=42.96$; $p<.05$ for all remaining cancer sites) although the estimated relative risks did not vary greatly in magnitude (Figure 2). Sites making the largest contributions to these test statistics were lung, ovaries, breast, and bladder (high relative risk), and stomach (low relative risk).

Trends in Radiation-induced Mortality

Leukemia: relative risk

For the spondylitics the final model for relative risk of leukemia from the modeling procedure consisted of an overall increase in risk wearing off in time (Table 6). Relative risks by age at exposure, time since exposure, and age at observation are shown in Figure 3. Males had slightly higher relative risks than females, but the difference was not significant ($p>.10$).

For the LSS the final model consisted of an overall increase dying out in time and with increasing age at exposure, and females in Nagasaki experienced reduced risk compared with other groups (Table 6 and Figure 3). In Hiroshima females had slightly, but not significantly, higher relative risks than males. The residual deviance for the final model showed significant lack of fit when compared with a χ^2 distribution, but simulation studies of data with identical stratum totals and person-years showed that the residual deviance was always substantially larger than the corresponding χ^2 variable, even for models with perfect fit. For the simulated data the Pearson χ^2 statistic followed the corresponding χ^2 distribution more closely.

The results of the above relative risk modeling procedure differ between the two studies, in that there is a significant trend with age at exposure in the LSS but not in the spondylitics. To see if this apparent discrepancy was due to the presence of those aged <15 ATB in the LSS, the modeling procedure for the LSS was repeated with them omitted. The final

集団に関して同様の計算を行ったところ、脊椎炎例のすべての高線量被曝部位 ($\chi^2_{12}=25.85$; $p<.05$) 及び白血病以外の癌のすべての部位 ($\chi^2_{25}=49.91$; $p<.01$) では、統計的に有意な相対危険度の不均一性が認められた。脊髄及び神経の腫瘍を計算対象から除外した場合も、依然として不均一性(それ以外の脊椎炎調査高線量被曝部位においては $\chi^2_{11}=18.74$; $.10>p>.05$, またそれ以外のすべての癌部位においては $\chi^2_{24}=42.96$; $p<.05$) が認められたが、推定相対危険度の大きさはあまり変化しなかった(図2)。これらの検定統計量に対して最大に寄与する部位は、肺、卵巣、乳房及び膀胱(相対危険度が高い)、並びに胃(相対危険度が低い)であった。

放射線誘発死亡率の傾向

白血病: 相対危険度

脊椎炎例の場合、モデリング法による白血病の相対危険度に関する最終モデルでは、リスクの全体的増加は経時的に減少していた(表6)。図3は、被曝時年齢、被曝後経過年数、及び観察時年齢別の相対危険度を示したものである。男性の相対危険度は女性よりやや高かったが、その差は有意なものではなかった($p>.10$)。

寿命調査集団に関する最終モデルは、全体的な増加は、経時的に、そして被曝時年齢の増加とともに消失しており、長崎の女性では他の群に比べて低いリスクが認められた(表6及び図3)。広島的女性における相対危険度は、男性よりもやや高かったが有意に高いものではなかった。最終モデルにおける残余偏差は、 χ^2 分布と比べると適合性が有意に乏しいことが認められたが、層の合計及び人年が同一である資料についてのシュミレーションでは、完全に適合するモデルの場合でさえ、残余偏差は対応する χ^2 変数よりも常に相当大きいものであった。シュミレーションでは、Pearson χ^2 統計量は対応する χ^2 分布に、より一層正確に従った。

寿命調査集団では被曝時年齢に伴って有意な傾向が見られるが、脊椎炎例ではそれが見られないという点で、両調査の間には上記相対危険度のモデリングの結果に差が認められる。この明瞭な不一致が、寿命調査集団中に原爆時年齢が15歳未満の者が含まれていることに起因したかどうかを調べるため、彼らを除外して寿命調査集団のモデリング法を繰り返した。

TABLE 6 MODELS OF CHANGES IN RELATIVE RISK WITH TIME SINCE EXPOSURE, AGE AT EXPOSURE, AGE AT OBSERVATION, CITY, AND SEX, FOR THE SPONDYLITIS SERIES AND THE LIFE SPAN STUDY SAMPLE (100+ vs 0-9 rad GROUP)

表6 脊椎炎調査及び寿命調査集団(100+rad 群対0~9 rad 群)における被曝後経過年数, 被曝時年齢, 観察時年齢, 都市及び性に伴う相対危険度の変化に関するモデル

Cause of death	Final model for relative risk	Residual deviance	Degrees of freedom	Parameter estimates ± standard errors	Correlation of parameter estimates
Leukemia					
All types					
Ankylosing spondylitis series	$e^{\alpha+\beta t}$	93.6	365	$\alpha = .8122 \pm .3571$ $\beta = -.1123 \pm .0360$	1.0000 .8492 1.0000
Life Span Study sample	$e^{\alpha+\nu x+\beta t+\gamma v}$	142.6 (Pearson $\chi^2=126.5$)	105	$\alpha = 2.5847 \pm .2097$ $\nu = -1.8407 \pm .6816$ $\beta = -.0904 \pm .0239$ $\gamma = -.0239 \pm .0118$	1.0000 -.3245 1.0000 -.2123 .0733 1.0000 -.0815 .2508 -.0685 1.0000
Acute Leukemia					
Life Span Study sample	$e^{\alpha+\nu x+\beta t+\delta u^2}$	102.2 (Pearson $\chi^2=90.6$)	78	$\alpha = 2.3077 \pm .3642$ $\nu = -1.3652 \pm .6343$ $\beta = -.1317 \pm .0305$ $\delta = .0014 \pm .0006$	1.0000 -.3184 1.0000 -.0232 .1198 1.0000 -.6719 -.0077 -.2999 1.0000
Selected Tumors Common to Both Series†					
Ankylosing spondylitis series	e^{α}	181.8	325	$\alpha = .3545 \pm .0733$	
Life Span Study sample	$e^{\alpha+\mu z+\delta s}$	357.1	334	$\alpha = 1.4430 \pm .2798$ $\mu = -.3256 \pm .1519$ $\delta = -.5753 \pm .1476$	1.0000 -.7576 1.0000 -.6730 .0935 1.0000

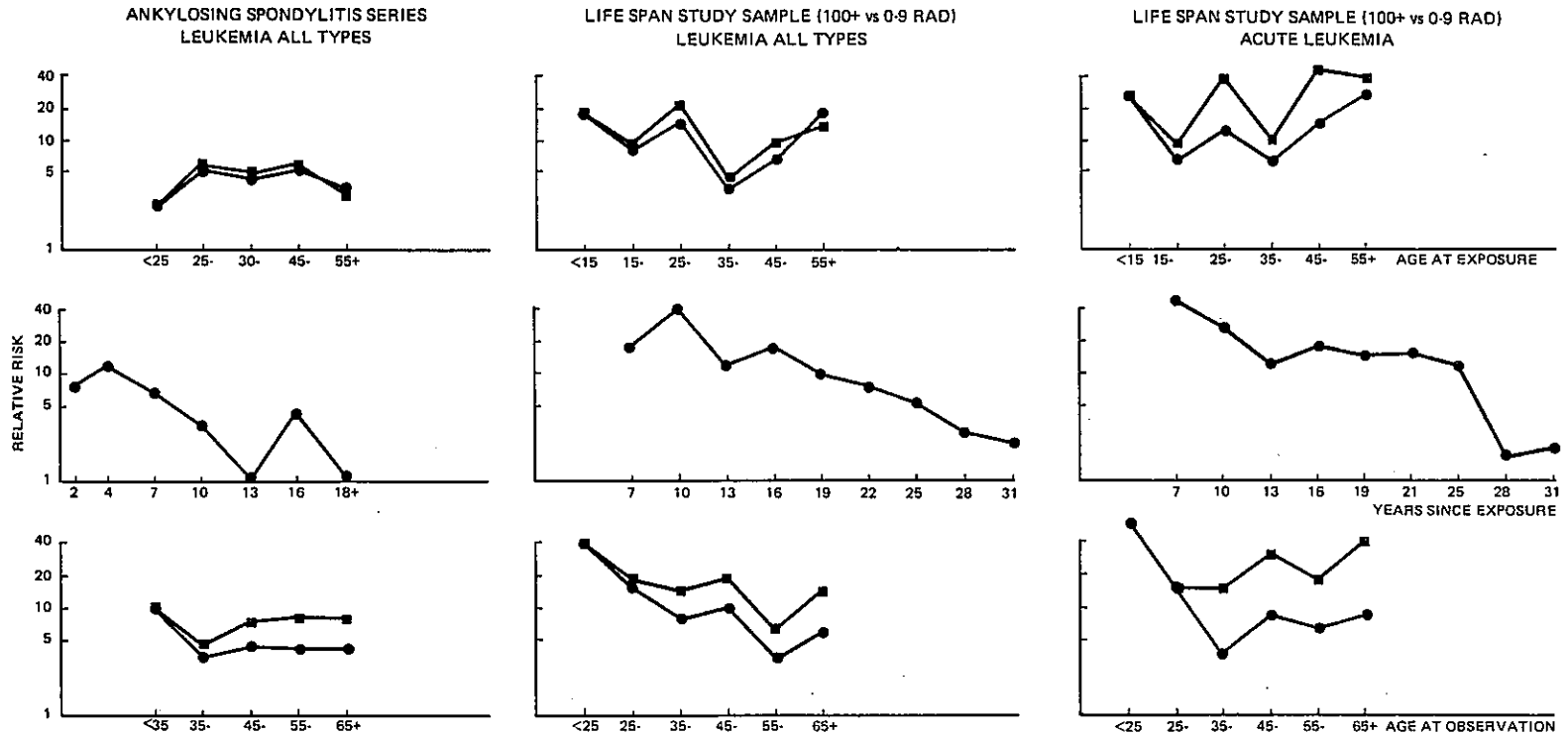
t = years since exposure - 16; x = 1 for Nagasaki females, 0 otherwise; v = age at exposure in years - 30; u = age at observation in years - 40;
t = 被曝後経過年数 -16; x = 長崎の女性の場合は1, その他の場合は0; v = 年単位の被曝時年齢 -30; u = 年単位の観察時年齢 -40;

z = 0 for Hiroshima, 1 for Nagasaki; s = log_e (age at exposure in years) - 2.5
z = 広島の場合は0, 長崎の場合は1; s = log_e(年単位の被曝時年齢) - 2.5

† Cancers of pharynx, esophagus, stomach, pancreas, larynx, lung, ovaries, skin, bones (excluding jaw and nose)
咽頭, 食道, 胃, 膵臓, 喉頭, 肺, 卵巣, 皮膚, 骨(顎及び鼻を除く)の癌

FIGURE 3 VARIABILITY IN RELATIVE RISK OF LEUKEMIA WITH AGE AT EXPOSURE, TIME SINCE EXPOSURE, AND AGE AT OBSERVATION

図3 被曝時年齢, 被曝後経過年数, 及び観察時年齢に伴う白血病の相対危険度の変動性



● UNADJUSTED 訂正しなかったもの

■ ALLOWING FOR A LINEAR TREND IN LOG (RELATIVE RISK) WITH TIME SINCE EXPOSURE. FOR THE PLOTTED POINTS TIME SINCE EXPOSURE HAS BEEN CHOSEN SO THAT THE INITIAL POINT COINCIDES WITH THE UNADJUSTED VALUE.

被曝後経過年数に伴うlog(相対危険度)の線形傾向を考慮したもの。プロットした点については、最初の点が未訂正の値と一致するように、被曝後経過年数を選定した。

model included a linear decrease in log (relative risk) with time since exposure, and a reduced risk for Nagasaki females, but after allowing for these the trend with age at exposure was not significant in the LSS alone ($\chi^2_1=0.8$; $p>.10$), nor when it was estimated jointly from the two studies ($b/SE=-0.63$; $p>.10$). Thus the trend with age at exposure in the LSS is entirely due to the presence of those aged <15 ATB.

The presence of those aged <15 ATB in the LSS does not, however, explain the increased overall relative risk for leukemia compared with the spondylitics. Just considering those aged ≥ 15 ATB in the LSS, the relative risk for leukemia between 5.2 and 20.5 years since exposure is 13.50 (90% confidence interval, CI, 8.60, 21.21). This is significantly greater than the corresponding risk for the spondylitics which is 3.37 (90% CI, 2.21, 5.15) ($p<.001$).

The different types of leukemia have different age distributions in the general population, with childhood leukemia being mainly acute. Also there is at present no evidence of an excess of chronic lymphatic leukemia following irradiation. Therefore, to see if the models selected above were artifacts due to grouping together diseases with differing etiologies, the mortality data in the LSS was matched against the leukemia registry data.^{12,13} For individuals who had died, the preferred diagnosis as to type and acuteness of leukemia was taken from the registry data. Nine individuals, all in the 100+rad dose group, whose death certificate diagnosis was not leukemia, but who appeared on the registry files with definite diagnoses of leukemia were included in the analysis (six of these deaths were certified as due to aplastic anemia). Five individuals with doses of 0-9 rad, and two individuals in the 100+rad dose group, had leukemia as their certified cause of death, but did not appear on the registry files. They were therefore excluded from the analysis. In the entire LSS only one individual, who was in the 0-9 rad dose group, had a registry diagnosis of chronic lymphatic leukemia. Nine individuals in the 0-9 rad dose group and 15 in the 100+rad group had registry diagnoses of other types of chronic leukemia. These were enough to demonstrate a significant excess (relative risk = 19.1, $p<.001$), but too few to do any detailed analyses. There were 47 registry diagnoses of acute leukemia in the 0-9 rad dose group, and 54 in

最終モデルには被曝後経過年数に伴う対数(相対危険度)の線形減少,並びに長崎の女性の低いリスクを含めたが,これらを考慮したところ,被曝時年齢に伴う傾向は寿命調査のみにおいては有意でなく($\chi^2_1=0.8$, $p>.10$),また両調査から同時に推定した場合でも有意なものではなかった($b/SE=-0.63$, $p>.10$).したがって,寿命調査集団における被曝時年齢に伴う傾向は,もっぱら原爆時年齢が15歳未満の者が含まれていることに起因する。

しかし,寿命調査集団に原爆時年齢15歳未満の者が存在することは,白血病の総合的な相対危険度が脊椎炎例のそれに比べて増加していることの説明にはならない。寿命調査集団中の原爆時年齢15歳以上の者を考えてみると,被曝後経過年数5.2年と20.5年の間における白血病の相対危険度は13.50(90%信頼区間8.60, 21.21)になる。これは,脊椎炎例の対応するリスク3.37(90%信頼区間2.21, 5.15)よりも有意に大きい($p<.001$)。

一般集団では,異なる型の白血病がそれぞれの異なる年齢分布を示し,例えば,小児白血病は主として急性である。また,現在のところ,放射線被曝による慢性リンパ球性白血病の過剰を示す所見はない。したがって,上記で選定したモデルが異なる病因による疾患を一つに分類したことによる人為的結果であったかどうかを調べるため,寿命調査の死亡率資料を白血病登録資料と組み合わせた。^{12,13} 死亡例の場合,白血病の型及び急性度に関する優先診断は登録資料から入手した。全員が100 rad以上の線量群に属し,死亡診断書の診断は白血病ではないが,診断確実な白血病として登録されている9例を解析に含めた(これらの死亡例のうち6例は,再生不能性貧血によるものと診断された)。線量が0~9 radである5例,及び100 rad以上群の2例は,死亡診断書では死因は白血病であったが,登録には認められなかったため解析から除外した。寿命調査集団全体では,0~9 rad線量群に属した1例のみが慢性リンパ球性白血病の診断名で登録されていた。0~9 rad線量群中の9例,及び100 rad以上群中の15例は,その他の種類の慢性白血病の診断で登録されていた。これらは有意な過剰(相対危険度=19.1, $p<.001$)を示すに十分なものであったが,詳細な解析を行うには例数が少な過ぎた。0~9 rad群に47例,100 rad以上群に54例の急性白血病の登録診断例があり,

the 100+rad group, enough to carry out a full analysis (Table 6 and Figure 3). After allowing for the effect of time since exposure, the effect of age at exposure was not significant ($p > .10$ for both linear and quadratic trends and also separate effects fitted to each age at exposure group), but a quadratic trend in age at observation was significant ($\chi^2_1 = 6.4, p < .05$).

Leukemia: excess risk

Excess risks from leukemia by age at exposure, time since exposure, and age at observation are shown in Table 7. As reported by Smith and Doll² excess risks in the spondylitics increased with age at exposure ($p < 0.5$ both before and after direct standardization for time since exposure), and decreased with time since exposure ($p < 0.01$ before, and $p < .05$ after standardization for age at exposure). Excess risks rose sharply with age at observation after age 40 ($p < .05$). Direct standardization seemed an unsuitable method of correcting risks by age at observation for the effect of time since exposure, as in the LSS there were no individuals in the <25 age-group in the latest time period. However, correcting for a linear trend in excess risk with time since exposure caused little change in the pattern of excess risks with age at observation in the spondylitics. Excess risks for males and females were not significantly different ($p > .10$).

For the LSS there was little evidence of a trend in excess risk with age at exposure for all types of leukemia or for acute leukemia, whether or not the risks were standardized for time since exposure ($p > .10$ in all four cases). There were clear decreases in excess risk with time since exposure for all types of leukemia ($p < .001$, both before and after standardization for age at exposure) and for acute leukemia ($p < .001$ before, and $p < .01$ after standardization for age at exposure). Excess risks for all types of leukemia showed quadratic variation in age at observation with a minimum at age 40 ($p < .01$). After correcting for a linear trend in excess risk with time since exposure, there was still a minimum at age 40, but the evidence of quadratic variation was reduced ($.10 > p > .05$). Excess risks for acute leukemia also showed quadratic variation with age at observation with a minimum at age 40, decreasing sharply until then and increasing steadily afterwards ($p < .01$ both before and after correcting for a linear

完全な解析を行うに十分であった(表6及び図3)。被曝後経過年数の影響を考慮したところ、被曝時年齢の影響は有意ではなかったが(線形及び二次の両傾向とも $p > .10$ であり、またそれぞれの影響も各被曝時年齢群に適合した)、観察時年齢における二次傾向は有意なものであった($\chi^2_1 = 6.4, p < .05$)。

白血病: 過剰リスク

表7は白血病の過剰リスクを被曝時年齢、被曝後経過年数、及び観察時年齢別に示したものである。Smith及びDoll²が報告したように、脊椎炎例における過剰リスクは、被曝時年齢とともに増加し(被曝後経過年数に関して直接標準化する前も後も、 $p < 0.5$)、被曝後経過年数とともに減少した(被曝時年齢に関する標準化の前は $p < 0.01$ 、後は $p < .05$)。過剰リスクは40歳以後は観察時年齢とともに急上昇した($p < .05$)。寿命調査集団では、最近の期間には25歳未満群の者がいなかったため、直接標準化には被曝後経過年数の影響について観察時年齢別にリスクを訂正する方法は不適當のように思われた。しかし、被曝後経過年数に伴う過剰リスクの線形傾向について訂正を行ったところ、脊椎炎例では、観察時年齢に伴う過剰リスクのパターンはほとんど変化は起こらなかった。男性と女性の過剰リスクに有意な差はなかった($p > .10$)。

寿命調査の場合は、被曝後経過年数についてリスクの標準化が行われていると否とにかかわらず、すべての型の白血病、又は急性白血病についての被曝時年齢に伴う過剰リスクに一定の傾向はほとんど認められなかった(四つの場合すべてにおいて $p > .10$)。すべての型の白血病(被曝時年齢に関する標準化の前後共に、 $p < .001$)並びに急性白血病(被曝時年齢に関する標準化の前には $p < .001$ 、後には $p < .01$)における被曝後経過年数に伴う過剰リスクには明らかな減少が認められた。すべての型の白血病に関する過剰リスクでは、観察時年齢に関して二次性変動が認められ、40歳の値が最小となった($p < .01$)。被曝後経過年数に伴う過剰リスクの線形傾向について訂正を行った後も、依然として40歳で最小値が認められたが、二次性変動は減少した($.10 > p > .05$)。急性白血病の過剰リスクでも観察時年齢に伴う二次性変動が認められ、40歳で最小であった。このリスクは40歳までは急激に減少し、その後しだいに上昇した(被曝後経過年数に伴う線形傾向について行った訂正の前

TABLE 7 EXCESS LEUKEMIA RISKS BY AGE AT EXPOSURE, TIME SINCE EXPOSURE, AND AGE AT OBSERVATION FOR THE SPONDYLITIS SERIES AND THE LIFE SPAN STUDY SAMPLE (100+ vs 0-9 rad GROUP)

表7 脊椎炎調査及び寿命調査集団(100+rad 群対0~9rad 群)に関する被曝時年齢, 被曝後経過年数, 及び観察時年齢別の過剰白血病リスク

Age at exposure	Ankylosing Spondylitis Series					Life Span Study Sample								
	All types of leukemia					All types of leukemia				Acute leukemia				
	Observed number of deaths	Crude excess risk	Excess risk standardized for time since exposure		Observed number of deaths		Crude excess risk	Excess risk standardized for time since exposure	Excess risk in those >15 at exposure standardized for time since exposure to spondylitis series	Observed number of deaths		Crude excess risk	Excess risk standardized for time since exposure	
			Entire study	>5.5 years since exposure only	0-9 rad	100+ rad				0-9 rad	100+ rad			
<15	-	-	-	-	12	18	40.9 (10.3)	43.7 (11.0)	-	7	15	34.7 (9.4)	38.0 (10.2)	
15-24	1	3.6 (6.0) [†]	3.7 (6.0)	-2.6 (0.0)	13	15	28.5 (9.0)	29.9 (9.3)	41.9 (14.0)	12	13	24.2 (8.4)	26.1 (8.9)	
25-34	7	13.4 (6.3)	14.0 (6.5)	6.9 (6.1)	8	11	50.5 (16.1)	51.1 (16.3)	58.5 (22.0)	6	7	31.8 (12.9)	31.4 (12.7)	
35-44	8	19.0 (8.5)	18.8 (8.5)	15.6 (9.6)	23	10	33.8 (14.5)	32.9 (14.2)	49.5 (20.3)	16	10	37.8 (14.4)	37.6 (14.3)	
45-54	8	43.1 (18.4)	45.6 (20.1)	50.7 (26.0)	9	6	56.4 ^a (18.3)	56.4 ^a (19.2)	31.3 (17.9)	4	5	44.3 ^a (15.8)	49.4 ^a (18.2)	
>55	4	52.3 (34.8)	37.9 (28.6)	0.77 (23.0)	5	6			117.8 (53.4)	2	4			

Years since exposure	Observed number of deaths	Crude excess risk	Excess risk standardized for age at exposure		Observed number of deaths		Crude excess risk	Excess risk standardized for age at exposure	Excess risk in those >15 at exposure standardized for age at exposure to spondylitis series	Observed number of deaths		Crude excess risk	Excess risk standardized for age at exposure
			Entire study	>5.5 years since exposure only	0-9 rad	100+ rad				0-9 rad	100+ rad		
			2.5-5.5	13	33.1 (10.2)	31.7 (9.8)				-	-		
5.5-11.5	9	19.7 (8.2)	19.3 (8.0)	19.1 (7.9)	12 ^b	28 ^b	72.5 ^b (14.5)	74.7 ^b (15.0)	67.5 ^b (19.7)	5 ^b	23 ^b	60.8 ^b (13.1)	65.4 ^b (14.1)
11.5-17.5	5	10.9 (7.8)	11.1 (8.0)	10.8 (7.7)	13	18	49.7 (12.9)	49.1 (12.8)	45.6 (17.1)	9	12	32.6 (10.6)	31.8 (10.3)
17.5-23.5	1 ^c	0.4 ^c (8.4)	4.7 ^c (14.3)	4.0 ^c (13.3)	11	10	28.3 (10.2)	28.6 (10.3)	32.6 ^c (11.0)	7	11	32.8 (10.7)	33.2 (10.9)
>23.5					34	10	13.6 (7.0)	15.1 (7.8)		26	8	11.1 (6.3)	13.8 (7.4)

(Continue 次頁)

TABLE 7 (Continued) 表7 続き

Age at observation	Ankylosing Spondylitis Series			Life Span Study Sample							
	All types of leukemia			All types of leukemia				Acute leukemia			
	Observed number of deaths	Crude excess risk	Excess risk 5.5-11.5 years since exposure, assuming a linear trend with time since exposure	Observed number of deaths		Crude excess risk	Excess risk 5.5-11.5 years since exposure, assuming a linear trend with time since exposure	Observed number of deaths		Crude excess risk	Excess risk 5.5-11.5 years since exposure, assuming a linear trend with time since exposure
			0-9 rad	100+ rad			0-9 rad	100+ rad			
<25	0	-	-	5	18	85.4 (20.8)	94.9	3	18	86.5 (20.8)	93.8
25-34	5	18.9 ^d (9.4) [†]	13.3 ^d	7	12	36.3 (11.8)	61.1	4	8	23.5 (9.7)	42.6
35-44	4	7.9 (5.5)	8.6	7	6	17.1 (7.7)	53.1	6	3	8.0 (5.5)	35.6
45-54	7	17.5 (8.4)	22.1	12	13	40.2 (13.2)	76.3	9	8	23.6 (10.4)	51.3
55-64	7	34.7 (16.8)	41.2	19	7	24.9 (13.2)	57.9	13	8	33.8 (14.1)	59.2
>65	5	65.4 (38.4)	72.3	20	10	47.9 (18.5)	89.6	12	9	45.5 (17.5)	77.6

† Standard errors in parentheses 括弧内は標準誤差

a: Age >45 at exposure, b: 5.2-11.5 years since exposure, c: >17.5 years since exposure, d: Age <35 at observation

a: 被曝時年齢 >45歳, b: 被曝後経過年数 5.2~11.5年, c: 被曝後経過年数 >17.5年, d: 観察時年齢 <35歳

Excess risks are per 100,000 person-years

過剰リスクは100,000人年当たりの値

trend with time since exposure). For all types of leukemia, excess risks for males were significantly greater than for females ($p < .05$), and the difference was chiefly due to a low excess among Nagasaki females. For acute leukemia, excess risks were very similar in males and females.

In order to compare excess risks by age at exposures in the two studies properly, those aged < 15 ATB were excluded from the LSS, and the initial time since exposure period excluded from the spondylitis data. For the remaining data, the trend with age at exposure was no longer significant in the spondylitis ($p > .10$ after standardization for time since exposure). Furthermore, omitting those aged < 15 ATB from the LSS and standardizing for time since exposure to the remaining overall distribution of person-years in the spondylitis data did not reveal any significant trend with age at exposure ($p > .10$). The estimated trends in the two studies were not significantly different from each other ($p > .10$), and their weighted mean was also not significantly different from zero ($p > .10$).

The presence of those aged < 15 ATB in the LSS does not explain the increased level of excess risk of leukemia in the LSS compared with the spondylitis. Just considering those aged ≥ 15 ATB in the LSS, the excess risk/ 10^5 up to 20.5 years since exposure is 51.2 (90% CI, 35.6, 66.8). This is significantly greater than the risk for the corresponding period in the spondylitis which is 14.5 (90% CI, 5.7, 23.2) ($p < .001$).

Selected tumors common to both series: relative risk

For the spondylitis the final model for relative risk for selected tumors common to both series consisted simply of an overall increase in relative risk (Table 6). There were no significant trends with age at exposure, time since exposure, or age at observation (Figure 4).

For the LSS, there were significant linear and quadratic trends in $\log(\text{relative risk})$ with age at exposure (linear trend $\chi_1^2 = 9.3$, $p < .01$, quadratic trend $\chi_1^2 = 5.2$, $p < .05$). Investigation showed that these were well modeled by a single linear trend with $\log(\text{age at exposure})$, and the final model included also a reduced level of risk for those in Nagasaki (Table 6). Those

はいずれも $p < .01$). すべての型の白血病においては、男性の過剰リスクは女性よりも有意に大きく ($p < .05$), その差は主として長崎の女性における過剰リスクが低いことに由来した。急性白血病に関する過剰リスクは男女とも酷似していた。

両調査における被曝時年齢別の過剰リスクを適切に比較するため、寿命調査集団から原爆時15歳未満であった者を、また脊椎炎資料から被曝後経過年数の最初の期間を、それぞれ除外した。残りの資料の場合は、脊椎炎例における被曝時年齢に伴う傾向はもはや有意なものではなかった(被曝後経過年数の標準化後は $p > .10$)。その上、寿命調査集団から原爆時年齢15歳未満の者を除外し、脊椎炎の資料における残りの総合人年分布に対して被曝後経過年数の標準化を行ったところ、被曝時年齢に伴う有意な傾向はならぬ認められなかった ($p > .10$)。両調査で推定された傾向には、相互の有意な差はなく ($p > .10$), その加重平均値も有意にゼロと異ならなかった ($p > .10$)。

寿命調査集団に原爆時年齢15歳未満の者がいることは、脊椎炎例に比べて寿命調査集団における白血病の過剰リスクの値が増加していることの説明にはならない。寿命調査集団中の原爆時年齢15歳以上の者を考えるだけでも、被曝後経過年数20.5年までの過剰リスク/ 10^5 年は51.2となる(90%信頼区間35.6, 66.8)。これは脊椎炎例の対応する期間におけるリスク14.5より有意に大きい(90%信頼区間5.7, 23.2) ($p < .001$)。

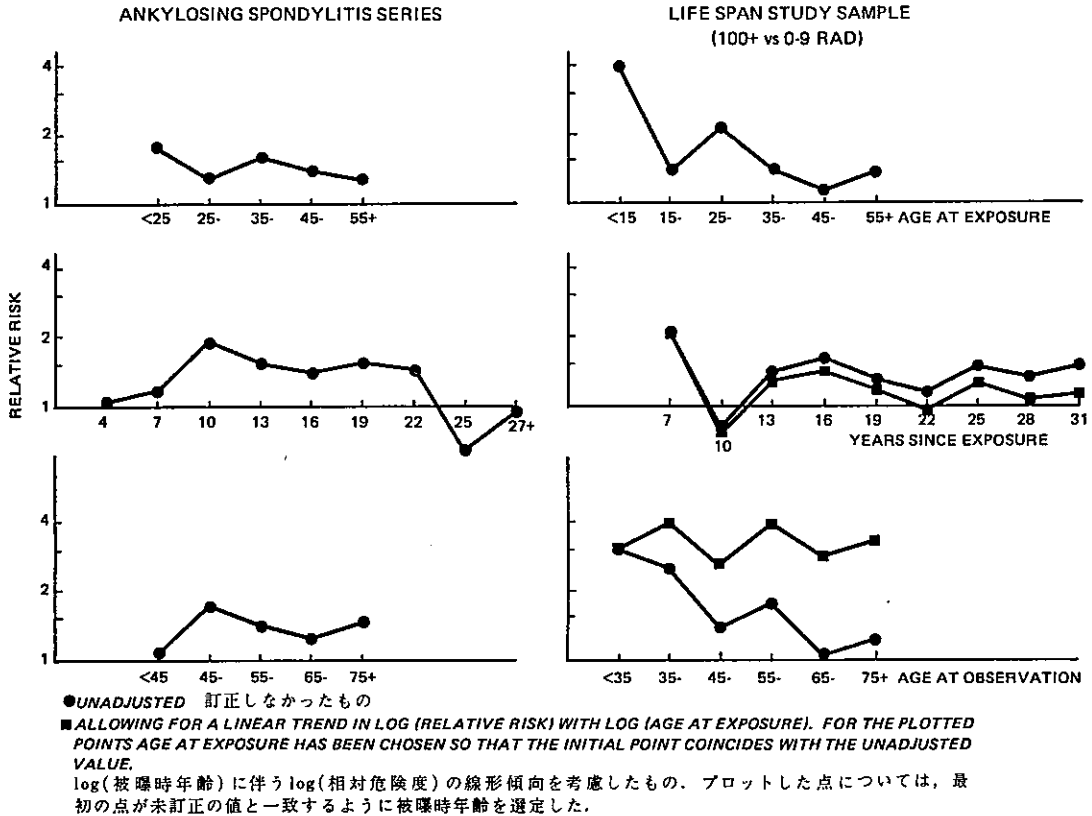
両調査に共通の特定腫瘍: 相対危険度

脊椎炎例においては、両調査に共通である特定腫瘍の相対危険度に関する最終モデルは、単に相対危険度の全体的な増加を示した(表6)。被曝時年齢、被曝後経過年数、又は観察時年齢に伴う有意な傾向はみられなかった(図4)。

寿命調査集団においては、被曝時年齢に伴って $\log(\text{相対危険度})$ に有意な線形及び二次の傾向があった(線形傾向 $\chi_1^2 = 9.3$, $p < .01$, 二次傾向 $\chi_1^2 = 5.2$, $p < .05$)。これらは $\log(\text{被曝時年齢})$ に伴う単一線形傾向によってうまくモデリングされ、最終モデルは長崎における低いリスクも含まれている

FIGURE 4 VARIABILITY IN RELATIVE RISK WITH AGE AT EXPOSURE, TIME SINCE EXPOSURE, AND AGE AT OBSERVATION FOR SELECTED TUMORS COMMON TO BOTH SERIES

図4 両調査に共通の特定腫瘍における被曝時年齢、被曝後経過年数、及び観察時年齢に伴う相対危険度の変動性



who were <35 ATB had lower death rates from all causes combined than older individuals, and so contributed a higher proportion of the person-years in the 100+rad dose group in the later part of the study than at early periods (80% in the latest time period compared with 60% in the first one). Allowing for the decrease in relative risk with increasing age at exposure, therefore reduces the relative risk in later time periods compared with the early ones (Figure 4). However the trend in log(relative risk) with time since exposure was not significant either before or after allowing for the effect of age at exposure ($\chi_1^2=0.0$, $p>.10$, before and $\chi_1^2=0.9$, $p>.10$ after allowing for the effect of age at exposure). Without adjusting for the effect of age at exposure, there was a significant trend in log(relative risk) with age at observation ($\chi_1^2=9.5$, $p<.01$, Figure 4). However, the trend completely disappeared when the effect of age at exposure was allowed for ($\chi_1^2=0.2$, $p>.10$).

ことが認められた(表6)。原曝時35歳未満であった者では、高齢者よりも全死因による死亡率が低かったため、調査の後半においては、初期よりも100rad以上群の年々に大きく寄与した(初期の60%に比べて後期では80%であった)。したがって、被曝時年齢の増加に伴う相対危険度の減少を考慮すると、初期に比べて後期の相対危険度は減少する(図4)。ただし、被曝後経過年数に伴うlog(相対危険度)の傾向は、被曝時年齢の影響を考慮する以前と以後のいずれにおいても、有意なものではなかった(被曝時年齢の影響を考慮する前は、 $\chi_1^2=0.0$, $p>.10$ であり、後は $\chi_1^2=0.9$, $p>.10$ である)。被曝時年齢を調整しない場合は、観察時年齢に伴ってlog(相対危険度)に有意な傾向がみられた($\chi_1^2=9.5$, $p<.01$, 図4)。しかし、被曝時年齢を考慮した場合は、この傾向は完全に消失した($\chi_1^2=0.2$, $p>.10$)。

The initial time period in the spondylitis data (2.5-5.5 years since exposure) is not present in the LSS, and if this period is excluded from the spondylitis data, then for the remaining data the coefficient of a linear trend in log (relative risk) with time since exposure is -0.0086 (SE .0157) while for the LSS the corresponding coefficient is -0.0076 (SE .0098), after allowing for intercity differences and a linear trend in log(relative risk) with log(age at exposure). These two are not significantly different ($p>.10$), and the coefficient of a linear trend in log(relative risk) with time since exposure estimated jointly from the two series is -0.0079 (SE .0083) which is not significantly different from zero. Thus for this group of solid tumors both studies are consistent with a model in which the relative risk for an exposed individual remains constant between about 5 and about 30 years after exposure.

In the spondylitis data, with the period 2.5-5.5 years since exposure omitted, the coefficient of a linear trend in log(relative risk) with log(age at exposure) is -0.1445 (SE .3230), so that although the trend with age at exposure in the spondylitis is not significantly different from zero, it is also not significantly different from that observed in the LSS ($p>.10$). Combining the information from the two studies, the joint estimate of the trend is -0.5009 (SE .1342). Thus the two studies are consistent and when combined provide evidence of a significant decreasing trend in log(relative risk) with log (age at exposure) ($p<.001$). From Figure 4 the evidence for the trend appears to come chiefly from individuals in the LSS who were aged <15 ATB. However, if these individuals are excluded from the calculations, the coefficient for the remaining LSS data is -0.5357 (SE .2495), and for both studies combined the joint estimate is -0.3895 (SE .1975) which is still significantly different from zero ($p<.05$).

There is no evidence of differences in the relative risk for males and females. In the LSS, after allowing for age at exposure and intercity differences, the estimates for females are slightly higher than for males, and in the spondylitis those for males are slightly higher than for females, but in neither study are the effects significant ($p>.10$ in both studies).

脊椎炎資料における最初の期間(被曝後経過年数 2.5~5.5年)は、寿命調査集団にはないので、この期間を脊椎炎資料から除けば、残りの資料については、被曝後経過年数に伴う log(相対危険度)の線形傾向の係数は -0.0086 (標準誤差.0157)となるが、寿命調査集団については、両市の差、並びに log(被曝時年齢)に伴う log(相対危険度)の線形傾向を考慮すると、対応する係数は -0.0076 (標準誤差.0098)である。これらの両者間に有意な差はなく($p>.10$)、両調査から同時に推定した被曝後経過年数に伴う log(相対危険度)の線形傾向の係数は -0.0079 (標準誤差.0083)であって、これは有意にゼロと異なる。したがって、この充実性腫瘍については、両調査とも、被曝者の相対危険度が被曝後約5年と約30年の間で一定であるモデルと一致している。

被曝後 2.5~5.5年の期間を除外した脊椎炎資料では、log(被曝時年齢)に伴う log(相対危険度)の線形傾向の係数は -0.1445 (標準誤差.3230)であるので、脊椎炎例における被曝時年齢に伴う傾向は有意にゼロと異なるが、寿命調査で認められた傾向とも有意な差はなかった($p>.10$)。両調査による資料を組み合わせると、その傾向の合計推定値は -0.5009 (標準誤差.1342)である。したがって、両調査は一致しており、両者を組み合わせた場合は、log(被曝時年齢)に伴う log(相対危険度)の有意な減少傾向が得られる($p<.001$)。図4によれば、この傾向は主として、原爆時15歳未満であった寿命調査対象者によってもたらされるように思われる。しかし、これらの対象者を計算から除外すれば、残りの寿命調査資料の係数は -0.5357 (標準誤差.2495)となり、両調査を組み合わせた場合は、合計推定値は -0.3895 (標準誤差.1975)となって、これも有意にゼロと異なる($p<.05$)。

男女の相対危険度には差は認められない。被曝時年齢及び両市間の差を考慮すると、寿命調査集団では女性の推定値は男性のそれよりやや高く、脊椎炎例では男性の推定値は女性のそれよりやや高い。いずれの調査においてもその影響は有意なものではない(両調査とも $p>.10$)。

Selected tumors common to both series: excess risk

In the spondylitics excess risk increased rapidly with age at exposure ($p < .01$, Table 8). Standardization for time since exposure caused little change in the pattern. Excess risk increased steadily with time since exposure ($p < .05$). Standardization for age at exposure made little change to the general pattern, but increased the significance level ($p < .01$). Excess risk increased rapidly with age at observation ($p < .001$). Standardization for time since exposure reduced the trend, but it remained significant ($p < .001$).

In the LSS excess risk varied irregularly with age at exposure and there was no significant overall trend ($p > .10$ whether or not the excess risks were standardized for time since exposure). There was marginal evidence of an increasing excess risk with time since exposure ($.10 > p > .05$, before and after standardization for age at exposure). Excess risk varied somewhat irregularly with age at observation, but nevertheless there was a significant trend ($p < .01$ before and $p < .05$ after standardization for time since exposure).

In the above analysis, trends in excess risk with age at exposure, time since exposure, and age at observation all appear more clearly in spondylitics than the LSS. For detailed comparison the initial time period was omitted from the spondylitics, those aged < 15 ATB were excluded from the LSS, and the remaining data for both studies were standardized to the person-years distribution of the spondylitics. In the spondylitics there was still a clear trend in excess risk with age at exposure ($p < .01$). In the LSS there was also a clear trend with age at exposure ($p < .05$). The reason for the apparent change in pattern in the LSS is that those aged 25-44 at exposure had large excess risks in the more recent time since exposure periods. These are given lower weight when the person-years of the spondylitics are used as a standardizing distribution. The trends in the two studies were not significantly different ($p > .10$), and the joint estimate of the increase in excess risk/ 10^5 was 31.7 (SE 8.5) for each 10-year increase in age at exposure.

両調査に共通の特定腫瘍: 過剰リスク

脊椎炎例においては、過剰リスクは被曝時年齢とともに急激に増加した ($p < .01$, 表 8)。被曝後経過年数で標準化しても、パターンにほとんど変化は起こらなかった。過剰リスクは被曝後経過年数とともにしだいに増加した ($p < .05$)。被曝時年齢について標準化を行っても、総合パターンにはほとんど変化は生じないが、有意水準は増加した ($p < .01$)。過剰リスクは観察時年齢とともに急激に増加した ($p < .001$)。被曝後経過年数で標準化したところ、この傾向は減少したが、依然として有意なものであった ($p < .001$)。

寿命調査集団では、過剰リスクは被曝時年齢とともに不規則に変動し、全体的に有意な傾向はなかった (被曝後経過年数について過剰リスクの標準化を行った場合も、そうでない場合も、 $p > .10$)。被曝後経過年数に伴って過剰リスクの増加が若干認められた (被曝時年齢の標準化の以前と以後いずれも $.10 > p > .05$)。過剰リスクは、観察時年齢とともに幾らか不規則に変化したが、それにもかかわらず有意な傾向があった (被曝後経過年数に対する標準化の前は $p < .01$, 後は $p < .05$)。

上記の解析では、被曝時年齢、被曝後経過年数、及び観察時年齢に伴う過剰リスクの傾向は、すべて寿命調査集団よりも脊椎炎例の方に明白に現れる。詳細な比較を行うために、脊椎炎例から最初の期間を除外し、寿命調査集団から原爆時15歳未満であった者を除外して、両調査に関する残りの資料を脊椎炎例の年分布に対して標準化させた。脊椎炎例では、依然として被曝時年齢に伴う過剰リスクに明白な傾向が認められた ($p < .01$)。寿命調査集団でも、被曝時年齢に伴う明白な傾向が認められた ($p < .05$)。寿命調査集団のパターンに明瞭な変化が認められる理由は、被曝時25~44歳であった者は、被曝後より近年において過剰リスクが高かったということである。脊椎炎例の年分布を標準化分布として用いる場合は、これらを重要視しない。両調査における傾向に有意な差はなく ($p > .10$)、被曝時年齢がそれぞれ10歳増加する場合の 10^5 人年当たりの過剰リスクの増加の合計推定値は31.7 (標準誤差 8.5)であった。

TABLE 8 EXCESS RISKS BY AGE AT EXPOSURE, TIME SINCE EXPOSURE, AND AGE AT OBSERVATION FOR SELECTED TUMORS COMMON TO BOTH SERIES

表8 両調査に共通の特定腫瘍に関する被曝時年齢, 被曝後経過年数, 及び観察時年齢別の過剰リスク

Age at exposure	Ankylosing Spondylitis Series				Life Span Study Sample (100+ vs 0-9 rad group)				
	Observed number of deaths	Crude excess risk	Excess risk standardized for time since exposure		Observed number of deaths		Crude excess risk	Excess risk standardized for time since exposure	Excess risk in those ≥15 ATB, standardized for time since exposure to spondylitis series
			Entire study	≥5.5 years since exposure only	0-9 rad	100+ rad			
<15	0	-	-	-	40	15	27.1 (9.5)	25.0 (8.9)	-
15-24	3	8.3 (11.6) [†]	6.6 (10.1)	9.4 (13.0)	79	20	11.8 (11.1)	10.9 (10.5)	6.6 (7.9)
25-34	21	13.4 (12.1)	12.7 (11.5)	20.0 (15.0)	163	37	91.0 (30.9)	87.1 (29.9)	49.5 (24.3)
35-44	67	85.7 (27.4)	86.1 (27.5)	103.9 (34.1)	460	71	80.8 (40.0)	81.0 (40.6)	52.5 (32.0)
45-54	60	118.4 (56.7)	123.3 (61.4)	143.5 (75.4)	638	74	79.3 ^a (59.0)	72.2 ^a (71.6)	71.6 (58.7)
>55	35	149.3 (118.8)	194.0 (137.2)	283.9 (171.8)	393	36			163.8 (134.6)

Years since exposure	Observed number of deaths	Crude excess risk	Excess risk standardized for age at exposure		Observed number of deaths		Crude excess risk	Excess risk standardized for age at exposure	Excess risk in those ≥15 ATB, standardized for age at exposure to spondylitis series
			Entire study	≥5.5 years since exposure only	0-9 rad	100+ rad			
2.5-5.5	18	4.5 (17.7)	4.7 (15.8)						
5.5-11.5	61	59.2 (21.2)	55.7 (19.8)	55.5 (19.4)	254 ^b	29 ^b	18.0 ^b (15.3)	14.2 ^b (12.2)	21.8 ^b (20.1)
11.5-17.5	70	78.4 (29.0)	81.7 (30.1)	78.4 (29.0)	348	49	48.6 (22.0)	45.7 (20.2)	72.0 (33.7)
17.5-23.5	37 ^c	84.6 ^c (51.1)	102.6 ^c (63.7)	100.9 ^c (61.9)	413	52	28.2 (24.6)	28.1 (25.1)	99.9 ^c (36.1)
>23.5					758	123	79.2 (25.7)	77.5 (32.0)	

(Continue 続)

TABLE 8 (Continued) 表8 続き

Age at observation	Ankylosing Spondylitis Series				Life Span Study Sample (100+ vs 0-9 rad group)				
	Observed number of deaths	Crude excess risk	Excess risk standardized for time since exposure		Observed number of deaths		Crude excess risk	Excess risk standardized for time since exposure	Excess risk standardized for time since exposure to spondylitis series
			Entire study	≥5.5 years since exposure only	0-9 rad	100+ rad			
<35	0	-	-	-	22	6	7.8 (5.0)	13.0 (8.9)	6.7 (4.8)
35-44	10	.1 ^d (6.2)	3.8 ^d (9.1)	5.0 ^d (11.7)	70	23	39.8 (15.9)	45.7 (18.1)	55.6 (27.2)
45-54	58	79.1 (25.8)	77.9 (26.2)	104.1 (30.9)	177	30	26.6 (21.1)	16.7 (21.0)	3.4 (25.0)
55-64	73	145.5 (56.7)	133.1 (59.8)	153.0 (63.8)	428	81	170.9 (46.5)	166.3 (46.7)	124.4 (58.6)
65-74	35	150.6 (128.1)	116.1 (130.6)	141.3 (139.1)	648	72	34.5 (69.6)	40.7 (77.8)	71.6 (116.7)
≥75	10	329.6 (322.0)	145.7 (286.3)	395.4 (375.8)	428	41	124.5 (165.0)	193.7 (174.8)	154.5 (240.2)

† Standard errors in parentheses 括弧内は標準誤差

a: Age ≥45 at exposure, b: 5.2-11.5 years since exposure, c: >17.5 years since exposure, d: Age <35 at exposure

a: 被曝時年齢 ≥45歳, b: 被曝後経過年数 5.2~11.5年, c: 被曝後経過年数 >17.5年, d: 被曝時年齢 <35歳

Excess risks are per 100,000 person-years

過剰リスクは100,000人年当たりの値

With the initial time period excluded, the trend in excess risk with time since exposure in the spondylitics was no longer significant ($p>.10$). In the LSS, however, standardization to the person-years of the spondylitics, revealed an increasing trend with time since exposure ($p<.05$). The trends were not significantly different in the two studies ($p>.10$), and the average rate of increase in excess risk/ 10^5 with time since exposure in both studies combined is 34.0 (SE 15.7) for each 6-year time period, which is significantly different from zero ($p<.05$).

Even with the initial time period excluded, there is a clear increasing trend in excess risk with age at observation in the spondylitics ($p<.001$). In the LSS excess risk increased erratically with age at observation after standardization to the person-years of the spondylitics, and a trend was not quite significant ($.10>p>.05$). Excess risks in the spondylitics appeared to increase more sharply than that in the LSS, and the difference in the average rate of change was significant ($p<.001$).

There was no evidence of differences in the excess risk for males and females. In the spondylitics males had slightly higher excess risks than females, while in the LSS females had a slightly higher excess risk than males, but in neither study were these differences significant ($p>.10$ in both studies).

Remaining neoplasms: relative risk

In order to see whether models which have constant relative risk with increasing time since exposure are appropriate for all neoplasms other than leukemia, the relative risk modeling procedure was carried out using the LSS data for mortality from all neoplasms other than leukemia and the selected tumors common to both series. The most significant effect was that of age at exposure ($\chi^2_5=26.9$, $p<.001$). Although highly significant, the variability with age at exposure was irregular (Figure 5), and so it was modeled by fitting a separate parameter for each age at exposure group. After allowing for the effect of age at exposure, there was a significant increasing trend in $\log(\text{relative risk})$ with time since exposure ($\chi^2_1=4.60$, $p<.05$, Figure 5). In the final model the regression coefficient of the trend in $\log(\text{relative risk})$ with time since exposure was .0229 (SE .0113), which is significantly different

最初の期間を除けば、脊椎炎例における被曝後経過年数に伴う過剰リスクの傾向は有意ではなかった ($p>.10$)。しかし、寿命調査集団では、脊椎炎例の人年に対する標準化によって、被曝後経過年数に伴う増加傾向が認められた ($p<.05$)。両調査間ではこの傾向に有意な差はなく ($p>.10$)、両調査の合計における被曝後経過年数に伴う 10^5 人年当たりの過剰リスクの平均増加率は、各6年期間ごとに34.0 (標準誤差15.7) であって、これは有意にゼロと異なる ($p<.05$)。

脊椎炎例では、最初の期間を除外しても、観察時年齢に伴う過剰リスクに明らかな増加傾向がある ($p<.001$)。寿命調査集団では、脊椎炎例の人年に対して標準化を行ったところ、過剰リスクは観察時年齢とともに不規則に増大したが、傾向はあまり有意なものではなかった ($.10>p>.05$)。脊椎炎例における過剰リスクは、寿命調査集団のそれよりも急激に増加するように思われ、また平均変化率の差は有意であった ($p<.001$)。

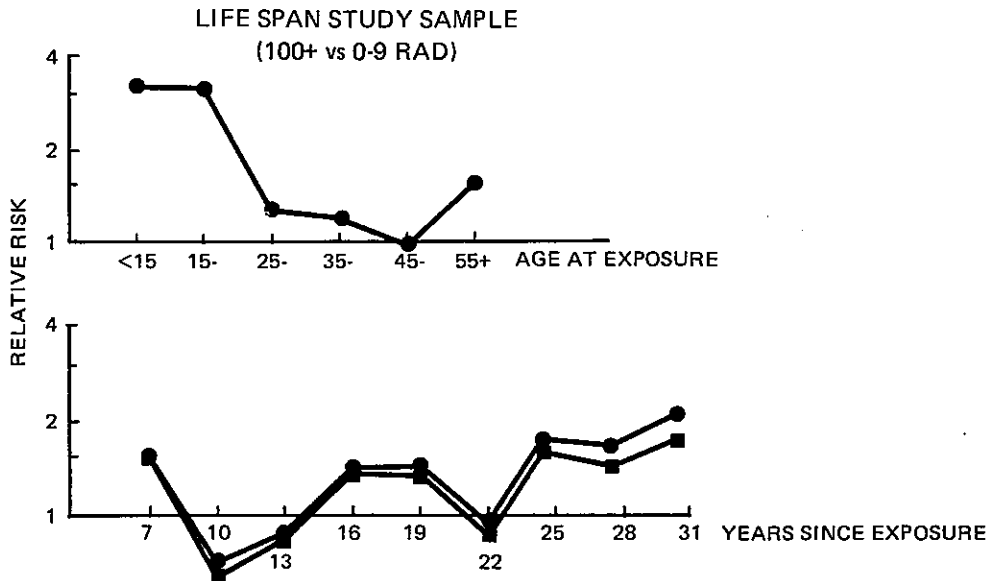
男女間に過剰リスクの差は認められなかった。脊椎炎例では、男性の過剰リスクは女性よりもやや高く、寿命調査集団では女性の過剰リスクの方が男性よりもやや高かったが、いずれの調査においてもこれらの差は有意でなかった (両調査とも $p>.10$)。

その他の新生物: 相対危険度

被曝後経過年数が増加しても相対危険度が一定であるモデルは、白血病以外のすべての新生物に適切なものであるかどうかを調べるために、白血病及び両調査に共通の特定腫瘍以外のすべての新生物による死亡率に関する寿命調査資料を用いて、相対危険度のモデリングを行った。最も有意な影響は被曝時年齢であった ($\chi^2_5=26.9$, $p<.001$)。被曝時年齢に伴う変動性は極めて有意なものではあるが、不規則なものであったので (図5)、各被曝時年齢群に対して別々のパラメーターを適合させてモデリングを行った。被曝時年齢の影響を考慮したところ、被曝後経過年数に伴って $\log(\text{相対危険度})$ が有意に増加する傾向がみられた ($\chi^2_1=4.60$, $p<.05$, 図5)。最終モデルにおいては、被曝後経過年数に伴う $\log(\text{相対危険度})$ の傾向の回帰係数は.0229 (標準誤差 .0113)

FIGURE 5 VARIABILITY IN RELATIVE RISK WITH AGE AT EXPOSURE AND TIME SINCE EXPOSURE FOR CANCERS OTHER THAN LEUKEMIA OR SELECTED TUMORS COMMON TO BOTH SERIES

図5 白血病又は両調査に共通の特定腫瘍以外の癌における被曝時年齢及び被曝後経過年数に伴う相対危険度の変動性



●UNADJUSTED 訂正しなかったもの

■ALLOWING FOR THE EFFECT OF AGE AT EXPOSURE IN SIX AGE-GROUPS. FOR THE PLOTTED POINTS THE EFFECT OF AGE AT EXPOSURE HAS BEEN CHOSEN SO THAT THE INITIAL POINT COINCIDES WITH THE UNADJUSTED VALUE.

六つの年齢群における被曝時年齢の影響を考慮したもの、プロットした点については、最初の点が未訂正の値と一致するように、被曝時年齢の影響を選定した。

from the corresponding coefficient for the selected tumors common to both series ($p < .05$). To see which sites were responsible for the increase in relative risk with time since exposure, all individual sites listed in Table 5 with over 10 deaths in the 100+ rad group were examined. After allowing for the effect of age at exposure, the trend with time since exposure was not significant for any individual site ($p > .10$ in every site), although for cancers of the colon, liver and gallbladder, and urinary bladder, the estimated regression coefficient was larger for the individual site than for all remaining neoplasms combined.

Remaining neoplasms: excess risk

In order to see whether the increasing trends in excess risk with age at exposure and time since exposure observed for the selected tumors common to both series are also observed for

であったが、これは両調査に共通の特定腫瘍についての対応する係数とは有意に異なっている ($p < .05$)。被曝後経過年数に伴う相対危険度の増加については、どの部位に原因があったかを調べるために100 rad以上群に10例以上の死亡が含まれる表5の各部位をすべて調べた。被曝時年齢の影響を考慮したところ、被曝後経過年数に伴う傾向はいかなる部位についても有意ではなかったが(各部位とも $p > .10$)、結腸、肝臓及び胆嚢、並びに膀胱の癌に関する推定回帰係数は、その他すべての新生物を合計した場合よりも、個別の部位の方が大きかった。

その他の新生物: 過剰リスク

両調査に共通の特定腫瘍について認められた被曝時年齢及び被曝後経過年数に伴う過剰リスクの増加傾向が、その他の新生物についても認められるかどうかを

other neoplasms, excess risks in the LSS by age at exposure and time since exposure were calculated for all neoplasms other than leukemia and the selected tumors common to both series (Table 9). Among those aged at least 15 ATB, after standardization to the person-years distribution of the spondylitis series, excess risk increased with time since exposure ($p < .05$), and the rate of increase was similar to that for the selected tumors. For these remaining neoplasms, however, there was no tendency for an increase in the excess risk with increasing age at exposure ($p > .10$). The average rate of increase was significantly different from that observed for the selected tumors in the LSS alone ($p < .05$), and for both studies combined ($p < .01$).

DISCUSSION

Previous analyses of cancer mortality in the LSS^{1,14,15} and the spondylitis series² each concentrated on only one of the two study populations, and used slightly different methodologies. This made it difficult to assess in detail the similarities and differences in radiation-induced mortality in the two study populations. A parallel analysis of the two data sets has enabled a closer comparison than was possible before, and the main finding is that the pattern of radiation-induced risk is very similar in the two populations. This not only increases confidence in both studies, but also in using these studies to estimate likely effects in other irradiated populations.

The present analysis is limited to a comparison of radiation-induced cancer mortality among two groups of people with substantial but varying doses. Therefore interpretation of results such as the apparent deficit of radiation-induced leukemia among Nagasaki females compared with other groups in the LSS, and also any dose-specific comparisons between the two populations must wait until revised dose estimates are available to replace the T65DR for the LSS, and detailed estimates of doses to organs other than the bone marrow are available for the spondylitis.

Methodology

Previous analyses of cancer mortality among A-bomb survivors^{1,14} have stratified the LSS only coarsely into five age ATB groups. Also the major significance tests for a trend in

調べるために、白血病及び両調査に共通の特定腫瘍以外のすべての新生物について、被曝時年齢及び被曝後経過年数別に寿命調査集団の過剰リスクを算定した(表9)。原爆時年齢が少なくとも15歳であった者では、脊椎炎調査の人年分布との標準化を行ったところ、過剰リスクは被曝後経過年数とともに増加し($p < .05$)、その増加率は特定腫瘍のそれに近似していた。しかし、これらその他の新生物については、被曝時年齢の増加に伴って過剰リスクが増加する傾向はなかった($p > .10$)。平均増加率は、寿命調査集団のみ($p < .05$)の場合、並びに両調査合計($p < .01$)の場合の特定腫瘍について認められたものとは有意に異なっていた。

考察

寿命調査^{1,14,15}及び脊椎炎調査²における癌死亡率に関する以前の解析は、それぞれ、二つの調査集団中の一つのみを扱っており、やや異なる方法を用いている。このことは、両調査集団の放射線誘発死亡率における類似性及び差異に関する詳細な評価を困難にしている。二組の資料群についての平行解析によって、以前よりも厳密な比較が可能になり、これによって得られた主な所見は、両集団における放射線誘発危険率のパターンが酷似していることである。これによって両調査の信頼度が増すばかりでなく、これらの調査を用いて他の被曝集団に認められると思われる影響を推定する際にも信頼度を増す。

今回の解析は、有意に高いが種々の線量に被曝した二つの集団における放射線誘発癌の死亡率の比較に限定した。したがって、寿命調査集団中の長崎の女性の放射線誘発白血病が他の群に比べて明らかに不足していることなど、所見に関する解釈や、両集団間の線量別の比較は、寿命調査ではT65DRに代わる改訂線量推定値が得られるまで、また脊椎炎調査では骨髄以外の臓器の詳細な線量推定値が得られるまで待たなければならない。

方法

原爆被曝者の癌死亡率に関する以前の解析^{1,14}では、寿命調査集団をごく大まかに五つの原爆時年齢群に層化した。また、暦年期間や被曝後経過年数別の

TABLE 9 EXCESS RISKS BY AGE AT EXPOSURE AND TIME SINCE EXPOSURE FOR CANCERS OTHER THAN LUEKEMIA OR SELECTED TUMORS COMMON TO BOTH SERIES IN THE LIFE SPAN STUDY SAMPLE (100+ vs 0-9 rad GROUP)

表9 白血病又は両調査に共通の特定腫瘍以外の癌に関する被曝時年齢及び被曝後経過年数別の過剰リスク；寿命調査集団(100+rad 群対0~9 rad 群)

Age at exposure	Observed number of deaths		Crude excess risk	Excess risk in those aged ≥ 15 at exposure standardized for time since exposure to spondylitis series	Years since exposure	Observed number of deaths		Crude excess risk	Excess risk in those aged ≥ 15 at exposure, standardized for age at exposure to spondylitis series
	0-9 rad	100+ rad				0-9 rad	100+ rad		
<15	51	15	22.91 (9.653) [†]	-	5.2-11.5	252	25	3.76 (14.42)	-7.224 (19.03)
15-24	85	43	61.37 (15.65)	24.80 (10.69)	11.5-17.5	272	30	12.22 (17.48)	12.77 (25.46)
25-34	161	24	29.57 (25.34)	-7.43 (15.59)	17.5-23.5	299	36	14.14 (20.67)	82.63 ^b (29.18)
35-44	366	50	43.83 (33.59)	36.36 (32.16)	≥ 23.5	550	109	108.0 (23.50)	
45-54	416	40	39.84 ^a (45.46)	-35.48 (42.53)					
≥ 55	294	28		166.7 (111.5)					

[†] Standard errors in parentheses 括弧内は標準誤差

a: Age ≥ 45 at exposure, b: ≥ 17.5 years since exposure a: 被曝時年齢 ≥ 45 歳, b: 被曝後経過年数 ≥ 17.5 年

Excess risks are per 100,000 person-years 過剰リスクは 100,000 人年当たりの値

mortality with radiation dose were carried out without stratification by calendar period or time since exposure, although subsidiary analyses were made for each 4-year time interval separately. (A statement to the contrary in the statistical methods section of the most recent LSS report¹ is incorrect.) The present analysis stratifies the LSS by 5-year age ATB groups and 3-year calendar intervals, which is comparable with the degree of stratification used in previous analyses of the spondylitis series.² In fact, because of the balanced nature of the LSS data, with similar proportions of the person-years in each dose category in all the strata, the additional stratification made little difference to the results.

In the significance tests for radiation effects, departures from the null hypothesis have been formulated for convenience in terms of a radiation risk which acts multiplicatively on the death rates in each stratum in the absence of exposure to radiation, and the tests will be locally most powerful⁸ in detecting multiplicative dose effects, although it is likely that they will have good properties in detecting other forms of dose-response relationship.^{16,17} The tests differ from those traditionally used in analyses of the LSS which test explicitly for additive dose effects.^{1,14,15}

Only three broad categories of dose have been considered in the LSS. It might seem as though this is wasteful of information, but theoretical studies of similar situations have shown that little power to detect effects is lost as a result of grouping exposures,¹⁸ although coarse grouping eliminates the possibility of carrying out detailed dose-response analyses. The 10-99 rad dose group is also omitted from many comparisons, however the number of radiation-induced deaths in this group is likely to be very few. The estimated relative risk for the 10-99 rad group compared with the 0-9 rad group for all neoplasms is 1.08, (90% CI, 1.02, 1.14).

Relationships between radiation exposure and cancer mortality rates have been studied, rather than between exposure and the total cancer risk per individual. This is because the total cancer risk will depend not only on the cancer mortality rate, but also on the pattern of mortality from other causes, and so relationships will be less simple and direct.¹⁹

層化はしないで、放射線量に伴う死亡率の傾向に関する主要な有意性検定を行っているが、これについては各4年期間ごとの補助解析を別々に行っている。(寿命調査に関するごく最近の報告¹の統計的方法の項にみられるこれとは反対の記述は正当でない。)今回の解析では、5歳間隔原爆時年齢及び3年間隔暦年期間別に寿命調査集団の層化を行っているが、これは脊椎炎調査に関する以前の解析²で用いられた層化の度合いに匹敵する。事実、寿命調査資料は平均がとれており、すべての層の各線量群における人年の割合が近似しているため、それ以上の層化を行っても結果にほとんど差はみられなかった。

放射線影響に関する有意性検定では、帰無仮説からの逸脱を、放射線被曝がない場合に各層の死亡率に相乗的に作用する放射線リスクによって便宜上公式化した。この検定は相乗的な線量影響を感知する際に局所的に最も強力なものとなるが、⁸他の種類の線量反応関係を感知する際に優れた特性を示すこともある。^{16,17}これらの検定は、寿命調査の解析に従来用いられた相加的な線量影響について解明する検定方法とは異なる。^{1,14,15}

寿命調査については、三つの大きい線量群のみとした。これは資料の浪費であるかのように思われるかもしれない。しかし、同様の状況に関する理論的研究により、大まかな分類では詳細な線量反応の解析は不可能であるが、被曝分類をしても影響を感知する力はほとんど失われないことが認められている。¹⁸10~99 rad 群も多くの比較から除外されているが、この群における放射線誘発性の死亡の数は極めて少ないように思われる。すべての新生物の場合、0~9 rad 群に対する10~99 rad 群の推定相対危険度は1.08である(90%信頼区間1.02, 1.14)。

放射線被曝と各対象者当たりの癌の総危険率との関係よりも、むしろ被曝と癌死亡率との関係について調べた。これは、癌の総危険率は、癌死亡率のみでなく、その他の原因による死亡率のパターンにも依存するので、被曝との関係が単純でなくなり、直接的でなくなるからである。¹⁹

The variability in radiation-induced risk with factors such as age at exposure, time since exposure, age at observation, city, and sex, has been studied by means of regression models. Although based on relative risk, these models include the possibility of time-dependent explanatory variables, and thus form a much broader class of models than the traditional BEIR relative risk model.³

Trends in excess risks have also been examined. For fixed numbers of person-years, the variance of the excess risk is directly proportional to the number of deaths, and so standard errors are large for categories including older age-groups where mortality rates are high (in contrast to estimates of $\log(\text{relative risk})$ which have variance inversely proportional to the number of deaths).

Overall Levels of Mortality

By examining a series of identical cancer sites in the LSS and the spondylitis series, the present analysis has extended the range of sites examined in both studies. In the previous analysis of the spondylitis data, Smith and Doll² found a high relative risk (7.84) for tumors of the spinal cord and nerves. The authors interpreted the excess cautiously, partly as there were no similar findings in other studies, and partly as, out of the four deaths from this cause among the spondylitics, two occurred only four years after exposure. Hence it seemed possible that at least one of them was present at the time of treatment, and perhaps might have been the cause of the symptoms which led to the treatment. The present analysis, however, has revealed a similar finding in the LSS: a statistically significant excess of tumors of the spinal cord and nerves, with a high relative risk (18.15). Thus in both studies the relative risk for this cause of death is higher than that for any other cancer, including leukemia, although these tumors are unusual and so the number of excess deaths involved is small. Until now there has been little information about the radiosensitivity of the central nervous system in man and, perhaps as a result, neural tissue has traditionally been regarded as radioresistant.³ However, in the light of the present evidence such a view seems no longer tenable.

Tentative evidence of a dose response for ovarian cancer based on tumor registry data for the LSS

被曝時年齢、被曝後経過年数、観察時年齢、都市、及び性などの因子に伴う放射線誘発危険率の変動性については、回帰モデルを用いて調べた。相対危険度に基づくものではあるが、これらのモデルは、時間依存性の説明変数の可能性を含んでいるので、従来のBEIR相対危険度モデル³よりもはるかに大きな区分のモデルになっている。

過剰リスクの傾向についても調べた。一定の年数に対して、過剰リスクの分散は死亡数に正比例するので、死亡率が高い高年齢群を含む区分群の標準誤差は大きい〔これは分散が死亡数に反比例する \log (相対危険度)の推定値と対照的である〕。

全般的な死亡率

今回の解析では、寿命調査と脊椎炎調査の一連の同一癌部位を調べることにより、両調査で調べた部位の範囲を拡大した。Smith及びDoll²は脊椎炎資料に関する以前の解析において、脊髄及び神経の腫瘍に高い相対危険度(7.84)を認めた。著者らはこの過剰を慎重に解釈した。というのは一つには、他の調査に同様の所見がなかったからであり、一つには、脊椎炎例にみられるこの死因による4例の死亡のうち、2例は被曝後わずか4年で発生しているからである。したがって、少なくともそれらの一つは診療時に認められ、恐らく治療を受けることになった症状の原因であったかもしれないと思われた。しかし、本解析では寿命調査において同様の所見を認めた。すなわち、脊髄及び神経の腫瘍に統計的に有意な過剰が認められ、相対危険度も高い(18.15)ということである。したがって、これらの腫瘍はまれであり、過剰死亡数も少ないものであるが、両調査ともこの死因の相対危険度は、白血病を含むその他のいかなる癌よりも高い。現在まで、人間の中樞神経系の放射線感受性に関する情報はほとんどなく、恐らくその結果、神経組織は放射線低抗性であると従来考えられてきた。³しかし、今回の所見に照らしてみれば、このような観察はもはや支持されないように思われる。

1959~70年における寿命調査対象者の腫瘍登録資料に基づく卵巣癌に関する線量反応の暫定的所見が

subjects during 1959-70 has been reported¹⁴ and the present analysis confirms this. Increased mortality from ovarian cancer is clearly a recent phenomenon in the LSS; out of the 12 deaths in the high dose category 7 have occurred since 1972, compared with the 1.96 expected. Only 1 of the 12 deaths occurred in Nagasaki, which is consistent with no excess being seen in the recent examination of the Nagasaki Tumor Registry data.²⁰ A recent comparison between the certified causes of death in the LSS and autopsy findings²¹ confirmed cancer of the ovary and other female genital organs (ICD 183-184, 8th Revision) in 44% of autopsied cases, but found that only 21% of these cancers were detected on the death certificates. Hence there is a possibility that the present result is spurious, as it is based on death certificate data only. Confirmation of the finding, based on more reliable diagnostic information is required.

For leukemia, the radiation risk in the spondylitics is about half that of the high dose group of the LSS. The discrepancy cannot be explained in terms of the mean organ doses for the two studies, or the different age at exposure distributions. The apparent difference in susceptibility between the two study populations should be considered in conjunction with the recent result relating excess leukemia mortality to radiation dose in the spondylitics which showed no clear relationship between dose and excess risk of leukemia.² In contrast leukemia risk in the LSS clearly increases with increasing dose.¹⁴ Smith and Doll have interpreted the lack of dose-response relationship for the spondylitics as being due to the cell sterilizing effect of radiation at high doses. For the LSS a provisional revised estimate of the average marrow dose in the T65DR 100+ rad dose group is 125 rad (Table 2) and in most cases the exposure was reasonably uniform, while for the spondylitics the estimated mean marrow dose is 335 rad.² As spinal marrow constitutes only about 40% of the total bone marrow and much of the marrow outside the spine will not have been directly in the radiation field, it seems likely that many marrow cells in the radiation field received doses of well over 600 rad, or large enough to sterilise them. In treatment for spondylitis the X-ray beam was usually aimed directly at the spine, and so of all the irradiated cells, those in the spinal marrow are likely to have received the highest doses. It is therefore to

報告されており,¹⁴ 今回の解析でもこの所見が確認された。卵巣癌の死亡率の増加は明らかに寿命調査集団における最近の現象である; 高線量群における12例の死亡のうち, 期待値1.96例に対して7例が1972年以後に発生している。この12例の死亡のうち, 長崎で認められたのはわずか1例であるが, この所見は長崎腫瘍登録資料に関する最近の調査で過剰が認められていないことと一致する。²⁰ 寿命調査で確認された死因と剖検所見に関する最近の比較²¹ では, 剖検例の44%に卵巣及びその他の女性性器の癌 (ICD 183-184, 第8回修正版) を確認したが, これらの癌のうち死亡診断書で探知されたのは21%にすぎなかった。したがって, 今回の結果は死亡診断書のみに基づいているので, 誤りがある可能性がある。より信頼できる診断情報に基づく所見の確認が必要である。

白血病の場合, 脊椎炎調査における放射線リスクは, 寿命調査集団の高線量群の約半分である。この差異は, 両調査における平均臓器線量や異なる被曝時年齢分布によっては説明できない。二つの調査集団における罹病率の明白な差は, 脊椎炎例において白血病の過剰死亡率と放射線量との関連を見たが, 線量と白血病の過剰リスクとの間に明白な関係が認められなかった最近の結果² とともに考慮する必要がある。これに対して, 寿命調査集団における白血病リスクは線量の増加に伴って明らかに増加する。¹⁴ Smith 及び Doll は, 脊椎炎例に線量反応関係が認められないのは, 高線量における放射線の細胞致死効果によるものと解釈した。寿命調査集団の場合は, T65DR が 100 rad 以上である線量群における平均骨髄線量の暫定改訂推定値は 125 rad であり (表 2), 多くの場合, 被曝はかなり均一的であるが, 脊椎炎例の場合は, 推定平均骨髄線量は 335 rad である。² 骨髄は全骨髄の約 40% にすぎず, また脊椎以外の骨髄の多くは直接に放射線野内に入るとは考えられないので, 放射線野における多くの骨髄細胞は 600 rad をはるかに越えるか, 又は骨髄細胞を殺すのに十分な大きさの線量を受けたと思われる。脊椎炎の治療では, X線は普通, 脊椎に直接照射されたので, 照射された全細胞のうち, 骨髄の細胞は最高の線量を受けている可能性が強い。したがって, 細胞致死

be expected that any cell-sterilizing effect should be more pronounced for leukemia than for cancers of other heavily irradiated sites. Thus the reduced risk for leukemia constitutes evidence in favour of a cell-sterilizing effect operating in the spondylitis series.

Among sites which were lightly irradiated in the spondylitics, radiation-related mortality from cancers of the liver and gallbladder has not been previously reported in the LSS, and it is clearly a recent phenomenon; out of 53 deaths in the high dose category, 15 were observed vs 6.50 expected in the period 1975-78, and 11 observed vs 4.25 expected in the period 1972-74. Among deaths certified as due to liver cancer for which a T65DR has been calculated, 11% are in the 100+ rad dose group, compared with 10% for cancer of the gallbladder. Thus it seems that both liver and gallbladder cancers are contributing to the excess. In a previous LSS report¹⁴ tabulations of tumor registry data during 1959-70 were made for both liver and gallbladder. For cancer of the liver the significance levels suggested a trend, but it was thought that the data were too sparse and tentative at that stage to base conclusions on them. For cancer of the gallbladder there was no suggestion of a trend. A recent study of the incidence of primary liver carcinoma²² found no relationship with radiation dose. However this study only included data up to 1975, which could explain the discrepancy with the present findings. The recent analysis of the Nagasaki Tumor Registry²⁰ also examines liver cancer incidence, and a linear test for trend finds a significance level of 0.037. However it was not concluded that there was firm evidence of a radiation-related increase for liver cancer as the incidence rates did not increase systematically with dose. Among autopsied cases in the LSS, a death certificate diagnosis of cancer of the liver or gallbladder was confirmed in 62% of cases, but it was found that only 15% of these cancers were detected on the death certificate.²¹

For cancers other than leukemia, there was a clear tendency for the excess risk to increase with the level of risk in the absence of exposure to radiation (Figure 1). In contrast the relative risk for different cancer sites showed no linear relationship with the expected disease rate in the population (Figure 2). The bone marrow and

効果は、その他高線量被曝部位の癌よりも白血病において顕著であるはずである。したがって、白血病リスクの減少は、脊椎炎調査で認められる細胞致死効果を支持する証拠となる。

脊椎炎例の低線量被曝部位のうち、肝臓及び胆嚢の癌による放射線関連死亡率は、寿命調査では以前に報告されておらず、明らかに最近の所見である；高線量群の53例の死亡のうち、1975～78年の期間には期待値 6.50に対して15例が、また1972～74年の期間には期待値 4.25に対して11例が観察されている。T65DR が算定され、肝臓癌と確認されている死亡のうち、100 rad 以上線量群に属する者は胆嚢癌で10%に対して11%である。したがって、肝臓癌も胆嚢癌も共に過剰に対して寄与しているように思われる。以前の寿命調査報告¹⁴では、肝臓及び胆嚢の両者について1959～70年の腫瘍登録資料の集計を行った。肝臓癌の場合、有意水準がある傾向を示唆したが、それらの値を結論の基礎とするには、資料はその段階ではあまりにも乏しく暫定的であると考えられた。胆嚢癌については、一つの傾向を示唆するものはなかった。原発性肝臓癌の発生率に関する最近の調査²²では、放射線量との関係は認められなかった。ただし、この調査は1975年までの資料を対象としたにすぎず、これにより、今回の所見との差異を説明できる。長崎腫瘍登録に関する最近の解析²²でも、肝臓癌の発生率を調べており、傾向に関する線形検定では0.037の有意水準が得られている。しかし、肝臓癌の発生率は線量とともに系統的に増加しなかったため、同癌の放射線関連増加を示す確固たる証拠があるとは結論付けられなかった。寿命調査集団中の剖検例では、死亡診断書における肝臓癌又は胆嚢癌の診断は症例の62%で確認されたが、これらの癌のうち、死亡診断書で探知されたのは15%にすぎない。²¹

白血病以外の癌では、放射線被曝がない場合の危険率とともに過剰リスクも増加する明白な傾向があった(図1)。これに対して、異なる癌部位の相対危険度と一般集団の期待疾患率の間には線形関係は認められなかった(図2)。骨髄及び神経系は、ほかの発癌物質に比べると放射線に特に感受性が強いが、

nervous system are particularly susceptible to radiation compared with other carcinogenic agents but, with only minor variations, the effect of radiation on other organs and systems is approximately proportional to the effect of other agents to which they are exposed. This would indicate that relative risk is a better starting point for modeling radiation risk than excess risk.

Some analyses of mortality of workers at the Hanford plant have considered two groups of cancers.^{23,24} Group A consisted of cancers of sites which were thought to be radiosensitive (ICD 145-149, 150-159, 160-163, 174, 193, and 200-209, 8th Revision),²⁴ while Group B consisted of cancers of other tissues (ICD 140-209, 8th Revision, excluding those in Group A). To see if the division into radiosensitive and other tissues is supported by the LSS, relative and excess risks for these two groups were calculated (Table 10). There were significant excesses in both A and B groups. The excess risk for Group B cancers was approximately one-quarter that of Group A cancers, which is similar to the difference in the number of expected deaths, and hence the expected death rate, for the two groups. The relative risk for Group A cancers was actually slightly less than that for Group B cancers, although the difference is not significant ($p < .10$). Thus the Mancuso et al²⁴ grouping of cancers into radiosensitive and other sites is not supported by the LSS.

その他の臓器及び器官系に及ぼす放射線の影響は、ごくわずかな差はあるにしても、他の発癌物質の影響にほぼ正比例する。このことは、放射線リスクのモデリングの出発点としては、相対危険度の方が過剰リスクよりも優れていることを意味する。

Hanford プラントにおける労働者の死亡率に関する幾つかの解析では、二つの癌群について考察を行っている。^{23,24} A 群は、放射線感受性を示すと考えられる部位の癌 (ICD 145~149, 150~159, 160~163, 174, 193及び200~209, 第8回修正版) から成り、²⁴ B 群はその他の組織の癌 (ICD 140~209, 第8回修正版で、A 群の各項目を除く) から成っている。放射線感受性を示す組織とその他の組織とに区分することが寿命調査で支持されるかどうかを調べるために、これら両群の相対危険度及び過剰リスクの算定を行った (表10)。A, B 両群とも有意な過剰があった。B 群の癌の過剰リスクはA 群の癌のその約1/4であったが、それは両群の期待死亡数の差と同じであり、したがって期待死亡率の差に近似している。A 群の癌の相対危険度は、B 群の癌のそれよりも実際はやや低かったが、その差は有意なものではない ($p < .10$)。したがって、癌を放射線感受性を示す群とその他の部位群に分類した Mancuso ら²⁴の方法は、寿命調査では支持されない。

TABLE 10 OBSERVED AND EXPECTED DEATHS, RELATIVE RISKS, EXCESS RISKS, AND 90% CONFIDENCE INTERVALS FOR THE LIFE SPAN STUDY SAMPLE (100+ vs 0-9 rad GROUP) FOR THE GROUP A AND B CANCERS OF MANCUSO ET AL²⁴

表10 寿命調査集団 (100+rad 群対0~9 rad 群) に対する Mancuso ら²⁴ のA 及びB 癌群の観察及び期待死亡数, 相対危険度, 過剰リスク, 及び90%信頼区間

Cancer group	Observed deaths in 100+ rad group	Expected deaths calculated from 0-9 rad group	Relative risk	Excess risk (per 10 ⁵ yr)
A	402***	257.00	1.59 (1.45, 1.74)	98.43 (74.91, 121.95)
B	96***	59.31	1.64 (1.37, 1.98)	24.90 (13.50, 36.31)

*** $p < .001$ (one-sided value 片側検定の値)

Trends in Radiation-Induced Risk

Leukemia

Mortality rates for England and Wales were only available for leukemia of all types, and so it was impossible to model leukemia on a type-specific basis in the spondylitics. In the LSS, mortality from leukemia of all types has been examined for comparability with the spondylitics, and also mortality from acute leukemia. In the LSS there were no deaths in the high dose group with a registry diagnosis of chronic lymphatic leukemia, and among the spondylitics no patient who had leukemia given on the death certificate as the underlying cause had chronic lymphatic leukemia as the preferred diagnosis.² Thus neither study provides any evidence of the production of chronic lymphatic leukemia by irradiation.

Both relative and excess risks of radiation-induced leukemia decreased with time since exposure in both studies. It has been noted²⁵ that the increased level of risk remained longer after exposure in the LSS than the spondylitics. However, from Figure 3 this seems a natural consequence of the higher level of risk suffered in the LSS. Ichimaru et al¹³ have commented that the pattern of disappearance of leukemia with time since exposure seems to differ by city in the LSS, but on the relative risk scale no significant interaction was found between time since exposure and city, either for leukemia of all types or for acute leukemia ($p > .10$ in both cases).

In the LSS, after allowing for the decrease in relative risk with increasing time since exposure, there was a significant decrease in relative risk with increasing age at exposure for leukemia of all types. Such a trend was not seen in the spondylitics, and investigation showed that its presence in the LSS was entirely due to those aged < 15 ATB. Among those aged at least 15 at exposure neither study provided evidence of a trend in relative risk of leukemia with age at exposure.

Excess risk from leukemia increased with increasing age at exposure in the spondylitics but not in the LSS, although the trends in the two studies were not significantly different. When the period up to 5.5 years after exposure in the spondylitics was omitted, for comparability with the LSS, the trend become nonsignificant,

放射線誘発危険率の傾向

白血病

England 及び Wales に関する死亡率は、すべての型の白血病についてのみ得られているので、脊椎炎例において型別に白血病のモデリングを行うことは不可能であった。寿命調査集団では、脊椎炎調査集団との比較を可能にするため、すべての型の白血病による死亡率を調べ、また、急性白血病の死亡率も調べた。寿命調査集団では、登録に慢性リンパ球性白血病の診断がみられる死亡例は高線量群中にはなく、脊椎炎例では、死亡診断書に原死因として白血病が記載された患者で、慢性リンパ球性白血病の優先診断を有する者はなかった。² したがって、いずれの調査でも、放射線被曝によって慢性リンパ球性白血病が発生する証拠は得られない。

両調査において、放射線誘発白血病の相対危険度及び過剰リスクはいずれも被曝後経過年数とともに減少した。被曝後のリスクの増加は、寿命調査集団の方が脊椎炎例よりも長く持続したことが認められている。²⁵ ただし、図3によれば、これは寿命調査集団のリスクが高いことの自然の結果であるように思われる。市丸ら¹³は、寿命調査集団では被曝後経過年数に伴う白血病消失のパターンは、都市別に異なるように思われると述べているが、相対危険度の観点からすると、すべての型の白血病又は急性白血病のいずれについても、被曝後経過年数と都市との間に有意な相互作用は認められなかった(両例とも $p > .10$)。

寿命調査集団では、被曝後経過年数の増加に伴う相対危険度の減少を考慮したところ、すべての型の白血病については、被曝時年齢の増加とともに相対危険度に有意な減少が認められた。脊椎炎例ではこのような傾向はみられず、寿命調査集団にそれが見られるのは、完全に、原爆時年齢15歳未満の者の存在によることが認められた。被曝時年齢が少なくとも15歳であった者では、いずれの調査によっても、被曝時年齢に伴う白血病の相対危険度に一定の傾向は認められなかった。

脊椎炎例では被曝時年齢の増加とともに白血病の過剰リスクは増加し、寿命調査集団では増加しなかったが、両調査における傾向には有意な差はなかった。寿命調査集団と比較するため、脊椎炎例で被曝後5.5年までの期間を除外したところ、この傾向は有意でなくなり、両調査による所見を合わせた場合

and remained so when evidence from the two studies was combined. Thus, when viewed together the two studies do not show strong evidence of increasing excess risk with increasing age at exposure for leukemia of all types. Similarly little variation in excess risk with age at exposure was found for acute leukemia in the LSS.

Age at observation has not previously been reported in the analysis of the leukemia data of either study. For leukemia of all types there was little to be gained by including age at observation as a potential explanatory variable in the relative risk modeling procedure. However, for acute leukemia mortality in the LSS, the pattern of relative risk was better explained by age at observation than age at exposure, with low risk between the ages of 25 and 45, and an increase at younger and older ages.

There was also greater variability in excess risk with age at observation than age at exposure in both studies for leukemia of all types, and in spite of the differing age at exposure distributions in the two studies, the excesses followed consistent patterns, with low excess risk at ages 35-45. The same pattern is repeated for mortality from acute leukemia in the LSS.

Previous analyses of mortality from all types of leukemia¹⁵ and of incidence of all types of leukemia and acute leukemia^{12,13} have reported that the pattern of increased leukemia risk with time since exposure depends on age at exposure. In the present analyses no significant interaction was found on the relative risk scale between age at exposure and time since exposure for leukemia of all types ($\chi^2_5 = 2.7$, $p > .10$ after allowing for linear trends with age at exposure and time since exposure and the reduced risk for females in Nagasaki). For acute leukemia there was a significant interaction between age at exposure and time since exposure before allowing for the effect of age at observation, but these disappeared when age at observation was taken into account ($\chi^2_5 = 13.9$, $p < .05$ after allowing for a linear trend with time since exposure and the reduced risk for Nagasaki females, $\chi^2_5 = 8.4$, $p > .10$ after also allowing for a quadratic trend with age at observation, and $\chi^2_5 = 5.5$, $p > .10$ after allowing for linear and quadratic trends with age at observation). Thus, in the present analysis, the dependence on age at exposure of

にも依然としてそうであった。したがって、両調査を合わせて検討すると、すべての型の白血病については被曝時年齢の増加とともに過剰リスクが増加する著しい所見は認められない。同様に寿命調査集団の急性白血病についても、被曝時年齢に伴う過剰リスクの変動はほとんど認められなかった。

いずれの調査の白血病資料の解析においても観察時年齢がこれまでに報告されたことはない。すべての型の白血病については、潜在的な説明変数としての観察時年齢を相対危険度モデルに含めても、得るものはほとんどなかった。しかし、寿命調査集団の急性白血病死亡率については、相対危険度のパターンは被曝時年齢よりも観察時年齢による方がよく説明され、リスクは25歳から45歳までの間で低く、それより若年及び高齢では増加した。

すべての型の白血病については、両調査とも被曝時年齢よりも観察時年齢に伴う過剰リスクの方が変動性も大きく、また両調査における被曝時年齢分布の差にもかわらず、これらの過剰は一貫したパターンをたどり、過剰リスクは35～45歳において低かった。寿命調査集団における急性白血病の死亡率については、同じパターンが繰り返された。

すべての型の白血病による死亡率¹⁵並びにすべての型の白血病及び急性白血病の発生率^{12,13}に関する以前の解析では、被曝後経過年数に伴う白血病リスクの増加のパターンは被曝時年齢に依存することが報告されている。今回の解析では、すべての型の白血病の場合、相対危険度の基準では、被曝時年齢と被曝後経過年数の間に有意な相互作用は認められなかった(被曝時年齢及び被曝後経過年数に伴う線形傾向、並びに長崎の女性におけるリスクの減少を考慮すると、 $\chi^2_5 = 2.7$, $p > .10$)。急性白血病の場合、観察時年齢の影響を考慮しない場合には、被曝時年齢と被曝後経過年数の間に有意な相互作用があったが、観察時年齢を考慮に入れたときには消失した(被曝後経過年数に伴う線形傾向及び長崎の女性におけるリスクの減少を考慮すると、 $\chi^2_5 = 13.9$, $p < .05$ となり、観察時年齢に伴う二次傾向を考慮すると、 $\chi^2_5 = 8.4$, $p > .10$ となり、また観察時年齢に伴う線形及び二次傾向を考慮すると、 $\chi^2_5 = 5.5$, $p > .10$ となる)。したがって、今回の解析では被曝後の急性白血病リスクのパターンの被曝時年齢に対する

the pattern of acute leukemia risk following exposure seems well described using age at observation as a subsidiary time scale.

Selected tumors common to both series

For the group of selected tumors common to both series, the two studies provide consistent evidence of a decrease in relative risk with increasing age at exposure. The relationship seems well described by a linear trend in $\log(\text{relative risk})$ with $\log(\text{age at exposure})$. Although individuals in the LSS who were aged <15 ATB had the highest relative risk, the evidence of a decreasing trend was not just due to them; even when they were excluded there was still a significant trend when the two data sets were combined. This result is in agreement with previous analyses of the LSS,¹ but previous conclusions of constant relative risk with age at exposure, based on the data from cancers of heavily irradiated sites in the spondylitics alone, do not now appear valid.

After standardization for time since exposure to the person-years distribution of the spondylitics, both studies showed a clear increase in excess risk with age at exposure in those aged 15 or more at exposure, and the trend was consistent in the two studies. The finding agrees with previous analyses of mortality from all heavily irradiated sites in the spondylitics.² When excess risk by age at exposure in the LSS was internally standardized for time since exposure to the person-years of that study, the trend was much reduced and no longer significantly different from zero. In the LSS a greater proportion of the person-years at risk in the high-dose group occurred 18 or more years after exposure than in the spondylitics (53% in the LSS compared with 15% in the spondylitics), and so standardizing to the LSS rather than the spondylitis series distribution of person-years is equivalent to lengthening the follow-up period of the study. Thus the trend in excess risk with age at exposure in the LSS is clearer during the earlier section of the follow-up than in later periods.

Both studies are consistent with a model in which the radiation-induced risk is a multiple of the natural age-specific risk for an individual. The multiple depends on the age at which the individual is exposed, but given this, it does not change with time since exposure between

依存性は、補助的な時間基準として観察時年齢を用いることにより十分説明されるように思われる。

両調査に共通の特定腫瘍

両調査に共通する特定腫瘍群については、両調査とも被曝時年齢の増加に伴う相対危険度の減少を一貫して示している。この関係は、 $\log(\text{被曝時年齢})$ に伴う $\log(\text{相対危険度})$ の線形傾向によって十分説明されるように思われる。原爆時15歳未満であった寿命調査集団の対象者は最高の相対危険度を示したが、減少傾向は正確には彼らによるものではなかった。なぜならば彼らを除外した場合でさえも、二つの資料群を組み合わせた場合には依然として有意な傾向が認められたからである。この結果は、寿命調査集団に関する以前の解析¹とは一致するが、脊椎炎例における高線量被曝部位の癌の資料にのみ基づいて、被曝時年齢に伴う一定の相対危険度について述べた以前の結論は、現在では正確なものとは思われない。

脊椎炎例の人年分布を用いて被曝後経過年数に対する標準化を行った後は、両調査とも、被曝時15歳又はそれ以上であった者では被曝時年齢とともに過剰リスクが明らかに増加することを示しており、その傾向は両調査とも一致していた。この所見は、脊椎炎例のすべての高線量被曝部位による死亡率に関する以前の解析²と一致する。寿命調査の被曝時年齢別の過剰リスクについて、この集団内で被曝後経過年数を人年に標準化したところ、この傾向は著しく減少し、有意にゼロと異ならなくなった。寿命調査集団では被曝後18年以降は、高線量群における観察人年の割合は、脊椎炎例のそれよりも大きかったので(脊椎炎例で15%であるのに対し、寿命調査集団では53%)、脊椎炎調査の人年分布の代わりに寿命調査の人年分布に対して標準化を行うことは、調査の経過観察期間を延長するに等しい。したがって、寿命調査集団における被曝時年齢に伴う過剰リスクの傾向は、経過観察の初期の方が後期よりも明らかである。

両調査とも、放射線誘発危険率が対象者の自然年齢別危険率の倍数であるモデルと一致する。この倍数は対象者が被曝した年齢に依存するが、この場合、被曝後5年から少なくとも30年までの間では、それは

about 5 and at least 30 years following exposure. Models of this type are termed relative risk models in the BEIR report.³ Although the immediate risk to those irradiated at older ages is greater than to those irradiated at younger ages, the constancy of relative risk with time since exposure will, if it continues, cause greater eventual risk to those who are young when irradiated. Clearly these populations need to be followed up in the future to see if this is so. In the LSS, as time since exposure increases, there is an increasing gap between the relative risks before and after adjusting for age at exposure (Figure 4). This demonstrates the necessity of allowing for the effect of age at exposure when examining trends with time since exposure in future analyses of these data.

After standardization for age at exposure to the person-years distribution of the spondylitics, the two studies showed consistent increasing trends in excess risk with increasing time since exposure. Previous analyses of the LSS¹ have also reported an increasing absolute risk with time since exposure for all cancer other than leukemia. The pattern of excess risk reported here differs from that reported for all heavily irradiated sites in the spondylitics where the excess risk fell more than 20 years after exposure.² The difference is due to the different group of causes of death being studied; for all heavily irradiated sites the crude excess risk/10⁵ in the time periods 2.5-5.4, 5.5-11.4, 11.5-17.4, and 17.5+ years after exposure is 31.4, 66.7, 123.5 and 90.5.

Neither study provides any evidence of variability in relative risk with age at observation, provided the effects of age at exposure are properly taken into account. This finding is in agreement with experimental studies of malignant epithelial tumors in mice which demonstrated that age per se was an irrelevant factor in determining tumor incidence.²⁶ The results of this experiment do not apply to leukemia, which arises from nonepithelial cells. For these solid tumors the constancy of relative risk with age at observation, after taking into account the effects of age at exposure, follows directly from the constancy of relative risk with time since exposure during the study period, so that in a sense, the two time scales are equivalent for these data. Despite this, it is easier to study topics such as induction periods, or to examine the data for signs that the

被曝後経過年数とともに変化しない。この種のモデルは、BEIR 報告³では相対危険度モデルと呼ばれている。高齢で被曝した者の直接危険率は若年で被曝した者よりも大きい。被曝後経過年数に伴う相対危険度が一定であり続ければ、被曝時に若年であった者の最終的な危険率は大きなものとなる。これが事実であるかどうかを調べるために、明らかに将来これらの集団の経過観察を行う必要がある。寿命調査集団では、被曝後経過年数が増加するにつれて、被曝時年齢の調整の前と後における相対危険度の差は増大している(図4)。このことは、将来これらの資料に関する解析で被曝後経過年数に伴う傾向を調べる際、被曝時年齢の影響を考慮する必要のあることを示す。

脊椎炎例の人年分布を用いて被曝時年齢に対する標準化を行うと、両調査とも、被曝後経過年数の増加とともに過剰リスクに一定の増加傾向があることを示した。寿命調査集団に関する以前の解析¹でも、白血病以外のすべての癌の場合、被曝後経過年数とともに絶対危険度が増加することを報告している。ここで報告した過剰リスクのパターンは、過剰リスクが被曝後20年以降に低下した脊椎炎例のすべての高線量被曝部位に関して報告されたパターンとは異なる。² この差は、検討中の異なる死因群によるものである；すべての高線量被曝部位については、被曝後2.5~5.4年、5.5~11.4年、11.5~17.4年及び17.5年以上の期間における粗過剰リスク/10⁵人年は、31.4、66.7、123.5及び90.5である。

被曝時年齢の影響を適切に考慮すると、いずれの調査においても、観察時年齢に伴う相対危険度の変動性は認められない。この所見は、マウスの悪性上皮腫瘍に関する実験調査が、年齢それ自体は腫瘍発生率を決定する際の因子として不適当なものであることを示した所見と一致する。²⁶ この実験の結果は、非上皮細胞に起因する白血病には適用できない。これらの充実性腫瘍については、被曝時年齢の影響を考慮した後では、観察時年齢に伴う相対危険度の不変性は、調査期間中の被曝後経過年数に伴う相対危険度の不変性による直接の結果であるから、ある意味では二つの時間基準はこれらの資料に対して等価である。それにもかかわらず、誘発期間のような問題を調査したり、観察時年齢の代わりに被曝後経過年数を時間基準として用いて、被曝の影響が

effect of the irradiation is beginning to wear off using time since exposure, rather than age at observation, as a time scale. For excess risk the degree of agreement between the two studies seems less good when the data are subdivided by age at observation than by time since exposure or age at exposure. It seems that there is little to be gained by considering age at observation as a time scale for these solid tumors.

Remaining neoplasms

Neoplasms other than leukemia and selected tumors common to both series do not form a sensible biological group on their own, as tumors of both epithelial and nonepithelial cells are included, as are cancers with widely differing age distributions in the general population. The group was examined in the LSS to see whether findings for the selected tumors apply generally to all neoplasms other than leukemia. Neoplasms other than leukemia and selected tumors common to both series showed an increasing relative risk with time since exposure. No one site was responsible for the trend, the main contributions coming from the colon, liver and gallbladder, and urinary bladder. Thus caution is needed when assuming models that have constant relative risk with increasing time since exposure for cancers outside the selected group, and further investigation of time dependency of radiation-induced risk in these sites is necessary.

Previous analyses of the LSS have reported that the relative risk for all cancers other than leukemia is increasing with time since exposure.¹⁴ Although this conclusion was based on an analysis which did not allow for the effects of age at exposure, it seems likely that the increasing trend was chiefly due to these remaining neoplasms rather than those in the selected group.

The rate of increase in excess risk with time since exposure is similar for these remaining neoplasms and those in the selected group, however, in contrast with the selected group, there is no increase in excess risk with age at exposure for these remaining neoplasms.

消失しはじめる徴候を示す資料を調べる方がより簡単である。過剰リスクについては、被曝後経過年数又は被曝時年齢ではなく観察時年齢によって資料を細区分すると、両調査間の一致度は低下するようになる。これらの充実性腫瘍については、観察時年齢を時間基準として考慮しても得るものはほとんどないように思われる。

その他の新生物

白血病並びに両調査に共通する特定腫瘍以外の新生物には、一般集団で年齢分布が広範囲に異なる癌が含まれ、上皮細胞及び非上皮細胞の腫瘍が含まれるので、これら自体では感受性の強い生物群を形成しない。特定腫瘍に関する所見が白血病以外のすべての新生物に全般的に応用できるかどうかを見るために、寿命調査におけるこの群を調べた。白血病並びに両調査に共通する特定腫瘍以外の新生物では、被曝後経過年数とともに相対危険度も増加した。この傾向の原因となったのは一つの部位ではなく、結腸、肝臓及び胆嚢、並びに膀胱が主に寄与した。したがって、特定群以外の癌について被曝後経過年数の増加に対して一定の相対危険度を維持するモデルを想定する場合は注意が必要であり、これらの部位における放射線誘発危険率の時間依存性について更に調査を行う必要がある。

寿命調査に関する以前の解析では、白血病以外のすべての癌の相対危険度は被曝後経過年数とともに増加していることが報告されている。¹⁴ この結論は、被曝時年齢の影響を考慮しなかった解析に基づくものであったが、この増加傾向は主として特定群よりも、これらその他の新生物によるものであったように思われる。

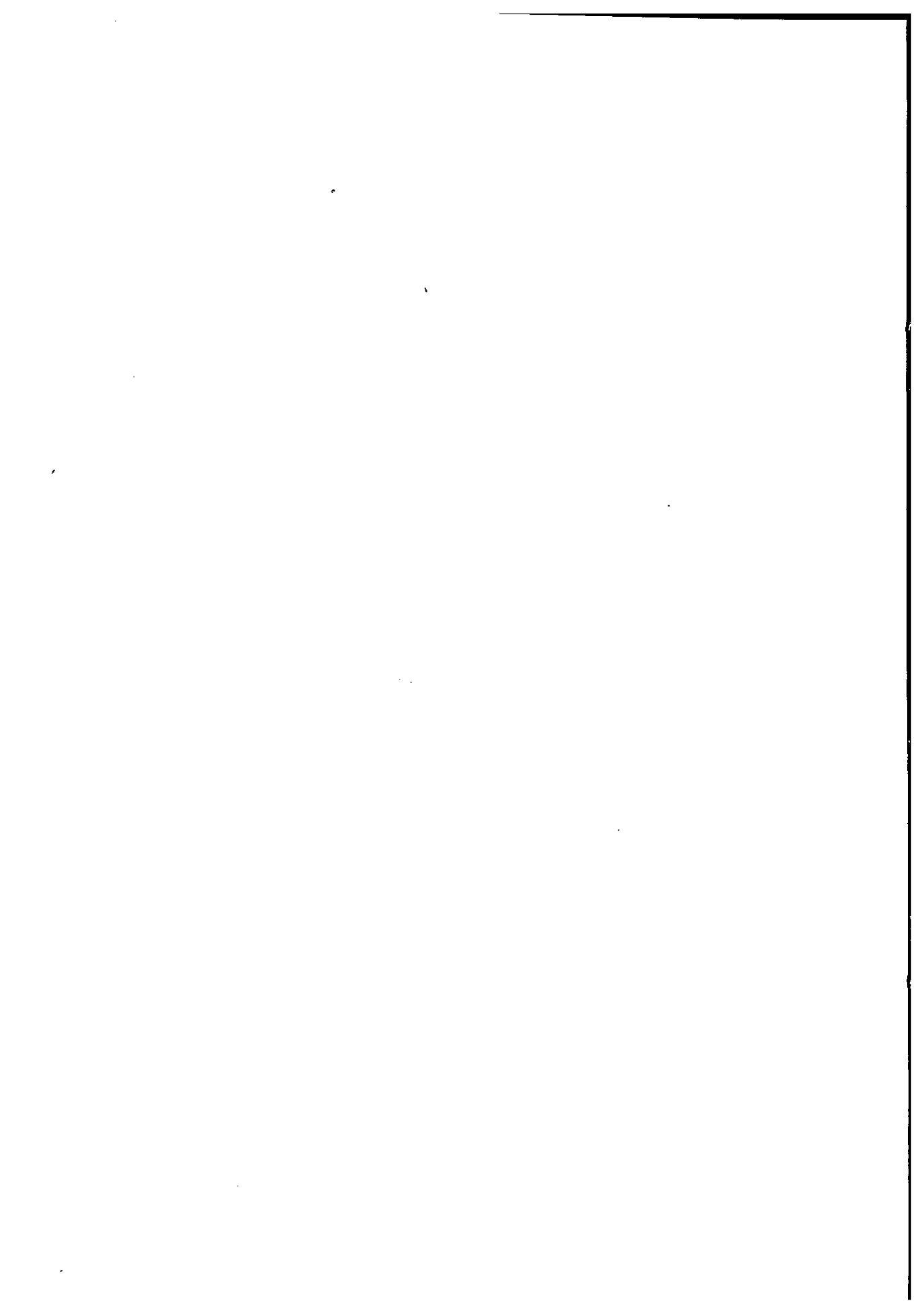
被曝後経過年数に伴う過剰リスクの増加率は、これらその他の新生物と特定群で類似しているが、特定群とは異なり、これらその他の新生物の場合は被曝時年齢に伴う過剰リスクの増加はない。

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CONTENTS OF APPENDIX TABLES

付表の目次

1. Disease groupings used in the analysis and the corresponding ICD codes 解析に用いた疾患群及びそれに相当するICDコード	53
The Life Span Study Sample (Extended). Tabulations by dose, city, sex, age ATB and calendar period 寿命調査集団(拡大). 線量, 都市, 性, 原爆時年齢及び暦年期間別の集計	
2. Number of person-years at risk 1950-1978 1950~78年における観察人年数	55
3. Deaths from leukemia 白血病による死亡	60
4. Deaths with leukemia registry diagnoses of acute leukemia 白血病登録で急性白血病と診断された死亡	62
5. Deaths from selected tumors common to both series 両調査に共通の特定腫瘍による死亡	64
6. Deaths from cancer of pharynx 咽頭癌による死亡	67
7. Deaths from cancer of esophagus 食道癌による死亡	68
8. Deaths from cancer of stomach 胃癌による死亡	70
9. Deaths from cancer of pancreas 膵臓癌による死亡	73
10. Deaths from cancer of larynx 喉頭癌による死亡	75
11. Deaths from cancer of lung and pleura 肺及び胸膜の癌による死亡	76
12. Deaths from cancer of ovaries 卵巣癌による死亡	78
13. Deaths from cancer of skin 皮膚癌による死亡	80
14. Deaths from cancer of bones (excluding jaw and nose) 骨(顎及び鼻を除く)の癌による死亡	81
15. Deaths from multiple myeloma 多発性骨髄腫による死亡	82
16. Deaths from other lymphomas その他のリンパ腫による死亡	83
17. Deaths from central nervous system tumors (spinal cord and nerves only) 中枢神経系腫瘍(脊髄及び神経のみ)による死亡	85
18. Deaths from neoplasms of other sites which were heavily irradiated in the spondylitis series 脊椎炎調査におけるその他の高線量被曝部位の新生物による死亡	86
19. Deaths from cancer of colon 結腸癌による死亡	88
20. Deaths from cancer of brain 脳の癌による死亡	90
21. Deaths from cancer of mouth and tonsils 口及び扁桃の癌による死亡	92
22. Deaths from cancer of tongue 舌癌による死亡	93
23. Deaths from cancer of liver and gallbladder 肝臓及び胆嚢の癌による死亡	94
24. Deaths from cancer of rectum 直腸癌による死亡	96

25. Deaths from cancer of breast 乳癌による死亡	98
26. Deaths from cancer of uterus 子宮癌による死亡	100
27. Deaths from cancer of prostate 前立腺癌による死亡	102
28. Deaths from cancer of testis 睾丸癌による死亡	103
29. Deaths from cancer of kidney and suprarenals 腎臓及び副腎の癌による死亡	104
30. Deaths from cancer of bladder 膀胱癌による死亡	105
31. Deaths from cancer of other sites which were lightly irradiated in the spondylitis series (lip, vulva, vagina, penis, scrotum, jaw, nose) 脊椎炎調査におけるその他の低線量被曝部位(唇, 外陰, 陰, 陰茎, 陰囊, 顎, 鼻)の 癌による死亡	107
Ankylosing Spondylitis Series. Tabulations by sex, age at observation, calendar period, age at exposure, and time since exposure 強直性脊椎炎調査. 性, 観察時年齢, 暦年期間, 被曝時年齢, 及び被曝後経過年数別の集計	
32. Number of person-years at risk 1935-1969 1935~69年における観察人年数	109
33. Deaths from leukemia 白血病による死亡	117
34. Deaths from selected tumors common to both series 両調査に共通の特定腫瘍による死亡	119
Ankylosing Spondylitis Series. Tabulations by sex, age at observation, and calendar period 強直性脊椎炎調査. 性, 観察時年齢, 及び暦年期間別の集計	
35. Deaths from cancer of pharynx 咽頭癌による死亡	122
36. Deaths from cancer of esophagus 食道癌による死亡	122
37. Deaths from cancer of stomach 胃癌による死亡	123
38. Deaths from cancer of pancreas 膵臓癌による死亡	123
39. Deaths from cancer of larynx 喉頭癌による死亡	124
40. Deaths from cancer of lung and pleura 肺及び胸膜の癌による死亡	124
41. Deaths from cancer of ovaries 卵巣癌による死亡	125
42. Deaths from cancer of skin 皮膚癌による死亡	125
43. Deaths from cancer of bones (excluding jaw and nose) 骨(顎及び鼻を除く)の癌による死亡	126
44. Deaths from multiple myeloma 多発性骨髄腫による死亡	126
45. Deaths from other lymphomas その他のリンパ腫による死亡	127
46. Deaths from central nervous system tumors (spinal cord and nerves only) 中枢神経系腫瘍(脊髄及び神経のみ)による死亡	127
47. Deaths from neoplasms of other sites which were heavily irradiated その他の高線量被曝部位の新生物による死亡	128

TABLE 1. DISEASE GROUPINGS USED IN THE ANALYSIS AND THE CORRESPONDING ICD CODES

LEUKEMIA

7TH REV CODE 204

8TH REV CODE 204-207

CANCER SITES WHICH WERE HEAVILY IRRADIATED IN THE SPONDYLITIS SERIES

PHARYNX

7TH REV CODE 145-148(EXCL 145.0)

8TH REV CODE 146-149(EXCL 146.0)

ESOPHAGUS

7TH REV CODE 150

8TH REV CODE 150

STOMACH

7TH REV CODE 151

8TH REV CODE 151

PANCREAS

7TH REV CODE 157

8TH REV CODE 157

LARYNX

7TH REV CODE 161,162.0

8TH REV CODE 161,162.0

LUNG AND PLEURA

7TH REV CODE 162.1,162.2,163

8TH REV CODE 162(EXCL 162.0),163.0,163.9

OVARIES

7TH REV CODE 175

8TH REV CODE 183

SKIN

7TH REV CODE 190,191

8TH REV CODE 172,173(EXCL 172.5,173.5)

BONES (EXCLUDING JAW AND NOSE)

7TH REV CODE 196(EXCL 196.0,196.1)

8TH REV CODE 170(EXCL 170.0,170.1)

MULTIPLE MYELOMA

7TH REV CODE 203

8TH REV CODE 203

OTHER LYMPHOMAS

7TH REV CODE 200,201,202,205

8TH REV CODE 200,201,202

CENTRAL NERVOUS SYSTEM TUMORS (SPINAL CORD AND NERVES ONLY)

7TH REV CODE 193.1-193.9,PT223,PT237*

8TH REV CODE 192.2-192.9,225.3-9,238.4-9

OTHER NEOPLASMS (BY SUBTRACTION)

7TH REV CODE 142,152,158,159,162.8,164-5,192,194,195.1-8,197-9,
210-239(EXCL 223,237)8TH REV CODE 142,152,158,159,163.1,171,190,193,194-9 (EXCL 194.0,197.7-8),
208-9,210-239(EXCL 225,238.1-9)

*Death certificates from the LSS which had been coded as 223 or 237 (7th revision code) were reviewed by H. Kato and classified as either brain tumors or tumors of the spinal cord and nerves.

TABLE 1. (Continued)

CANCER SITES WHICH WERE LIGHTLY IRRADIATED IN THE SPONDYLITIS SERIES

BRAIN

7TH REV CODE 193.0,PT223,PT237*

8TH REV CODE 191,192.0-1,225.0-2,238.1-3

MOUTH AND TONSILS

7TH REV CODE 143,144,145.0

8TH REV CODE 143-145,146.0

TONGUE

7TH REV CODE 141

8TH REV CODE 141

LIVER AND GALLBLADDER

7TH REV CODE 155,156

8TH REV CODE 155,156,197.7-8

RECTUM

7TH REV CODE 154

8TH REV CODE 154

BREAST

7TH REV CODE 170

8TH REV CODE 174

UTERUS

7TH REV CODE 171-174

8TH REV CODE 180-182

PROSTATE

7TH REV CODE 177

8TH REV CODE 185

TESTIS

7TH REV CODE 178

8TH REV CODE 186

KIDNEY AND SUPRARENALS

7TH REV CODE 180,195.0

8TH REV CODE 189.0,189.1,194.0

BLADDER

7TH REV CODE 181

8TH REV CODE 188,189.2,189.9

OTHER SITES WHICH WERE LIGHTLY IRRADIATED IN THE SPONDYLITIS SERIES

(LIP, VULVA, VAGINA, PENIS, SCROTUM, JAW, NOSE,)

7TH REV CODE 140,160,176,179,196.0,196.1

8TH REV CODE 140,160,170.0,170.1,172.5,173.5,184,187

OTHER CANCER SITES

COLON

7TH REV CODE 153

8TH REV CODE 153

TABLE 2-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) NUMBER OF PERSON-YEARS AT RISK 1950-1978

TABLE 2-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	
TOTAL 1950-78														
	ALL AGES ATB	1936155	421091	629583	113947	160212	121129	208748	55442	78690	32032	46223	30385	38672
	0-4	248330	66850	71308	17808	17271	21367	22206	9385	9578	3176	3779	2975	2626
	5-9	176828	45077	44703	15340	18003	13392	12540	8760	9138	2232	2541	2476	2627
	10-14	223140	65486	49427	19061	21620	13378	15688	8999	10534	2997	5369	4485	6095
	15-19	244463	41843	77467	17844	26186	10880	24084	6360	10396	5464	6481	6777	10682
	20-24	145093	13469	62909	3863	16427	3440	21066	2080	7209	1436	6019	1322	5854
	25-29	134607	22389	52245	5328	11611	5964	18282	2755	5672	2144	3852	2045	2520
	30-34	142978	25376	56333	6112	10630	7512	18217	2485	6276	2131	3582	2664	1660
	35-39	154582	29331	58691	6007	10238	6713	21453	3336	5778	2766	4296	1934	2038
	40-44	147747	32168	50579	7423	9294	10232	18731	3416	4712	3187	4196	2268	1539
	45-49	133301	32572	42782	6883	8600	10917	15244	3247	3898	2797	3085	1700	1576
	50-54	83517	21441	26238	4540	4942	7183	9185	2154	2469	2027	1533	1144	658
	55-59	52829	13560	18230	2125	2880	4406	6053	1437	1536	950	781	367	503
	60-64	28369	6867	10564	983	1477	2222	3651	663	673	558	400	170	143
	65-69	13674	3267	5144	467	693	1049	1661	250	607	107	254	49	126
	70-74	4911	1099	2209	127	212	402	510	86	138	58	49	7	15
	75-79	1314	236	623	32	109	64	150	28	55	2	6	0	9
	80-84	231	43	117	0	16	10	23	0	23	0	0	0	0
	85+	38	17	16	0	3	0	2	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	255927	58032	81332	15284	20449	16810	27156	7440	10093	4539	5956	4009	4827
	0-4	28899	7802	8249	2080	2004	2496	2579	1094	1116	374	438	355	312
	5-9	20739	5297	5207	1818	2113	1565	1454	1031	1075	276	301	293	309
	10-14	26534	7837	5822	2293	2566	1599	1831	1060	1238	372	637	534	725
	15-19	29048	5024	9119	2167	3100	1292	2854	763	1223	659	772	807	1268
	20-24	17408	1669	7462	508	1961	426	2510	247	861	175	724	164	701
	25-29	16336	2751	6235	664	1407	766	2191	339	683	263	475	258	303
	30-34	17596	3204	6814	768	1314	944	2208	306	783	266	443	340	207
	35-39	19781	3900	7291	811	1313	1164	2679	444	729	367	549	276	259
	40-44	20148	4610	6644	1050	1252	1439	2478	489	632	463	557	330	204
	45-49	19818	5157	5894	1137	1226	1733	2134	566	571	463	436	275	226
	50-54	14254	3979	4130	869	787	1244	1464	403	402	384	256	225	111
	55-59	10922	3084	3343	547	593	957	1139	361	312	242	165	79	101
	60-64	7368	1982	2452	319	384	634	873	197	184	171	105	48	39
	65-69	4333	1133	1513	173	261	357	456	94	178	37	69	16	47
	70-74	1922	452	791	61	97	161	193	40	62	25	28	7	8
	75-79	645	121	294	20	38	28	73	7	31	2	4	0	7
	80-84	136	25	64	0	10	6	17	0	14	0	0	0	0
	85+	21	7	9	0	3	0	2	0	0	0	0	0	0

TABLE 2-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) NUMBER OF PERSON-YEARS AT RISK 1950-1978

TABLE 2-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1954-56														
	ALL AGES ATB	229319	51453	73338	13625	18411	14938	24492	6644	9085	4004	5373	3606	4349
	0-4	26582	7177	7606	1906	1847	2292	2372	1008	1023	342	402	324	281
	5-9	19056	4872	4792	1670	1933	1439	1340	945	986	249	276	270	284
	10-14	24251	7152	5334	2089	2340	1460	1693	973	1137	335	585	492	661
	15-19	26582	4581	8362	1973	2839	1187	2623	693	1116	601	708	738	1161
	20-24	15882	1509	6834	439	1796	384	2297	225	784	159	664	150	640
	25-29	14908	2513	5703	605	1263	681	2003	310	630	240	433	235	273
	30-34	15998	2691	6223	695	1200	854	2020	280	703	242	402	303	182
	35-39	17937	3523	6637	731	1181	1050	2443	404	664	327	494	248	235
	40-44	18090	4091	5998	946	1130	1291	2235	442	564	415	501	294	183
	45-49	17567	4324	5282	997	1091	1523	1910	492	504	400	399	246	198
	50-54	12395	3409	3654	750	684	1077	1294	338	358	331	216	188	98
	55-59	9225	2536	2920	423	500	808	1000	287	263	195	140	66	87
	60-64	5856	1499	2008	236	310	500	722	158	154	124	84	36	27
	65-69	3240	794	1192	120	187	258	362	61	141	27	50	15	34
	70-74	1309	307	574	34	57	111	131	23	35	17	16	0	3
	75-79	369	58	187	10	28	18	42	6	16	0	2	0	2
	80-84	59	10	28	0	0	3	5	0	7	0	0	0	0
	85+	11	6	5	0	0	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	221684	49213	71299	13142	17905	14230	23821	6407	8841	3809	5252	3501	4261
	0-4	26503	7152	7593	1901	1843	2283	2364	1004	1019	341	402	322	279
	5-9	18943	4842	4773	1656	1917	1433	1334	939	977	245	276	270	280
	10-14	24030	7082	5299	2063	2312	1435	1688	967	1130	329	584	486	656
	15-19	26328	4512	8294	1952	2817	1182	2600	687	1105	593	698	731	1154
	20-24	15723	1489	6779	422	1778	380	2277	225	777	159	655	147	636
	25-29	14728	2477	5651	590	1268	666	1987	303	624	237	427	228	270
	30-34	15780	2846	6158	687	1174	837	2001	277	686	237	400	299	178
	35-39	17604	3449	6538	706	1161	1021	2410	394	659	317	483	234	231
	40-44	17461	3901	5827	915	1094	1241	2162	425	545	397	498	284	171
	45-49	16724	4242	5107	944	1040	1614	1838	455	483	372	387	232	191
	50-54	11525	3094	3469	681	641	1000	1229	314	335	305	203	168	88
	55-59	8180	2154	2696	554	444	700	933	242	241	153	124	64	75
	60-64	4748	1169	1720	164	249	389	602	115	124	93	70	28	24
	65-69	2368	548	905	83	129	176	285	39	108	20	41	9	26
	70-74	834	197	380	21	29	62	91	15	22	9	5	0	3
	75-79	170	29	89	2	7	10	21	6	6	0	0	0	0
	80-84	30	7	19	0	0	1	0	0	2	0	0	0	0
	85+	5	4	1	0	0	0	0	0	0	0	0	0	0

TABLE 2-3 THE LIFE SPAN STUDY SAMPLE (EXTENDED) NUMBER OF PERSON-YEARS AT RISK 1950-1978

TABLE 2-3

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1960-62														
	ALL AGES ATB	214653	47149	69382	12671	17503	13629	23160	6179	8642	3629	5124	3391	4194
	0-4	26459	7135	7598	1899	1837	2278	2361	1000	1017	339	402	315	279
	5-9	18852	4812	4751	1640	1917	1433	1330	934	975	237	276	267	279
	10-14	23889	7023	5273	2051	2307	1427	1679	965	1129	324	579	479	651
	15-19	26169	4486	8253	1924	2800	1176	2582	687	1104	587	695	727	1147
	20-24	15612	1468	6745	413	1767	377	2258	223	775	157	649	146	635
	25-29	14593	2442	5623	579	1254	659	1968	303	616	234	420	225	270
	30-34	15604	2816	6093	675	1161	829	1984	272	680	228	394	296	176
	35-39	17243	3358	6447	689	1128	996	2367	378	644	315	472	222	228
	40-44	16871	3744	5664	877	1064	1185	2102	406	525	380	482	275	168
	45-49	15825	3972	4919	866	986	1316	1772	416	461	349	368	218	182
	50-54	10580	2748	3263	606	603	912	1162	282	315	270	191	149	79
	55-59	7044	1794	2426	273	389	592	823	188	210	125	109	48	66
	60-64	3731	869	1429	112	195	289	501	88	94	66	50	20	18
	65-69	1631	370	626	59	71	120	210	24	83	13	36	5	14
	70-74	452	93	223	6	18	53	54	7	11	6	0	0	1
	75-79	91	17	44	0	6	7	9	6	2	0	0	0	0
	80-84	6	1	3	0	0	0	0	0	0	0	0	0	0
1963-65														
	ALL AGES ATB	207242	45003	67403	12200	17073	12953	22410	5940	8424	3433	4999	3281	4124
	0-4	26402	7111	7591	1894	1836	2269	2359	997	1017	336	402	312	278
	5-9	18785	4793	4741	1625	1914	1427	1329	931	974	234	272	267	279
	10-14	23727	6961	5244	2033	2297	1417	1674	959	1125	317	575	477	648
	15-19	26026	4463	8221	1906	2787	1165	2559	685	1102	584	693	725	1137
	20-24	15467	1445	6695	408	1747	368	2243	222	769	153	647	143	627
	25-29	14428	2409	5581	565	1239	639	1956	301	606	229	411	223	270
	30-34	15374	2759	6017	662	1139	812	1961	269	672	228	387	292	174
	35-39	16800	3236	6345	667	1092	957	2308	368	625	308	463	210	222
	40-44	16212	3553	5504	836	1026	1129	2040	391	515	344	455	253	165
	45-49	14862	3654	4717	789	936	1206	1706	359	440	325	356	200	172
	50-54	9409	2351	3013	502	565	795	1047	239	284	236	177	125	76
	55-59	5765	1406	2082	217	319	484	673	139	169	90	93	37	56
	60-64	2750	611	1124	69	138	190	386	58	64	41	39	15	15
	65-69	986	215	396	25	24	75	136	17	57	5	29	3	5
	70-74	222	30	124	3	7	19	31	0	5	2	0	0	0
	75-79	28	6	8	0	6	1	3	3	0	0	0	0	0
	80-84	1	0	1	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 2-4 THE LIFE SPAN STUDY SAMPLE (EXTENDED) NUMBER OF PERSON-YEARS AT RISK 1950-1978

TABLE 2-4

REF TR 4-84

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
			MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
1966-68														
	ALL AGES ATB	199528	42812	65393	11667	16671	12264	21606	5680	8172	3253	4832	3134	4043
	0-4	26335	7084	7576	1887	1832	2261	2359	993	1017	336	402	312	276
	5-9	16706	4769	4734	1614	1909	1419	1329	929	963	234	268	260	276
	10-14	23573	6909	5218	2011	2285	1411	1665	953	1117	313	570	474	647
	15-19	25843	4425	8193	1883	2767	1148	2541	673	1101	581	687	719	1125
	20-24	15302	1409	6649	396	1739	356	2227	222	758	153	639	138	616
	25-29	14228	2359	5534	553	1218	620	1940	295	598	224	403	218	266
	30-34	15096	2687	5939	646	1117	791	1928	265	658	225	378	286	174
	35-39	16232	3078	6189	623	1059	910	2256	351	608	290	455	199	215
	40-44	15388	3309	5318	764	965	1051	1971	362	496	320	441	229	161
	45-49	13653	3263	4489	679	892	1082	1600	299	401	286	333	167	163
	50-54	8139	1941	2700	411	526	686	912	199	249	193	154	97	71
	55-59	4474	1054	1715	146	254	360	519	99	135	63	63	28	39
	60-64	1852	375	826	47	89	113	259	32	35	32	24	8	12
	65-69	598	135	250	7	11	45	90	8	32	3	15	1	1
	70-74	100	12	62	1	3	10	8	0	3	0	0	0	0
	75-79	10	4	1	0	4	0	1	0	0	0	0	0	0
1969-71														
	ALL AGES ATB	191583	40621	63168	11158	16232	11646	20795	5411	7902	3034	4642	3015	3959
	0-4	26234	7050	7550	1878	1823	2251	2351	992	1016	335	401	312	276
	5-9	18616	4743	4725	1606	1896	1610	1328	921	958	230	265	258	276
	10-14	23373	6850	5193	1989	2268	1404	1648	945	1105	306	558	471	636
	15-19	25642	4381	8159	1850	2749	1139	2518	660	1100	572	683	713	1119
	20-24	15121	1377	6596	389	1723	350	2200	219	751	150	625	136	606
	25-29	13998	2303	5469	546	1202	600	1917	285	584	220	400	208	264
	30-34	14753	2579	5859	623	1093	769	1885	259	644	225	368	277	171
	35-39	15585	2889	6017	586	1023	854	2194	329	581	277	443	185	207
	40-44	14390	3021	5069	699	919	980	1862	309	457	296	416	207	156
	45-49	12310	2830	4184	566	837	984	1473	251	371	228	290	140	156
	50-54	6840	1606	2311	313	455	587	791	169	211	134	128	79	54
	55-59	3279	741	1318	87	179	240	413	56	104	41	42	24	33
	60-64	1089	194	532	23	61	58	151	13	13	17	15	6	6
	65-69	308	49	153	1	3	16	63	3	6	2	8	0	0
	70-74	47	7	32	0	1	5	1	0	1	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 2-5 THE LIFE SPAN STUDY SAMPLE (EXTENDED) NUMBER OF PERSON-YEARS AT RISK 1950-1978

TABLE 2-5

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1972-74														
	ALL AGES ATB	183909	38609	60948	10681	15761	11009	20005	5177	7668	2861	4445	2866	3878
	0-4	26170	7026	7535	1873	1822	2248	2350	987	1010	333	399	311	276
	5-9	18545	4712	4713	1601	1892	1403	1329	915	957	228	263	255	276
	10-14	23191	6778	5180	1958	2257	1389	1636	940	1100	305	552	462	633
	15-19	25420	4321	8129	1816	2722	1130	2502	654	1095	563	674	702	1112
	20-24	14961	1356	6544	387	1694	345	2184	214	746	145	613	133	599
	25-29	13753	2251	5400	540	1187	586	1877	268	576	216	385	203	263
	30-34	14373	2476	5759	604	1067	745	1845	245	630	215	358	259	171
	35-39	14865	2683	5834	541	1003	788	2124	305	556	259	418	160	194
	40-44	13377	2763	4765	635	843	897	1755	281	437	273	387	190	150
	45-49	10812	2396	3834	452	763	823	1330	207	322	186	249	112	138
	50-54	5418	1242	1909	217	354	464	642	119	169	100	106	57	41
	55-59	2248	472	954	45	120	159	306	38	61	24	30	16	24
	60-64	615	113	302	13	35	33	89	1	3	11	8	6	2
	65-69	142	20	72	0	3	1	37	3	3	0	3	0	0
	70-74	18	1	17	0	0	0	0	0	0	0	0	0	0
1975-78														
	ALL AGES ATB	232310	48198	77320	13520	20208	13650	25301	6565	9862	3469	5600	3581	5035
	0-4	34745	9313	10011	2489	2427	2991	3111	1310	1342	440	531	412	368
	5-9	24587	6237	6265	2111	2510	1864	1765	1215	1273	299	344	337	367
	10-14	30573	8895	6861	2574	2989	1836	2155	1238	1452	396	728	610	839
	15-19	33408	5650	10737	2373	3604	1460	3307	857	1448	723	871	916	1459
	20-24	19619	1748	8605	503	2222	454	2870	284	988	184	802	165	793
	25-29	17836	2884	7050	687	1553	748	2444	349	753	280	499	248	340
	30-34	18404	3118	7472	752	1365	930	2385	312	819	264	452	310	226
	35-39	18535	3214	7394	652	1278	973	2674	363	712	307	519	201	248
	40-44	15809	3175	5790	703	1000	1019	2126	312	541	297	459	206	180
	45-49	11729	2514	4356	453	829	834	1480	202	347	186	266	112	150
	50-54	4957	1073	1790	191	327	417	646	93	145	73	104	56	41
	55-59	1692	319	776	30	83	106	247	28	41	16	17	6	23
	60-64	341	55	172	2	16	17	68	0	1	3	5	4	0
	65-69	68	3	35	0	4	0	22	1	0	0	3	0	0
	70-74	7	0	7	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 3-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM LEUKEMIA

TABLE 3-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9		10-99				100+					
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	
TOTAL 1950-78														
	ALL AGES ATB	180	30	26	5	9	20	19	3	2	22	24	15	5
	0-4	10	1	1	1	1	1	2	0	0	1	3	6	1
	5-9	12	3	0	0	2	1	1	0	0	4	0	0	1
	10-14	8	2	1	0	0	2	0	1	0	1	1	0	0
	15-19	24	3	3	1	1	4	2	0	1	2	3	1	3
	20-24	12	2	1	1	1	0	1	0	0	1	5	0	0
	25-29	12	1	2	0	0	1	2	0	0	2	3	1	0
	30-34	15	2	3	0	0	2	3	0	0	3	1	1	0
	35-39	14	2	2	1	1	2	1	0	0	1	2	2	0
	40-44	26	5	10	0	2	3	1	0	0	1	2	2	0
	45-49	17	6	1	1	0	1	2	1	1	3	1	0	0
	50-54	8	0	1	0	0	2	2	1	0	1	0	1	0
	55-59	10	1	1	0	1	1	1	0	0	1	3	1	0
	60-64	2	1	0	0	0	0	0	0	0	1	0	0	0
	65-69	2	1	0	0	0	0	1	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	32	3	4	2	0	3	2	0	0	6	4	4	2
	0-4	5	0	0	1	0	0	0	0	0	0	2	2	0
	5-9	2	1	0	0	0	0	0	0	0	0	0	0	1
	10-14	1	0	0	0	0	0	0	0	0	1	0	0	0
	15-19	4	0	0	0	0	1	0	0	0	1	0	1	1
	20-24	3	0	1	0	0	0	0	0	0	1	1	0	0
	25-29	4	1	0	0	0	0	1	0	0	1	0	1	0
	30-34	2	0	0	0	0	0	0	0	0	0	1	0	0
	35-39	2	0	0	0	0	1	0	0	0	0	0	1	0
	40-44	3	0	2	0	0	0	0	0	0	0	1	0	0
	45-49	2	0	0	1	0	0	0	0	0	1	0	0	0
	50-54	2	0	0	0	0	1	1	0	0	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	18	1	1	1	0	3	2	0	0	4	3	1	2
	0-4	4	0	1	0	0	0	1	0	0	1	0	0	1
	5-9	1	0	0	0	0	0	0	0	0	1	0	0	0
	10-14	1	0	0	0	0	1	0	0	0	0	0	0	0
	15-19	3	0	0	1	0	0	0	0	0	0	1	0	1
	20-24	1	0	0	0	0	0	0	0	0	0	1	0	0
	40-44	3	0	0	0	0	1	0	0	0	1	0	1	0
	45-49	1	0	0	0	0	1	0	0	0	0	0	0	0
	50-54	1	0	0	0	0	0	1	0	0	0	0	0	0
	55-59	2	0	0	0	0	0	0	0	0	1	1	0	0
	65-69	1	1	0	0	0	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	30	5	4	0	1	3	3	1	0	6	4	3	0
	0-4	2	0	0	0	0	0	1	0	0	0	0	1	0
	10-14	2	0	0	0	0	0	0	1	0	0	1	0	0
	15-19	4	0	0	0	1	1	0	0	0	1	1	0	0
	25-29	2	0	0	0	0	0	1	0	0	1	0	0	0
	30-34	2	0	0	0	0	0	1	0	0	1	0	0	0
	35-39	2	0	0	0	0	0	0	0	0	1	1	0	0
	40-44	8	2	4	0	0	1	0	0	0	0	0	1	0
	45-49	3	2	0	0	0	0	0	0	0	0	1	0	0
	50-54	1	0	0	0	0	0	0	0	0	1	0	0	0
	55-59	3	1	0	0	0	1	0	0	0	0	0	1	0
	60-64	1	0	0	0	0	0	0	0	0	1	0	0	0
1960-62														
	ALL AGES ATB	13	0	2	0	1	2	3	0	0	2	0	3	0
	0-4	3	0	0	0	0	0	0	0	0	0	0	3	0
	5-9	5	0	0	0	1	1	1	0	0	2	0	0	0
	10-14	1	0	1	0	0	0	0	0	0	0	0	0	0
	25-29	1	0	0	0	0	1	0	0	0	0	0	0	0
	30-34	1	0	0	0	0	0	1	0	0	0	0	0	0
	45-49	1	0	0	0	0	0	1	0	0	0	0	0	0
	50-54	1	0	1	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 3-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM LEUKEMIA

TABLE 3-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1963-65	ALL AGES ATB	16	3	1	0	1	3	2	1	0	0	4	0	1
	0-4	2	0	0	0	1	1	0	0	0	0	0	0	0
	15-19	2	0	0	0	0	1	0	0	0	0	0	0	0
	20-24	2	1	0	0	0	0	1	0	0	0	0	0	1
	25-29	2	0	0	0	0	0	0	0	0	0	2	0	0
	40-44	3	2	0	0	0	0	0	0	0	0	1	0	0
	45-49	2	0	1	0	0	0	0	1	0	0	0	0	0
	50-54	1	0	0	0	0	1	0	0	0	0	0	0	0
	55-59	1	0	0	0	0	0	0	0	0	0	1	0	0
	65-69	1	0	0	0	0	0	1	0	0	0	0	0	0
1966-68	ALL AGES ATB	14	1	2	0	3	1	2	0	0	0	3	2	0
	5-9	1	1	0	0	0	0	0	0	0	0	0	0	0
	10-14	1	0	0	0	0	1	0	0	0	0	0	0	0
	15-19	1	0	0	0	0	0	1	0	0	0	0	0	0
	20-24	1	0	0	0	0	0	0	0	0	0	1	0	0
	25-29	1	0	1	0	0	0	0	0	0	0	0	0	0
	30-34	1	0	1	0	0	0	0	0	0	0	0	0	0
	35-39	2	0	0	0	0	0	0	0	0	0	1	1	0
	40-44	3	0	0	0	2	0	1	0	0	0	0	0	0
	50-54	1	0	0	0	0	0	0	0	0	0	0	1	0
	55-59	2	0	0	0	1	0	0	0	0	0	1	0	0
1969-71	ALL AGES ATB	11	2	3	2	0	0	0	0	0	1	3	0	0
	5-9	1	0	0	0	0	0	0	0	0	1	0	0	0
	10-14	1	1	0	0	0	0	0	0	0	0	0	0	0
	15-19	2	0	2	0	0	0	0	0	0	0	0	0	0
	20-24	2	0	0	1	0	0	0	0	0	0	1	0	0
	25-29	1	0	0	0	0	0	0	0	0	0	1	0	0
	30-34	2	1	0	0	0	0	0	0	0	0	1	0	0
	35-39	1	0	0	1	0	0	0	0	0	0	0	0	0
	40-44	1	0	1	0	0	0	0	0	0	0	0	0	0
1972-74	ALL AGES ATB	16	7	2	0	2	2	0	0	0	1	2	0	0
	0-4	1	1	0	0	0	0	0	0	0	0	0	0	0
	5-9	1	0	0	0	1	0	0	0	0	0	0	0	0
	15-19	4	2	0	0	0	1	0	0	0	0	1	0	0
	20-24	2	0	0	0	1	0	0	0	0	0	0	0	0
	30-34	2	1	0	0	0	0	0	0	1	0	0	0	0
	35-39	3	1	1	0	0	1	0	0	0	0	0	0	0
	40-44	1	0	1	0	0	0	0	0	0	0	0	0	0
	45-49	2	2	0	0	0	0	0	0	0	0	0	0	0
1975-78	ALL AGES ATB	30	8	7	0	1	3	5	1	2	2	1	0	0
	0-4	1	0	0	0	0	0	0	0	0	0	1	0	0
	5-9	1	1	0	0	0	0	0	0	0	0	0	0	0
	10-14	1	1	0	0	0	0	0	0	0	0	0	0	0
	15-19	4	1	1	0	0	0	1	0	1	0	0	0	0
	20-24	1	1	0	0	0	0	0	0	0	0	0	0	0
	25-29	1	0	1	0	0	0	0	0	0	0	0	0	0
	30-34	5	0	2	0	0	2	1	0	0	0	0	0	0
	35-39	4	1	1	0	1	0	1	0	0	0	0	0	0
	40-44	4	1	2	0	0	1	0	0	0	0	0	0	0
	45-49	6	2	0	0	0	0	1	0	1	2	0	0	0
	50-54	1	0	0	0	0	0	0	1	0	0	0	0	0
	55-59	1	0	0	0	0	0	1	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 4-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS WITH LEUKEMIA REGISTRY DIAGNOSES OF ACUTE LEUKEMIA

TABLE 4-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	119	19	18	2	8	10	8	0	0	12	23	11	8
	0-4	13	0	1	0	1	1	2	0	0	1	2	4	1
	5-9	9	1	0	0	2	1	1	0	0	1	1	0	2
	10-14	5	2	0	0	0	0	0	0	0	2	1	0	0
	15-19	20	3	3	1	1	2	1	0	0	2	2	1	4
	20-24	6	1	1	1	1	0	0	0	0	0	3	0	1
	25-29	6	1	2	0	0	1	0	0	1	0	3	1	0
	30-34	9	1	2	0	0	1	2	0	0	1	1	1	0
	35-39	12	1	2	0	1	1	1	0	0	1	4	1	0
	40-44	18	3	6	0	1	2	0	0	0	1	2	1	0
	45-49	6	3	1	0	0	0	1	0	0	2	1	0	0
	50-54	3	0	0	0	0	1	0	0	0	1	1	1	0
	55-59	5	1	0	0	1	0	0	0	0	2	1	0	0
	60-64	1	0	0	0	0	0	0	0	0	1	0	0	0
1950-53														
	ALL AGES ATB	22	1	2	0	0	1	1	0	0	3	5	5	4
	0-4	4	0	0	0	0	0	0	0	0	2	2	0	0
	5-9	3	0	0	0	0	0	0	0	0	1	0	2	0
	10-14	2	0	0	0	0	0	0	0	2	0	0	0	0
	15-19	5	0	0	0	0	1	0	0	1	0	1	2	0
	20-24	2	0	1	0	0	0	0	0	0	1	0	0	0
	25-29	2	1	0	0	0	0	0	0	0	0	1	0	0
	30-34	2	0	0	0	0	0	1	0	0	0	1	0	0
	40-44	2	0	1	0	0	0	0	0	0	1	0	0	0
1954-56														
	ALL AGES ATB	9	0	1	1	0	0	1	0	0	2	2	0	2
	0-4	4	0	1	0	0	0	1	0	0	1	0	0	1
	15-19	3	0	0	1	0	0	0	0	0	1	0	1	0
	20-24	1	0	0	0	0	0	0	0	0	1	0	0	0
	40-44	1	0	0	0	0	0	0	0	0	1	0	0	0
1957-59														
	ALL AGES ATB	21	4	3	0	1	1	2	0	0	3	4	3	0
	0-4	2	0	0	0	0	0	1	0	0	0	0	1	0
	10-14	1	0	0	0	0	0	0	0	0	0	1	0	0
	15-19	3	0	0	0	1	0	0	0	0	1	1	0	0
	30-34	1	0	0	0	0	0	1	0	0	0	0	0	0
	35-39	2	0	0	0	0	0	0	0	0	1	1	0	0
	40-44	7	2	3	0	0	1	0	0	0	0	0	1	0
	45-49	2	1	0	0	0	0	0	0	0	0	1	0	0
	55-59	2	1	0	0	0	0	0	0	0	0	0	1	0
	60-64	1	0	0	0	0	0	0	0	0	1	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 4-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS WITH
LEUKEMIA REGISTRY DIAGNOSES OF ACUTE LEUKEMIA

TABLE 4-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1960-62														
	ALL AGES ATB	6	0	0	0	1	2	1	0	0	1	0	1	0
	0-4	1	0	0	0	0	0	0	0	0	0	0	1	0
	5-9	4	0	0	0	1	1	1	0	0	1	0	0	0
	25-29	1	0	0	0	0	1	0	0	0	0	0	0	0
1963-65														
	ALL AGES ATB	12	2	1	0	1	2	0	0	0	0	4	0	2
	0-4	2	0	0	0	1	1	0	0	0	0	0	0	0
	15-19	1	0	0	0	0	0	0	0	0	0	0	0	1
	20-24	1	0	0	0	0	0	0	0	0	0	0	0	1
	25-29	2	0	0	0	0	0	0	0	0	0	2	0	0
	40-44	3	2	0	0	0	0	0	0	0	0	1	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
	50-54	1	0	0	0	0	1	0	0	0	0	0	0	0
	55-59	1	0	0	0	0	0	0	0	0	0	1	0	0
1966-68														
	ALL AGES ATB	9	0	1	0	2	0	1	0	0	0	3	2	0
	15-19	1	0	0	0	0	0	1	0	0	0	0	0	0
	25-29	1	0	1	0	0	0	0	0	0	0	0	0	0
	35-39	2	0	0	0	0	0	0	0	0	0	1	1	0
	40-44	1	0	0	0	1	0	0	0	0	0	0	0	0
	50-54	2	0	0	0	0	0	0	0	0	0	1	1	0
	55-59	2	0	0	0	1	0	0	0	0	0	1	0	0
1969-71														
	ALL AGES ATB	8	1	2	1	0	0	0	0	0	0	4	0	0
	10-14	1	1	0	0	0	0	0	0	0	0	0	0	0
	15-19	2	0	2	0	0	0	0	0	0	0	0	0	0
	20-24	2	0	0	1	0	0	0	0	0	0	1	0	0
	25-29	1	0	0	0	0	0	0	0	0	0	1	0	0
	30-34	1	0	0	0	0	0	0	0	0	0	1	0	0
	35-39	1	0	0	0	0	0	0	0	0	0	1	0	0
1972-74														
	ALL AGES ATB	14	6	2	0	2	2	0	0	0	1	1	0	0
	5-9	1	0	0	0	1	0	0	0	0	0	0	0	0
	15-19	3	2	0	0	0	1	0	0	0	0	0	0	0
	20-24	1	0	0	0	1	0	0	0	0	0	0	0	0
	30-34	2	1	0	0	0	0	0	0	0	1	0	0	0
	35-39	4	1	1	0	0	1	0	0	0	0	1	0	0
	40-44	1	0	1	0	0	0	0	0	0	0	0	0	0
	45-49	2	2	0	0	0	0	0	0	0	0	0	0	0
1975-78														
	ALL AGES ATB	18	5	6	0	1	2	2	0	0	2	0	0	0
	5-9	1	1	0	0	0	0	0	0	0	0	0	0	0
	10-14	1	1	0	0	0	0	0	0	0	0	0	0	0
	15-19	2	1	1	0	0	0	0	0	0	0	0	0	0
	20-24	1	1	0	0	0	0	0	0	0	0	0	0	0
	25-29	1	0	1	0	0	0	0	0	0	0	0	0	0
	30-34	3	0	2	0	0	1	0	0	0	0	0	0	0
	35-39	3	0	1	0	1	0	1	0	0	0	0	0	0
	40-44	3	1	1	0	0	1	0	0	0	0	0	0	0
	45-49	3	0	0	0	0	0	1	0	0	2	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 5-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM SELECTED TUMORS COMMON TO BOTH SERIES

TABLE 5-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD										
			0-9				10-99				100+		
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES		
TOTAL 1950-78													
ALL AGES ATB	2686	866	613	176	116	283	245	77	55	95	75	54	29
0-4	10	3	4	0	0	0	1	0	1	1	0	0	0
5-9	17	4	5	0	2	0	0	0	0	1	2	1	2
10-14	37	10	6	3	3	1	3	1	2	1	2	3	2
15-19	59	11	12	6	6	3	3	2	1	1	4	3	5
20-24	66	10	21	1	12	0	13	0	2	1	2	1	3
25-29	96	17	25	2	5	4	12	3	4	3	13	5	3
30-34	163	43	51	11	9	12	20	3	3	1	6	5	1
35-39	298	90	75	18	8	26	30	11	11	11	10	5	3
40-44	413	133	89	28	19	40	42	12	8	19	12	9	2
45-49	541	161	98	53	23	82	37	20	5	25	7	7	3
50-54	419	150	89	25	19	52	36	11	5	17	6	5	2
55-59	318	125	75	18	6	30	26	10	6	10	3	6	1
60-64	155	54	40	8	4	19	15	3	3	4	4	1	0
65-69	69	30	13	3	0	11	5	1	3	0	1	1	1
70-74	19	3	11	0	0	1	1	0	1	0	1	0	1
75-79	3	1	1	0	0	0	1	0	0	0	0	0	0
80-84	1	1	0	0	0	0	0	0	0	0	0	0	0
1950-53													
ALL AGES ATB	160	66	31	7	1	20	7	6	4	6	4	5	3
30-34	6	1	3	0	0	0	1	0	0	0	0	0	1
35-39	10	1	3	1	0	1	0	1	0	1	2	0	0
40-44	9	4	2	0	0	1	0	0	1	1	0	0	0
45-49	28	7	7	3	0	5	3	1	0	2	0	0	0
50-54	22	11	2	1	0	2	1	2	0	0	2	1	0
55-59	33	16	4	1	1	3	1	1	2	1	0	3	0
60-64	26	13	6	1	0	4	1	0	0	1	0	0	0
65-69	21	12	1	0	0	4	0	1	0	0	0	1	1
70-74	4	0	3	0	0	0	0	0	0	0	0	0	1
75-79	1	1	0	0	0	0	0	0	0	0	0	0	0
1954-56													
ALL AGES ATB	215	83	45	12	9	26	15	7	7	7	2	1	1
10-14	1	1	0	0	0	0	0	0	0	0	0	0	0
15-19	1	0	1	0	0	0	0	0	0	0	0	0	0
20-24	1	0	1	0	0	0	0	0	0	0	0	0	0
25-29	2	1	1	0	0	0	0	0	0	0	0	0	0
30-34	6	0	4	1	1	0	0	0	0	0	0	0	0
35-39	7	2	2	1	0	2	0	0	0	0	0	0	0
40-44	22	9	4	0	2	2	2	0	1	1	1	0	0
45-49	41	13	7	1	2	8	4	2	0	4	0	0	0
50-54	41	16	8	3	2	4	1	3	2	1	0	0	1
55-59	44	21	6	4	1	6	3	2	1	0	0	0	0
60-64	33	14	6	1	1	3	3	0	2	1	1	1	0
65-69	11	5	3	1	0	1	1	0	0	0	0	0	0
70-74	4	1	1	0	0	0	1	0	1	0	0	0	0
75-79	1	0	1	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 3-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM SELECTED TUMORS COMMON TO BOTH SERIES

TABLE 3-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1957-59														
ALL AGES ATB	250	76	34	16	13	29	30	7	4	9	6	3	1	
5-9	2	0	1	0	0	0	0	0	0	0	0	0	1	
10-14	3	0	3	0	0	0	0	0	0	0	0	0	0	
15-19	1	0	0	1	0	0	0	0	0	0	0	0	0	
20-24	3	0	0	0	3	0	2	0	0	0	0	0	0	
25-29	3	0	0	0	0	0	2	0	0	0	1	0	0	
30-34	9	1	4	0	1	1	1	0	0	0	1	0	0	
35-39	9	1	6	0	0	0	1	0	0	1	0	0	0	
40-44	26	4	5	1	3	3	6	3	0	0	0	1	0	
45-49	53	20	5	3	3	6	5	1	2	4	3	1	0	
50-54	37	16	6	2	2	6	3	0	0	1	1	0	0	
55-59	55	23	11	3	0	7	3	1	1	3	0	1	0	
60-64	26	7	6	3	1	4	4	2	0	0	1	0	0	
65-69	15	4	3	1	0	2	2	0	1	0	0	0	0	
70-74	3	0	2	0	0	0	0	0	0	0	1	0	0	
75-79	1	0	0	0	0	0	1	0	0	0	0	0	0	
1960-62														
ALL AGES ATB	279	95	73	13	6	29	22	7	4	13	9	3	1	
0-4	1	0	0	0	0	0	0	0	0	1	0	0	0	
10-14	1	0	0	0	1	0	0	0	0	0	0	0	0	
15-19	2	0	0	0	0	0	1	0	0	0	0	1	0	
20-24	6	0	3	0	0	0	1	0	0	1	0	0	1	
25-29	10	2	1	1	1	1	0	0	0	1	3	0	0	
30-34	6	2	4	0	2	0	0	0	0	0	0	0	0	
35-39	27	8	8	1	2	1	3	2	1	0	0	1	0	
40-44	41	12	10	1	2	6	2	1	1	1	3	2	0	
45-49	55	20	14	3	0	10	2	3	0	1	0	0	0	
50-54	48	20	8	2	0	4	6	0	1	5	2	0	0	
55-59	46	19	15	2	0	2	4	1	0	2	0	1	0	
60-64	19	7	4	1	0	4	1	0	0	1	1	0	0	
65-69	7	3	1	0	0	0	2	0	1	0	0	0	0	
70-74	7	1	5	0	0	1	0	0	0	0	0	0	0	
80-84	1	1	0	0	0	0	0	0	0	0	0	0	0	
1963-65														
ALL AGES ATB	292	99	61	18	6	36	34	9	3	15	5	3	1	
10-14	1	1	0	0	0	0	0	0	0	0	0	0	0	
15-19	3	0	1	0	1	0	0	0	0	0	0	0	1	
20-24	5	2	2	0	0	0	1	0	0	0	0	0	0	
25-29	8	1	4	0	1	0	0	0	0	1	1	0	0	
30-34	17	3	4	2	1	2	4	0	0	0	1	0	0	
35-39	29	9	8	1	0	2	6	1	1	1	0	0	0	
40-44	42	17	6	2	2	2	6	0	0	5	1	1	0	
45-49	51	18	8	2	0	11	1	5	1	3	1	1	0	
50-54	63	22	14	6	1	8	7	1	0	3	0	1	0	
55-59	43	15	8	3	0	6	6	2	0	2	1	0	0	
60-64	20	6	4	1	2	3	3	0	1	0	0	0	0	
65-69	9	4	2	1	0	2	0	0	0	0	0	0	0	
70-74	1	1	0	0	0	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 3-3 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM SELECTED TUMORS COMMON TO BOTH SERIES

TABLE 5-3

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1966-68														
ALL AGES ATB	339	105	85	26	11	32	32	15	5	11	7	7	3	
5-9	3	1	0	0	1	0	0	0	0	0	0	1	0	
10-14	1	0	1	0	0	0	0	0	0	0	0	0	0	
15-19	11	2	2	2	2	0	1	1	0	0	0	0	1	
20-24	6	0	3	0	0	0	2	0	1	0	0	0	0	
25-29	14	2	5	0	0	3	1	0	1	0	1	0	1	
30-34	24	9	7	2	0	1	3	1	1	0	0	0	0	
35-39	44	14	11	1	1	4	6	2	1	2	1	1	0	
40-44	67	18	18	4	4	7	4	3	1	4	1	2	1	
45-49	66	25	10	13	1	7	5	4	0	2	0	1	0	
50-54	53	19	14	3	1	7	4	2	0	2	0	1	0	
55-59	30	9	8	1	1	2	4	1	0	1	2	1	0	
60-64	15	6	5	0	0	0	2	1	0	0	1	0	0	
65-69	3	0	1	0	0	1	0	0	0	0	1	0	0	
1969-71														
ALL AGES ATB	333	103	72	26	18	33	31	6	9	9	13	11	2	
0-4	1	1	0	0	0	0	0	0	0	0	0	0	0	
5-9	4	0	2	0	0	0	0	0	0	1	1	0	0	
10-14	5	2	0	1	0	0	0	0	0	0	1	0	0	
15-19	5	1	2	0	1	1	0	0	0	0	0	0	0	
20-24	9	3	1	0	2	0	2	0	1	0	0	0	0	
25-29	10	2	2	0	0	0	2	1	1	0	2	0	0	
30-34	16	5	3	1	0	1	3	0	0	0	1	2	0	
35-39	49	11	11	5	2	3	5	1	2	1	4	3	1	
40-44	53	24	10	3	1	6	5	1	2	0	1	0	0	
45-49	78	23	12	12	6	11	5	1	0	3	1	3	1	
50-54	72	19	17	4	3	9	8	1	2	3	2	2	0	
55-59	23	10	8	0	1	1	1	1	1	0	0	0	0	
60-64	5	0	4	0	0	0	0	0	0	1	0	0	0	
65-69	3	2	0	0	0	1	0	0	0	0	0	0	0	
1972-74														
ALL AGES ATB	354	106	90	22	22	29	31	10	8	10	11	7	8	
0-4	3	0	1	0	0	0	1	0	1	0	0	0	0	
5-9	2	1	0	0	0	0	0	0	0	0	1	0	0	
10-14	9	3	1	0	0	1	2	1	0	0	0	0	1	
15-19	14	4	2	1	2	0	1	0	0	0	1	1	2	
20-24	14	1	4	0	6	0	2	0	0	0	0	0	1	
25-29	20	4	7	0	1	0	4	0	1	0	1	2	0	
30-34	26	6	6	1	3	2	3	1	0	1	2	1	0	
35-39	51	21	14	3	0	1	3	3	3	2	1	0	0	
40-44	60	15	18	6	1	5	8	3	0	1	3	0	0	
45-49	76	27	15	7	3	11	3	1	2	3	1	1	2	
50-54	48	15	9	3	6	9	2	0	0	2	1	0	1	
55-59	26	8	9	1	0	0	2	1	1	1	0	2	1	
60-64	5	1	4	0	0	0	0	0	0	0	0	0	0	
1975-78														
ALL AGES ATB	464	133	104	36	26	49	43	10	11	15	16	12	9	
0-4	5	2	3	0	0	0	0	0	0	0	0	0	0	
5-9	6	2	2	0	1	0	0	0	0	0	0	0	1	
10-14	16	3	1	2	2	0	1	0	2	1	1	2	1	
15-19	22	4	4	2	0	4	0	1	1	1	3	1	1	
20-24	20	4	7	1	1	0	3	0	0	0	2	1	1	
25-29	29	5	5	1	2	0	3	2	1	1	4	3	2	
30-34	53	16	16	4	1	5	5	1	2	0	1	2	0	
35-39	72	23	12	5	3	12	6	1	3	3	2	0	2	
40-44	93	30	16	11	4	8	9	1	2	6	2	3	1	
45-49	91	28	20	7	8	13	9	2	0	3	1	0	0	
50-54	35	12	11	1	2	3	4	2	0	0	0	0	0	
55-59	18	4	6	1	2	3	2	0	0	0	0	0	0	
60-64	4	0	1	1	0	1	1	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 6-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF PHARYNX

TABLE 6-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	10	4	1	2	0	2	0	0	0	0	0	1	0
	20-24	1	1	0	0	0	0	0	0	0	0	0	0	0
	30-34	2	1	0	1	0	0	0	0	0	0	0	0	0
	35-39	1	1	0	0	0	0	0	0	0	0	0	0	0
	40-44	1	0	0	0	0	1	0	0	0	0	0	0	0
	45-49	2	1	1	0	0	0	0	0	0	0	0	0	0
	50-54	2	0	0	1	0	0	0	0	0	0	0	1	0
	65-69	1	0	0	0	0	1	0	0	0	0	0	0	0
1963-65														
	ALL AGES ATB	2	1	0	0	0	1	0	0	0	0	0	0	0
	45-49	1	1	0	0	0	0	0	0	0	0	0	0	0
	65-69	1	0	0	0	0	1	0	0	0	0	0	0	0
1966-68														
	ALL AGES ATB	1	0	1	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
1969-71														
	ALL AGES ATB	3	0	0	2	0	0	0	0	0	0	0	1	0
	30-34	1	0	0	1	0	0	0	0	0	0	0	0	0
	50-54	2	0	0	1	0	0	0	0	0	0	0	1	0
1972-74														
	ALL AGES ATB	1	1	0	0	0	0	0	0	0	0	0	0	0
	35-39	1	1	0	0	0	0	0	0	0	0	0	0	0
1975-78														
	ALL AGES ATB	3	2	0	0	0	1	0	0	0	0	0	0	0
	20-24	1	1	0	0	0	0	0	0	0	0	0	0	0
	30-34	1	1	0	0	0	0	0	0	0	0	0	0	0
	40-44	1	0	0	0	0	1	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 7-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF ESOPHAGUS

TABLE 7-1

EAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
ALL AGES ATB	156	64	14	13	3	28	7	8	3	9	4	3	0	
10-14	2	0	0	0	0	1	0	0	0	0	0	1	0	
20-24	3	1	1	0	1	0	0	0	0	0	0	0	0	
25-29	3	1	0	0	0	0	0	0	1	0	0	1	0	
30-34	10	3	2	1	0	1	1	1	1	0	0	0	0	
35-39	14	4	2	0	0	3	1	1	0	1	1	1	0	
40-44	18	13	0	0	0	3	0	1	0	0	1	0	0	
45-49	36	12	3	5	0	9	2	2	0	3	0	0	0	
50-54	30	8	4	4	2	5	1	2	0	2	2	0	0	
55-59	25	14	1	3	0	2	1	1	1	2	0	0	0	
60-64	8	3	1	0	0	2	1	0	0	1	0	0	0	
65-69	6	4	0	0	0	2	0	0	0	0	0	0	0	
70-74	1	1	0	0	0	0	0	0	0	0	0	0	0	
1950-53														
ALL AGES ATB	16	7	2	1	0	3	0	1	0	1	1	0	0	
30-34	1	0	1	0	0	0	0	0	0	0	0	0	0	
45-49	1	0	0	0	0	0	0	0	0	1	0	0	0	
50-54	3	0	1	0	0	0	0	1	0	0	1	0	0	
55-59	3	2	0	1	0	0	0	0	0	0	0	0	0	
60-64	5	3	0	0	0	2	0	0	0	0	0	0	0	
65-69	3	2	0	0	0	1	0	0	0	0	0	0	0	
1954-56														
ALL AGES ATB	11	6	0	1	0	1	0	1	1	1	0	0	0	
40-44	2	2	0	0	0	0	0	0	0	0	0	0	0	
45-49	2	0	0	0	0	1	0	0	0	1	0	0	0	
50-54	3	1	0	1	0	0	0	1	0	0	0	0	0	
55-59	3	2	0	0	0	0	0	0	1	0	0	0	0	
70-74	1	1	0	0	0	0	0	0	0	0	0	0	0	
1957-59														
ALL AGES ATB	15	6	1	1	2	1	2	0	0	1	1	0	0	
20-24	1	0	0	0	1	0	0	0	0	0	0	0	0	
45-49	5	3	0	0	0	0	2	0	0	0	0	0	0	
50-54	3	1	0	0	1	0	0	0	0	0	1	0	0	
55-59	5	1	1	1	0	1	0	0	0	1	0	0	0	
65-69	1	1	0	0	0	0	0	0	0	0	0	0	0	
1960-62														
ALL AGES ATB	10	5	0	0	0	1	1	1	0	2	0	0	0	
35-39	1	1	0	0	0	0	0	0	0	0	0	0	0	
40-44	2	2	0	0	0	0	0	0	0	0	0	0	0	
45-49	2	1	0	0	0	0	0	1	0	0	0	0	0	
50-54	4	1	0	0	0	1	1	0	0	1	0	0	0	
60-64	1	0	0	0	0	0	0	0	0	1	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 7-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF ESOPHAGUS

TABLE 7-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9		10-99				100+					
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	
1963-65														
	ALL AGES ATB	24	12	0	3	1	4	1	1	0	2	0	0	0
	30-34	1	0	0	0	0	1	0	0	0	0	0	0	0
	35-39	1	1	0	0	0	0	0	0	0	0	0	0	0
	40-44	2	2	0	0	0	0	0	0	0	0	0	0	0
	45-49	6	3	0	0	0	1	0	1	0	1	0	0	0
	50-54	5	1	0	2	1	1	0	0	0	0	0	0	0
	55-59	7	4	0	1	0	0	1	0	0	1	0	0	0
	65-69	2	1	0	0	0	1	0	0	0	0	0	0	0
1966-68														
	ALL AGES ATB	19	9	2	2	0	3	1	2	0	0	0	0	0
	25-29	1	1	0	0	0	0	0	0	0	0	0	0	0
	30-34	3	1	0	1	0	0	0	1	0	0	0	0	0
	35-39	1	1	0	0	0	0	0	0	0	0	0	0	0
	40-44	2	1	0	0	0	1	0	0	0	0	0	0	0
	45-49	4	2	0	1	0	1	0	0	0	0	0	0	0
	50-54	4	1	2	0	0	1	0	0	0	0	0	0	0
	55-59	3	2	0	0	0	0	0	1	0	0	0	0	0
	60-64	1	0	0	0	0	0	1	0	0	0	0	0	0
1969-71														
	ALL AGES ATB	19	6	1	3	0	3	1	1	1	1	0	2	0
	10-14	1	0	0	0	0	0	0	0	0	0	0	1	0
	25-29	1	0	0	0	0	0	0	0	1	0	0	0	0
	35-39	3	1	0	0	0	0	1	0	0	0	0	1	0
	40-44	3	1	0	0	0	1	0	1	0	0	0	0	0
	45-49	7	1	1	3	0	2	0	0	0	0	0	0	0
	50-54	3	2	0	0	0	0	0	0	0	1	0	0	0
	55-59	1	1	0	0	0	0	0	0	0	0	0	0	0
1972-74														
	ALL AGES ATB	20	6	4	1	0	5	0	1	0	0	2	1	0
	10-14	1	0	0	0	0	1	0	0	0	0	0	0	0
	20-24	1	0	1	0	0	0	0	0	0	0	0	0	0
	25-29	1	0	0	0	0	0	0	0	0	0	0	1	0
	35-39	5	0	2	0	0	1	0	1	0	0	1	0	0
	40-44	3	2	0	0	0	0	0	0	0	0	1	0	0
	45-49	3	2	0	1	0	2	0	0	0	0	0	0	0
	50-54	1	0	0	0	0	1	0	0	0	0	0	0	0
	55-59	2	2	0	0	0	0	0	0	0	0	0	0	0
	60-64	1	0	1	0	0	0	0	0	0	0	0	0	0
1975-78														
	ALL AGES ATB	22	7	4	1	0	7	1	0	1	1	0	0	0
	20-24	1	1	0	0	0	0	0	0	0	0	0	0	0
	30-34	5	2	1	0	0	0	1	0	1	0	0	0	0
	35-39	3	0	0	0	0	2	0	0	0	1	0	0	0
	40-44	4	3	0	0	0	1	0	0	0	0	0	0	0
	45-49	4	0	2	0	0	2	0	0	0	0	0	0	0
	50-54	4	1	1	1	0	1	0	0	0	0	0	0	0
	55-59	1	0	0	0	0	1	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 8-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF STOMACH

TABLE 8-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
ALL AGES ATB	1754	581	422	107	71	175	168	48	40	60	37	26	19	
0-4	8	3	3	0	0	0	1	0	1	0	0	0	0	
5-9	13	4	4	0	2	0	0	0	0	1	0	0	2	
10-14	26	9	4	3	1	0	3	1	1	0	1	1	2	
15-19	39	8	8	4	4	4	0	2	1	1	0	3	4	
20-24	41	8	9	1	8	0	10	0	1	1	1	1	1	
25-29	72	13	19	2	4	3	12	3	3	2	6	1	2	
30-34	98	28	30	8	3	8	12	0	2	0	3	3	1	
35-39	187	54	56	10	5	15	17	9	7	7	3	2	2	
40-44	260	86	53	16	16	23	32	5	7	13	4	4	1	
45-49	332	116	61	30	12	47	26	13	4	18	3	3	1	
50-54	273	100	66	16	9	31	23	7	4	8	6	2	1	
55-59	216	84	55	9	4	22	18	6	4	7	3	4	0	
60-64	117	42	31	6	3	14	11	1	2	2	4	1	0	
65-69	52	22	12	2	0	7	4	1	2	0	0	1	1	
70-74	17	2	10	0	0	1	1	0	1	0	1	0	1	
75-79	2	1	1	0	0	0	0	0	0	0	0	0	0	
80-84	1	1	0	0	0	0	0	0	0	0	0	0	0	
1950-53														
ALL AGES ATB	129	56	24	5	1	13	5	3	3	5	2	5	3	
30-34	4	1	2	0	0	0	0	0	0	0	0	0	1	
35-39	9	1	3	1	0	1	0	1	0	1	1	0	0	
40-44	8	4	1	0	0	1	0	0	1	1	0	0	0	
45-49	24	7	6	2	0	4	3	1	0	1	0	0	0	
50-54	17	10	0	1	0	2	1	1	0	0	1	1	0	
55-59	27	13	3	0	1	2	1	1	2	1	0	3	0	
60-64	18	9	5	1	0	2	0	0	0	1	0	0	0	
65-69	17	10	1	0	0	3	0	1	0	0	0	1	1	
70-74	4	0	3	0	0	0	0	0	0	0	0	0	1	
75-79	1	1	0	0	0	0	0	0	0	0	0	0	0	
1954-56														
ALL AGES ATB	173	66	34	10	9	21	13	5	5	6	2	1	1	
10-14	1	1	0	0	0	0	0	0	0	0	0	0	0	
15-19	1	0	1	0	0	0	0	0	0	0	0	0	0	
25-29	2	1	1	0	0	0	0	0	0	0	0	0	0	
30-34	4	0	2	1	1	0	0	0	0	0	0	0	0	
35-39	6	2	1	1	0	2	0	0	0	0	0	0	0	
40-44	19	7	3	0	2	2	2	0	1	1	1	0	0	
45-49	35	12	6	1	2	5	4	2	2	3	0	0	0	
50-54	36	13	7	2	2	3	1	2	2	1	0	0	1	
55-59	31	14	5	3	1	5	2	1	0	0	0	0	0	
60-64	26	11	4	1	1	3	2	0	1	1	1	1	0	
65-69	9	3	3	1	0	1	1	0	0	0	0	0	0	
70-74	2	0	0	0	0	0	1	0	1	0	0	0	0	
75-79	1	0	1	0	0	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 8-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF STOMACH

TABLE 8-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD										
			0-9				10-99				100+		
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES		
1957-59													
ALL AGES ATB	187	61	45	10	7	22	27	3	3	4	4	0	1
5-9	2	0	1	0	0	0	0	0	0	0	0	0	1
10-14	2	0	2	0	0	0	0	0	0	0	0	0	0
15-19	1	0	0	1	0	0	0	0	0	0	0	0	0
20-24	4	0	0	0	2	0	2	0	0	0	0	0	0
25-29	3	0	0	0	0	0	2	0	0	0	1	0	0
30-34	6	1	3	0	0	1	1	0	0	0	0	0	0
35-39	8	0	6	0	0	0	1	0	0	1	0	0	0
40-44	20	4	3	0	3	2	6	2	0	0	0	0	0
45-49	33	16	3	2	1	5	3	0	2	2	1	0	0
50-54	26	11	6	2	0	4	3	0	0	0	0	0	0
55-59	42	20	10	2	0	3	3	1	0	1	0	0	0
60-64	21	6	4	2	1	3	4	0	0	0	1	0	0
65-69	14	3	5	1	0	2	2	0	1	0	0	0	0
70-74	3	0	2	0	0	0	0	0	0	0	1	0	0
1960-62													
ALL AGES ATB	192	66	53	10	6	17	15	4	4	8	7	2	0
10-14	1	0	0	0	1	0	0	0	0	0	0	0	0
15-19	1	0	0	0	0	0	0	0	0	0	0	1	0
20-24	2	0	1	0	0	0	0	0	0	1	0	0	0
25-29	8	1	0	1	1	1	0	0	0	1	3	0	0
30-34	5	2	2	0	1	0	0	0	0	0	0	0	0
35-39	24	7	7	1	2	1	3	2	1	0	0	0	0
40-44	25	8	6	1	1	2	2	1	1	1	1	1	0
45-49	37	12	10	5	0	7	2	0	0	1	0	0	0
50-54	30	15	6	1	0	1	2	0	1	2	2	0	0
55-59	33	13	11	1	0	1	4	1	0	2	0	0	0
60-64	13	4	4	0	0	3	1	0	0	0	1	0	0
65-69	5	2	1	0	0	0	1	0	1	0	0	0	0
70-74	7	1	5	0	0	1	0	0	0	0	0	0	0
80-84	1	1	0	0	0	0	0	0	0	0	0	0	0
1963-65													
ALL AGES ATB	191	57	46	12	6	24	21	6	3	9	4	2	1
10-14	1	1	0	0	0	0	0	0	0	0	0	0	0
15-19	3	0	1	0	1	0	0	0	0	0	0	0	1
20-24	5	2	2	0	0	0	1	0	0	0	0	0	0
25-29	7	0	4	0	1	0	0	0	0	1	1	0	0
30-34	14	3	3	2	1	1	3	0	0	0	1	0	0
35-39	19	6	6	0	0	0	4	1	1	1	0	0	0
40-44	27	10	3	2	2	2	3	0	0	3	1	1	0
45-49	32	8	6	1	0	8	1	4	1	2	0	1	0
50-54	37	11	11	4	0	6	4	0	0	1	0	0	0
55-59	23	6	5	2	0	5	2	1	0	1	1	0	0
60-64	18	6	4	1	1	2	3	0	1	0	0	0	0
65-69	4	3	1	0	0	0	0	0	0	0	0	0	0
70-74	1	1	0	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 8-3 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF STOMACH

TABLE 8-3

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9		10-99				100+					
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	
1966-68														
	ALL AGES ATB	216	68	60	15	6	17	19	9	4	8	4	4	2
	5-9	2	1	0	0	1	0	0	0	0	0	0	0	0
	10-14	1	0	1	0	0	0	0	0	0	0	0	0	0
	15-19	8	1	2	1	2	0	0	1	0	0	0	0	1
	20-24	3	0	1	0	0	0	2	0	0	0	0	0	0
	25-29	11	1	4	0	0	2	1	0	1	0	1	0	1
	30-34	15	6	4	1	0	0	3	0	1	0	0	0	0
	35-39	28	10	10	0	0	2	1	2	1	1	0	1	0
	40-44	47	12	13	4	3	5	4	2	1	2	0	1	0
	45-49	36	13	6	6	0	3	3	2	0	2	0	1	0
	50-54	33	14	9	2	0	4	2	1	0	2	0	1	0
	55-59	18	5	5	1	0	1	3	0	0	1	2	0	0
	60-64	11	5	4	0	0	0	0	1	0	0	1	0	0
	65-69	1	0	1	0	0	0	0	0	0	0	0	0	0
1969-71														
	ALL AGES ATB	196	62	48	14	9	16	16	5	6	6	6	3	1
	0-4	1	1	0	0	0	0	0	0	0	0	0	0	0
	5-9	3	0	2	0	0	0	0	0	1	0	0	0	0
	10-14	4	2	0	1	0	0	0	0	0	1	0	0	0
	15-19	4	1	2	0	0	1	0	0	0	0	0	0	0
	20-24	7	3	0	0	2	0	1	0	1	0	0	0	0
	25-29	6	1	2	0	0	0	2	1	0	0	0	0	0
	30-34	10	3	3	0	0	0	3	0	0	0	0	1	0
	35-39	28	5	8	4	1	1	2	1	2	1	1	1	1
	40-44	33	15	6	2	0	5	3	0	1	0	1	0	0
	45-49	38	13	5	5	2	5	2	1	0	3	1	1	0
	50-54	42	10	13	2	3	4	5	1	1	1	2	0	0
	55-59	16	7	5	0	1	1	0	1	1	0	0	0	0
	60-64	2	0	2	0	0	0	0	0	0	0	0	0	0
	65-69	2	1	0	0	0	1	0	0	0	0	0	0	0
1972-74														
	ALL AGES ATB	209	67	57	12	12	15	21	3	5	6	3	4	4
	0-4	3	0	1	0	0	0	1	0	1	0	0	0	0
	5-9	1	1	0	0	0	0	0	0	0	0	0	0	0
	10-14	8	3	1	0	0	0	2	1	0	0	0	0	1
	15-19	8	3	1	1	1	0	0	0	0	0	0	1	1
	20-24	8	1	1	0	3	0	2	0	0	0	0	0	1
	25-29	15	4	4	0	1	0	4	0	1	0	0	1	0
	30-34	16	5	5	1	0	2	1	0	0	0	1	1	0
	35-39	27	12	9	1	0	0	1	1	1	2	0	0	0
	40-44	31	9	10	4	1	2	5	0	0	0	0	0	0
	45-49	44	15	9	3	3	6	2	1	1	2	1	0	1
	50-54	30	9	7	2	3	5	2	0	0	1	1	0	0
	55-59	14	4	6	0	0	0	1	0	1	1	0	1	0
	60-64	4	1	3	0	0	0	0	0	0	0	0	0	0
1975-78														
	ALL AGES ATB	261	78	55	19	15	26	29	8	7	8	5	5	6
	0-4	4	2	2	0	0	0	0	0	0	0	0	0	0
	5-9	5	2	1	0	1	0	0	0	0	0	0	0	1
	10-14	8	2	0	2	0	0	1	0	1	0	0	1	1
	15-19	13	3	1	1	0	3	0	1	1	1	0	1	1
	20-24	12	2	4	1	1	0	2	0	0	0	1	1	0
	25-29	20	5	4	1	1	0	3	0	1	0	2	0	1
	30-34	24	7	6	3	0	4	1	0	1	0	1	1	0
	35-39	38	11	6	2	2	8	5	1	1	0	1	0	1
	40-44	50	17	8	3	4	2	7	0	2	5	0	1	1
	45-49	51	20	10	5	4	4	4	2	0	2	0	0	0
	50-54	20	5	7	0	1	2	3	2	0	0	0	0	0
	55-59	12	2	5	0	1	2	2	0	0	0	0	0	0
	60-64	4	0	1	1	0	1	1	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 9-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF PANCREAS

TABLE 9-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	148	49	43	6	9	16	7	3	4	4	1	5	1
	5-9	1	0	0	0	0	0	0	0	0	0	0	1	0
	15-19	3	0	1	1	1	0	0	0	0	0	0	0	0
	20-24	4	0	4	0	0	0	0	0	0	0	0	0	0
	25-29	6	2	1	0	1	0	0	0	0	0	1	1	0
	30-34	9	2	4	0	0	2	0	1	0	0	0	0	0
	35-39	19	9	3	1	0	0	1	0	4	1	0	0	0
	40-44	26	5	9	1	2	4	1	0	0	1	0	3	0
	45-49	36	8	12	2	5	4	3	0	1	0	0	0	1
	50-54	22	13	3	0	0	3	1	1	0	1	0	0	0
	55-59	16	9	3	1	0	2	1	0	0	0	0	0	0
	60-64	5	1	2	0	0	1	0	1	0	0	0	0	0
	65-69	1	0	1	0	0	0	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	1	0	0	0	0	1	0	0	0	0	0	0	0
	55-59	1	0	0	0	0	1	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	6	2	2	0	0	2	0	0	0	0	0	0	0
	30-34	1	0	1	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	0	0	0	1	0	0	0	0	0	0	0
	55-59	2	1	0	0	0	1	0	0	0	0	0	0	0
	60-64	2	1	1	0	0	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	13	5	3	2	1	0	0	1	0	0	0	1	0
	40-44	3	0	1	1	0	0	0	0	0	0	0	1	0
	45-49	2	0	1	0	1	0	0	0	0	0	0	0	0
	50-54	3	3	0	0	0	0	0	0	0	0	0	0	0
	55-59	3	2	0	1	0	0	0	0	0	0	0	0	0
	60-64	2	0	1	0	0	0	0	1	0	0	0	0	0
1960-62														
	ALL AGES ATB	18	4	7	0	1	5	0	0	0	0	0	1	0
	20-24	2	0	2	0	0	0	0	0	0	0	0	0	0
	30-34	1	0	1	0	0	0	0	0	0	0	0	0	0
	40-44	5	1	1	0	1	1	0	0	0	0	0	1	0
	45-49	5	1	2	0	0	2	0	0	0	0	0	0	0
	50-54	3	2	0	0	0	1	0	0	0	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
	60-64	1	0	0	0	0	1	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 9-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF PANCREAS

TABLE 9-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1963-65														
ALL AGES ATB	22	12	6	1	0	0	1	1	0	1	0	0	0	
25-29	1	1	0	0	0	0	0	0	0	0	0	0	0	
35-39	1	0	1	0	0	0	0	0	0	0	0	0	0	
40-44	2	1	1	0	0	0	0	0	0	0	0	0	0	
45-49	4	2	1	1	0	0	0	0	0	0	0	0	0	
50-54	6	5	1	0	0	0	0	1	0	1	0	0	0	
55-59	5	3	1	0	0	0	0	1	0	0	0	0	0	
65-69	1	0	1	0	0	0	0	0	0	0	0	0	0	
1966-68														
ALL AGES ATB	12	3	3	1	1	0	1	0	0	1	0	2	0	
5-9	1	0	0	0	0	0	0	0	0	0	0	1	0	
15-19	1	0	0	1	0	0	0	0	0	0	0	0	0	
20-24	1	0	1	0	0	0	0	0	0	0	0	0	0	
35-39	1	1	0	0	0	0	0	0	0	0	0	0	0	
40-44	3	0	0	0	1	0	0	0	0	1	0	1	0	
45-49	3	1	2	0	0	0	0	0	0	0	0	0	0	
50-54	1	0	0	0	0	0	1	0	0	0	0	0	0	
55-59	1	1	0	0	0	0	0	0	0	0	0	0	0	
1969-71														
ALL AGES ATB	22	6	6	1	2	2	1	0	0	0	1	0	1	
25-29	2	1	0	0	0	0	0	0	0	0	1	0	0	
30-34	2	1	0	0	0	1	0	0	0	0	0	0	0	
35-39	4	2	2	0	0	0	0	0	0	0	0	0	0	
40-44	4	1	2	0	0	0	1	0	0	0	0	0	0	
45-49	6	2	2	1	2	0	0	0	0	0	0	0	1	
50-54	2	1	0	0	0	1	0	0	0	0	0	0	0	
1972-74														
ALL AGES ATB	20	6	7	0	1	2	1	0	2	1	0	0	0	
15-19	1	0	0	0	1	0	0	0	0	0	0	0	0	
25-29	1	0	1	0	0	0	0	0	0	0	0	0	0	
35-39	4	2	0	0	0	0	0	2	0	0	0	0	0	
40-44	3	0	2	0	0	1	0	0	0	0	0	0	0	
45-49	3	2	1	0	0	0	1	0	0	1	0	0	0	
50-54	4	1	2	0	0	1	0	0	0	0	0	0	0	
55-59	2	1	1	0	0	0	0	0	0	0	0	0	0	
1975-76														
ALL AGES ATB	34	9	9	1	3	4	3	1	2	1	0	1	0	
15-19	1	0	1	0	0	0	0	0	0	0	0	0	0	
20-24	1	0	1	0	0	0	0	0	0	0	0	0	0	
25-29	2	0	0	0	1	0	0	0	0	0	0	1	0	
30-34	5	1	2	0	0	1	0	1	0	0	0	0	0	
35-39	9	4	0	1	0	0	1	0	2	1	0	0	0	
40-44	6	2	2	0	0	2	0	0	0	0	0	0	0	
45-49	6	0	3	0	2	1	2	0	0	0	0	0	0	
50-54	1	1	0	0	0	0	0	0	0	0	0	0	0	
55-59	1	1	0	0	0	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 10-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF LARYNX

TABLE 10-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD										
			0-9				10-99				100+		
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES		
TOTAL 1950-78													
ALL AGES ATB	46	18	4	5	1	8	2	4	0	2	1	0	1
30-34	3	1	0	0	1	1	0	0	0	0	0	0	0
35-39	4	1	1	1	0	1	0	0	0	0	0	0	0
40-44	6	4	0	1	0	0	1	0	0	0	0	0	0
45-49	12	2	1	1	0	3	0	2	0	1	1	0	1
50-54	7	3	1	1	0	1	0	0	0	1	0	0	0
55-59	5	2	1	0	0	1	0	1	0	0	0	0	0
60-64	5	2	0	1	0	1	0	1	0	0	0	0	0
65-69	3	3	0	0	0	0	0	0	0	0	0	0	0
75-79	1	0	0	0	0	0	1	0	0	0	0	0	0
1950-53													
ALL AGES ATB	3	2	0	0	0	1	0	0	0	0	0	0	0
45-49	1	0	0	0	0	1	0	0	0	0	0	0	0
50-54	1	1	0	0	0	0	0	0	0	0	0	0	0
60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
1954-56													
ALL AGES ATB	4	3	0	0	0	1	0	0	0	0	0	0	0
50-54	1	0	0	0	0	1	0	0	0	0	0	0	0
55-59	1	1	0	0	0	0	0	0	0	0	0	0	0
65-69	2	2	0	0	0	0	0	0	0	0	0	0	0
1957-59													
ALL AGES ATB	3	0	0	0	0	0	1	2	0	1	1	0	0
45-49	3	0	0	0	0	0	0	1	0	1	1	0	0
60-64	1	0	0	0	0	0	0	1	0	0	0	0	0
75-79	1	0	0	0	0	0	1	0	0	0	0	0	0
1960-62													
ALL AGES ATB	6	2	0	2	0	0	0	1	0	1	0	0	0
45-49	1	0	0	0	0	0	0	1	0	0	0	0	0
50-54	2	0	0	1	0	0	0	0	0	1	0	0	0
55-59	1	1	0	0	0	0	0	0	0	0	0	0	0
60-64	1	0	0	1	0	0	0	0	0	0	0	0	0
65-69	1	1	0	0	0	0	0	0	0	0	0	0	0
1963-65													
ALL AGES ATB	3	0	0	0	0	2	0	1	0	0	0	0	0
55-59	2	0	0	0	0	1	0	1	0	0	0	0	0
60-64	1	0	0	0	0	1	0	0	0	0	0	0	0
1966-68													
ALL AGES ATB	8	4	1	0	0	3	0	0	0	0	0	0	0
30-34	2	1	0	0	0	1	0	0	0	0	0	0	0
35-39	1	0	0	0	0	1	0	0	0	0	0	0	0
40-44	1	1	0	0	0	0	0	0	0	0	0	0	0
45-49	2	1	0	0	0	1	0	0	0	0	0	0	0
50-54	1	0	1	0	0	0	0	0	0	0	0	0	0
60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
1969-71													
ALL AGES ATB	6	2	3	0	0	1	0	0	0	0	0	0	0
35-39	1	0	1	0	0	0	0	0	0	0	0	0	0
40-44	1	1	0	0	0	0	0	0	0	0	0	0	0
45-49	2	0	1	0	0	1	0	0	0	0	0	0	0
50-54	1	1	0	0	0	0	0	0	0	0	0	0	0
55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
1972-74													
ALL AGES ATB	9	4	0	2	1	0	1	0	0	0	0	0	1
30-34	1	0	0	0	1	0	0	0	0	0	0	0	0
35-39	2	1	0	1	0	0	0	0	0	0	0	0	0
40-44	2	1	0	0	0	0	1	0	0	0	0	0	0
45-49	3	1	0	1	0	0	0	0	0	0	0	0	1
50-54	1	1	0	0	0	0	0	0	0	0	0	0	0
1975-78													
ALL AGES ATB	2	1	0	1	0	0	0	0	0	0	0	0	0
40-44	2	1	0	1	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 11-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF LUNG AND PLEURA

TABLE 11-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9		10-99				100+					
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES FEMALES		MALES FEMALES		MALES FEMALES		MALES FEMALES		MALES FEMALES		MALES FEMALES				
TOTAL 1950-78														
ALL AGES ATB														
	0-4	467	139	85	40	25	51	45	13	6	19	19	18	7
	5-9	1	0	1	0	0	0	0	0	0	0	0	0	0
	10-14	5	1	0	0	1	0	0	1	1	0	1	0	0
	15-19	10	2	0	1	1	1	1	0	0	0	3	0	1
	20-24	8	0	3	0	1	0	1	0	1	0	1	0	1
	25-29	12	1	4	0	0	1	0	0	0	1	2	2	1
	30-34	31	7	9	1	5	0	5	1	0	1	0	2	0
	35-39	62	20	9	6	3	7	8	1	0	2	4	1	1
	40-44	86	25	21	9	1	7	3	6	1	5	5	2	1
	45-49	110	39	13	15	4	19	7	3	1	2	3	4	0
	50-54	76	24	12	3	6	11	10	1	1	5	0	2	1
	55-59	47	15	10	4	2	3	6	1	0	1	0	4	1
	60-64	12	4	2	0	1	1	3	0	0	1	0	0	0
	65-69	6	1	0	1	0	1	1	0	1	0	1	0	0
1950-53														
ALL AGES ATB														
	45-49	6	1	2	1	0	0	1	0	1	0	0	0	0
	50-54	2	0	1	1	0	0	0	0	0	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
	65-69	1	0	0	0	0	0	0	0	1	0	0	0	0
1954-56														
ALL AGES ATB														
	35-39	12	5	2	1	0	1	2	1	0	0	0	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
	55-59	3	1	1	0	0	1	0	0	0	0	0	0	0
	60-64	5	2	0	1	0	0	1	1	0	0	0	0	0
	65-69	3	2	0	0	0	0	1	0	0	0	0	0	0
1957-59														
ALL AGES ATB														
	30-34	18	1	2	1	1	6	0	1	0	3	1	2	0
	35-39	2	0	1	0	1	0	0	0	0	0	0	0	0
	40-44	1	1	0	0	0	0	0	0	0	0	0	0	0
	45-49	3	0	1	0	0	1	0	1	0	0	0	0	0
	50-54	5	0	0	1	0	1	0	0	0	1	1	1	0
	55-59	3	0	0	0	0	2	0	0	0	1	0	0	0
	60-64	3	0	0	0	0	1	0	0	0	1	0	1	0
	65-69	1	0	0	0	0	1	0	0	0	0	0	0	0
1960-62														
ALL AGES ATB														
	25-29	41	16	9	1	1	4	4	1	0	1	2	2	0
	30-34	1	1	0	0	0	0	0	0	0	0	0	0	0
	35-39	2	0	1	0	1	0	0	0	0	0	0	0	0
	40-44	2	0	1	0	0	0	0	0	0	0	0	1	0
	45-49	6	1	2	0	0	1	0	0	0	2	0	0	0
	50-54	8	5	1	0	0	1	0	1	0	0	0	0	0
	55-59	8	2	1	0	0	1	3	0	0	1	0	0	0
	60-64	11	5	3	1	0	1	0	0	0	0	0	1	0
	65-69	2	2	0	0	0	0	0	0	0	0	0	0	0
	65-69	1	0	0	0	0	0	1	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 11-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF LUNG AND PLEURA

TABLE 11-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1963-65														
ALL AGES ATB	41	15	6	2	1	5	7	0	0	3	1	1	0	
30-34	1	0	0	0	0	0	1	0	0	0	0	0	0	
35-39	8	2	1	1	0	2	2	0	0	0	0	0	0	
40-44	7	4	1	0	0	0	0	0	0	2	0	0	0	
45-49	7	3	1	0	0	2	0	0	0	0	1	0	0	
50-54	11	4	2	0	0	1	2	0	0	1	0	1	0	
55-59	5	2	1	0	0	0	2	0	0	0	0	0	0	
60-64	1	0	0	0	1	0	0	0	0	0	0	0	0	
65-69	1	0	0	1	0	0	0	0	0	0	0	0	0	
1966-68														
ALL AGES ATB	74	21	14	8	4	9	7	4	1	2	2	1	1	
15-19	2	1	0	0	0	0	1	0	0	0	0	0	0	
20-24	2	0	1	0	0	0	0	0	1	0	0	0	0	
25-29	2	0	1	0	0	1	0	0	0	0	0	0	0	
30-34	3	1	2	0	0	0	0	0	0	0	0	0	0	
35-39	9	2	0	1	1	1	2	0	0	1	1	0	0	
40-44	13	4	5	0	0	1	0	1	0	1	0	0	1	
45-49	20	8	0	6	1	2	1	2	0	0	0	0	0	
50-54	12	4	2	1	1	2	1	1	0	0	0	0	0	
55-59	7	1	2	0	1	1	1	0	0	0	0	1	0	
60-64	2	0	1	0	0	0	1	0	0	0	0	0	0	
65-69	2	0	0	0	0	1	0	0	0	0	1	0	0	
1969-71														
ALL AGES ATB	75	25	9	5	6	9	10	0	2	2	3	4	0	
15-19	1	0	0	0	1	0	0	0	0	0	0	0	0	
25-29	1	0	0	0	0	0	0	0	0	0	1	0	0	
30-34	2	1	0	0	0	0	0	0	0	0	0	1	0	
35-39	11	3	0	1	1	2	2	0	0	0	2	0	0	
40-44	11	6	2	0	1	0	1	0	1	0	0	0	0	
45-49	20	7	1	3	1	3	3	0	0	0	0	2	0	
50-54	21	3	3	1	2	4	3	0	1	1	0	1	0	
55-59	5	2	2	0	0	0	1	0	0	0	0	0	0	
60-64	2	0	1	0	0	0	0	0	0	1	0	0	0	
65-69	1	1	0	0	0	0	0	0	0	0	0	0	0	
1972-74														
ALL AGES ATB	76	22	14	7	5	6	6	5	1	3	2	2	3	
15-19	2	1	0	0	0	0	0	0	0	0	0	0	1	
20-24	1	0	0	0	1	0	0	0	0	0	0	0	0	
25-29	3	0	2	0	0	0	0	0	0	0	1	0	0	
30-34	7	1	0	0	2	0	2	1	0	1	0	0	0	
35-39	11	5	2	1	0	0	2	1	0	0	0	0	0	
40-44	17	3	4	2	0	2	1	3	0	1	1	0	0	
45-49	19	7	5	2	0	3	0	0	1	0	0	1	0	
50-54	10	4	0	1	2	1	0	0	0	1	0	0	1	
55-59	6	1	1	1	0	0	1	0	0	0	0	1	1	
1975-78														
ALL AGES ATB	124	33	27	14	7	11	8	1	1	5	8	6	3	
0-4	1	0	1	0	0	0	0	0	0	0	0	0	0	
5-9	1	0	1	0	0	0	0	0	0	0	0	0	0	
10-14	5	1	0	0	1	0	0	0	1	1	0	1	0	
15-19	5	0	0	1	0	1	0	0	0	0	3	0	0	
20-24	5	0	2	0	0	0	1	0	0	0	1	0	1	
25-29	5	0	1	0	0	0	0	0	0	1	0	2	1	
30-34	14	4	5	1	1	0	2	0	0	0	0	1	0	
35-39	19	7	4	2	1	2	0	0	0	1	1	0	1	
40-44	29	7	6	7	0	2	1	1	0	1	2	2	0	
45-49	26	8	3	2	2	6	3	0	0	1	1	0	0	
50-54	10	5	3	0	1	0	1	0	0	0	0	0	0	
55-59	4	1	1	1	1	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 12-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF OVARIES

TABLE 12-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD										
			0-9		10-99				100+				
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI
	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	
TOTAL 1950-78													
ALL AGES ATB	64	0	31	0	7	0	13	0	1	0	11	0	1
5-9	2	0	0	0	0	0	0	0	0	0	2	0	0
10-14	3	0	1	0	1	0	0	0	0	0	1	0	0
15-19	3	0	2	0	0	0	2	0	0	0	1	0	0
20-24	9	0	4	0	2	0	2	0	0	0	0	0	1
25-29	3	0	1	0	0	0	0	0	0	0	2	0	0
30-34	9	0	5	0	0	0	2	0	0	0	2	0	0
35-39	6	0	2	0	0	0	3	0	0	0	1	0	0
40-44	10	0	5	0	0	0	3	0	0	0	2	0	0
45-49	0	0	5	0	2	0	1	0	0	0	0	0	0
50-54	4	0	2	0	2	0	0	0	0	0	0	0	0
55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
60-64	4	0	3	0	0	0	0	0	1	0	0	0	0
1950-53													
ALL AGES ATB	4	0	2	0	0	0	1	0	0	0	1	0	0
30-34	1	0	0	0	0	0	1	0	0	0	0	0	0
35-39	1	0	0	0	0	0	0	0	0	0	1	0	0
40-44	1	0	1	0	0	0	0	0	0	0	0	0	0
60-64	1	0	1	0	0	0	0	0	0	0	0	0	0
1954-56													
ALL AGES ATB	6	0	5	0	0	0	0	0	1	0	0	0	0
20-24	1	0	1	0	0	0	0	0	0	0	0	0	0
30-34	1	0	1	0	0	0	0	0	0	0	0	0	0
40-44	1	0	1	0	0	0	0	0	0	0	0	0	0
50-54	1	0	1	0	0	0	0	0	0	0	0	0	0
60-64	2	0	1	0	0	0	0	0	1	0	0	0	0
1957-59													
ALL AGES ATB	4	0	2	0	2	0	0	0	0	0	0	0	0
45-49	2	0	1	0	1	0	0	0	0	0	0	0	0
50-54	1	0	0	0	1	0	0	0	0	0	0	0	0
60-64	1	0	1	0	0	0	0	0	0	0	0	0	0
1960-62													
ALL AGES ATB	7	0	4	0	0	0	2	0	0	0	0	0	1
15-19	1	0	0	0	0	0	1	0	0	0	0	0	0
20-24	2	0	0	0	0	0	1	0	0	0	0	0	1
25-29	1	0	1	0	0	0	0	0	0	0	0	0	0
40-44	1	0	1	0	0	0	0	0	0	0	0	0	0
45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
50-54	1	0	1	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 12-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF OVARIES

TABLE 12-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1963-65														
ALL AGES ATB	5	0	2	0	0	0	3	0	0	0	0	0	0	
30-34	1	0	1	0	0	0	0	0	0	0	0	0	0	
40-44	4	0	1	0	0	0	3	0	0	0	0	0	0	
1966-68														
ALL AGES ATB	8	0	3	0	0	0	4	0	0	0	1	0	0	
30-34	1	0	1	0	0	0	0	0	0	0	0	0	0	
35-39	3	0	0	0	0	0	3	0	0	0	0	0	0	
40-44	1	0	0	0	0	0	0	0	0	0	1	0	0	
45-49	2	0	1	0	0	0	1	0	0	0	0	0	0	
55-59	1	0	1	0	0	0	0	0	0	0	0	0	0	
1969-71														
ALL AGES ATB	6	0	2	0	1	0	1	0	0	0	2	0	0	
5-9	1	0	0	0	0	0	0	0	0	0	1	0	0	
20-24	2	0	1	0	0	0	1	0	0	0	0	0	0	
30-34	1	0	0	0	0	0	0	0	0	0	1	0	0	
45-49	2	0	1	0	1	0	0	0	0	0	0	0	0	
1972-74														
ALL AGES ATB	12	0	4	0	3	0	1	0	0	0	4	0	0	
5-9	1	0	0	0	0	0	0	0	0	0	1	0	0	
15-19	2	0	0	0	0	0	1	0	0	0	1	0	0	
20-24	4	0	2	0	2	0	0	0	0	0	0	0	0	
30-34	1	0	0	0	0	0	0	0	0	0	1	0	0	
35-39	1	0	1	0	0	0	0	0	0	0	0	0	0	
40-44	2	0	1	0	0	0	0	0	0	0	1	0	0	
50-54	1	0	0	0	1	0	0	0	0	0	0	0	0	
1975-78														
ALL AGES ATB	12	0	7	0	1	0	1	0	0	0	3	0	0	
10-14	3	0	1	0	1	0	0	0	0	0	1	0	0	
15-19	2	0	2	0	0	0	0	0	0	0	0	0	0	
25-29	2	0	0	0	0	0	0	0	0	0	2	0	0	
30-34	3	0	2	0	0	0	1	0	0	0	0	0	0	
35-39	1	0	1	0	0	0	0	0	0	0	0	0	0	
45-49	1	0	1	0	0	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 13-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF SKIN

TABLE 13-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9		10-99				100+					
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES		
TOTAL 1950-78														
	ALL AGES ATB	26	7	12	0	0	1	2	1	1	0	2	0	0
	10-14	1	0	1	0	0	0	0	0	0	0	0	0	0
	30-34	2	0	1	0	0	0	0	0	0	1	0	0	0
	35-39	4	1	2	0	0	0	0	0	0	1	0	0	0
	40-44	3	0	1	0	0	1	1	0	0	0	0	0	0
	45-49	3	2	1	0	0	0	0	0	0	0	0	0	0
	50-54	3	2	0	0	0	1	0	0	0	0	0	0	0
	55-59	7	1	4	0	0	0	1	1	0	0	0	0	0
	60-64	2	1	1	0	0	0	0	0	0	0	0	0	0
	70-74	1	0	1	0	0	0	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	1	0	1	0	0	0	0	0	0	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	3	1	2	0	0	0	0	0	0	0	0	0	0
	55-59	2	1	1	0	0	0	0	0	0	0	0	0	0
	70-74	1	0	1	0	0	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	4	1	1	0	0	0	0	1	0	1	0	0	0
	10-14	1	0	1	0	0	0	0	0	0	0	0	0	0
	30-34	1	0	0	0	0	0	0	0	0	1	0	0	0
	50-54	1	1	0	0	0	0	0	0	0	0	0	0	0
	55-59	1	0	0	0	0	0	0	1	0	0	0	0	0
1960-62														
	ALL AGES ATB	3	2	0	0	0	1	0	0	0	0	0	0	0
	40-44	1	0	0	0	0	1	0	0	0	0	0	0	0
	45-49	1	1	0	0	0	0	0	0	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
1963-65														
	ALL AGES ATB	4	2	1	0	0	0	1	0	0	0	0	0	0
	45-49	1	1	0	0	0	0	0	0	0	0	0	0	0
	50-54	2	1	0	0	0	0	1	0	0	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
1966-68														
	ALL AGES ATB	1	0	1	0	0	0	0	0	0	0	0	0	0
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	0
1969-71														
	ALL AGES ATB	3	0	2	0	0	0	0	0	0	1	0	0	0
	35-39	1	0	0	0	0	0	0	0	0	1	0	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
	60-64	1	0	1	0	0	0	0	0	0	0	0	0	0
1972-74														
	ALL AGES ATB	4	0	3	0	0	0	1	0	0	0	0	0	0
	30-34	1	0	1	0	0	0	0	0	0	0	0	0	0
	40-44	1	0	1	0	0	0	0	0	0	0	0	0	0
	55-59	2	0	1	0	0	0	1	0	0	0	0	0	0
1975-78														
	ALL AGES ATB	3	1	1	0	0	0	1	0	0	0	0	0	0
	35-39	2	1	1	0	0	0	0	0	0	0	0	0	0
	40-44	1	0	0	0	0	0	1	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 14-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF BONES (EXCLUDING JAW AND NOSE) TABLE 14-1

YEAR	AGE ATB	TOTAL	7-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-76														
	ALL AGES ATB	15	4	3	3	0	2	1	0	0	1	0	1	0
	0-4	1	0	0	0	0	0	0	0	0	1	0	0	0
	15-19	2	1	1	0	0	0	0	0	0	0	0	0	0
	30-34	1	1	0	0	0	0	0	0	0	0	0	1	0
	35-39	1	0	0	0	0	0	0	0	0	0	0	0	0
	40-44	3	0	0	1	0	1	1	0	0	0	0	0	0
	45-49	2	1	1	0	0	0	0	0	0	0	0	0	0
	50-54	2	0	1	0	0	1	0	0	0	0	0	0	0
	55-59	1	0	0	1	0	0	0	0	0	0	0	0	0
	60-64	2	1	0	1	0	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	4	2	0	2	0	0	0	0	0	0	0	0	0
	45-49	1	1	0	0	0	0	0	0	0	0	0	0	0
	55-59	1	0	0	1	0	0	0	0	0	0	0	0	0
	60-64	2	1	0	1	0	0	0	0	0	0	0	0	0
1960-62														
	ALL AGES ATB	2	0	0	0	0	1	0	0	0	1	0	0	0
	0-4	1	0	0	0	0	0	0	0	0	1	0	0	0
	40-44	1	0	0	0	0	1	0	0	0	0	0	0	0
1969-71														
	ALL AGES ATB	3	0	1	1	0	0	0	0	0	0	0	1	0
	35-39	1	0	0	0	0	0	0	0	0	0	0	1	0
	40-44	1	0	0	1	0	0	0	0	0	0	0	0	0
	50-54	1	0	1	0	0	0	0	0	0	0	0	0	0
1972-74														
	ALL AGES ATB	3	0	1	0	0	1	1	0	0	0	0	0	0
	15-19	1	0	1	0	0	0	0	0	0	0	0	0	0
	40-44	1	0	0	0	0	0	1	0	0	0	0	0	0
	50-54	1	0	0	0	0	1	0	0	0	0	0	0	0
1975-76														
	ALL AGES ATB	3	2	1	0	0	0	0	0	0	0	0	0	0
	15-19	1	1	0	0	0	0	0	0	0	0	0	0	0
	30-34	1	1	0	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 15-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM MULTIPLE MYELOMA

TABLE 15-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	20	3	6	1	2	0	1	1	2	0	2	2	0
	15-19	1	1	0	0	0	0	0	0	0	0	0	0	0
	30-34	3	0	0	0	0	0	1	0	0	0	1	1	0
	35-39	4	0	0	1	2	0	0	0	0	0	0	1	0
	40-44	5	2	2	0	0	0	0	0	1	0	0	0	0
	45-49	3	0	1	0	0	0	0	1	0	0	1	0	0
	50-54	3	0	2	0	0	0	0	0	1	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	1	0	0	0	0	0	1	0	0	0	0	0	0
	30-34	1	0	0	0	0	0	1	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	1	0	0	0	1	0	0	0	0	0	0	0	0
	35-39	1	0	0	0	1	0	0	0	0	0	0	0	0
1960-62														
	ALL AGES ATB	2	0	0	0	0	0	0	0	1	0	1	0	0
	30-34	1	0	0	0	0	0	0	0	0	0	1	0	0
	50-54	1	0	0	0	0	0	0	0	1	0	0	0	0
1963-65														
	ALL AGES ATB	1	0	1	0	0	0	0	0	0	0	0	0	0
	50-54	1	0	1	0	0	0	0	0	0	0	0	0	0
1966-68														
	ALL AGES ATB	1	1	0	0	0	0	0	0	0	0	0	0	0
	40-44	1	1	0	0	0	0	0	0	0	0	0	0	0
1969-71														
	ALL AGES ATB	3	1	1	0	0	0	0	1	0	0	0	0	0
	40-44	2	1	1	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	0	0	0	0	0	1	0	0	0	0	0
1972-74														
	ALL AGES ATB	3	1	1	0	0	0	0	0	0	0	0	1	0
	15-19	1	1	0	0	0	0	0	0	0	0	0	0	0
	35-39	1	0	0	0	0	0	0	0	0	0	0	1	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
1975-78														
	ALL AGES ATB	8	0	3	1	1	0	0	0	1	0	1	1	0
	30-34	1	0	0	0	0	0	0	0	0	0	0	1	0
	35-39	2	0	0	1	1	0	0	0	0	0	0	0	0
	40-44	2	0	1	0	0	0	0	0	1	0	0	0	0
	45-49	2	0	1	0	0	0	0	0	0	0	1	0	0
	50-54	1	0	1	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 16-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM OTHER LYMPHOMAS

TABLE 16-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	85	22	15	7	9	7	9	5	3	4	1	2	1
	5-9	3	0	0	1	1	0	0	0	0	1	0	0	0
	10-14	4	2	1	0	0	0	0	0	0	0	1	0	0
	15-19	9	2	0	1	3	0	0	1	1	1	0	0	0
	20-24	5	1	1	1	0	1	1	0	0	0	0	0	0
	25-29	8	2	1	1	1	1	1	0	0	1	0	0	0
	30-34	6	0	4	0	0	0	1	0	1	0	0	0	0
	35-39	8	0	2	0	1	0	1	1	0	0	0	2	1
	40-44	12	3	1	0	2	1	3	1	1	0	0	0	0
	45-49	12	4	1	2	0	2	0	2	0	1	0	0	0
	50-54	10	3	3	1	0	1	2	0	0	0	0	0	0
	55-59	7	4	1	0	1	1	0	0	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	6	3	0	0	1	0	1	0	0	0	1	0	0
	10-14	1	0	0	0	0	0	0	0	0	0	1	0	0
	35-39	1	0	0	0	1	0	0	0	0	0	0	0	0
	40-44	1	0	0	0	0	0	1	0	0	0	0	0	0
	45-49	1	1	0	0	0	0	0	0	0	0	0	0	0
	50-54	2	2	0	0	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	4	2	1	0	0	0	0	0	1	0	0	0	0
	40-44	1	0	0	0	0	0	0	0	1	0	0	0	0
	55-59	3	2	1	0	0	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	5	2	0	0	1	0	0	1	1	0	0	0	0
	15-19	1	0	0	0	0	0	0	0	1	0	0	0	0
	40-44	2	1	0	0	1	0	0	0	0	0	0	0	0
	45-49	2	1	0	0	0	0	0	1	0	0	0	0	0
1960-62														
	ALL AGES ATB	5	1	1	0	0	1	1	0	0	1	0	0	0
	5-9	1	0	0	0	0	0	0	0	0	1	0	0	0
	20-24	1	0	0	0	0	1	0	0	0	0	0	0	0
	25-29	1	1	0	0	0	0	0	0	0	0	0	0	0
	50-54	2	0	1	0	0	0	1	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 16-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM OTHER LYMPHOMAS

TABLE 16-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1963-65														
ALL AGES ATB	6	2	1	1	1	0	0	0	0	0	0	0	1	
15-19	1	0	0	0	1	0	0	0	0	0	0	0	0	
20-24	1	0	1	0	0	0	0	0	0	0	0	0	0	
35-39	1	0	0	0	0	0	0	0	0	0	0	0	1	
45-49	1	0	0	1	0	0	0	0	0	0	0	0	0	
55-59	2	2	0	0	0	0	0	0	0	0	0	0	0	
1966-68														
ALL AGES ATB	12	4	2	1	1	3	0	1	0	0	0	0	0	
10-14	1	0	1	0	0	0	0	0	0	0	0	0	0	
15-19	1	0	0	0	1	0	0	0	0	0	0	0	0	
20-24	1	1	0	0	0	0	0	0	0	0	0	0	0	
25-29	2	1	0	0	0	1	0	0	0	0	0	0	0	
30-34	1	0	1	0	0	0	0	0	0	0	0	0	0	
45-49	1	0	0	0	0	0	0	1	0	0	0	0	0	
50-54	3	1	0	1	0	1	0	0	0	0	0	0	0	
55-59	1	0	0	0	0	1	0	0	0	0	0	0	0	
60-64	1	1	0	0	0	0	0	0	0	0	0	0	0	
1969-71														
ALL AGES ATB	12	1	4	2	0	1	0	1	1	1	0	1	0	
5-9	1	0	0	1	0	0	0	0	0	0	0	0	0	
30-34	2	0	1	0	0	0	0	1	0	0	0	0	0	
35-39	3	0	1	0	0	0	0	1	0	0	0	1	0	
45-49	4	1	0	1	0	1	0	0	0	1	0	0	0	
50-54	2	0	2	0	0	0	0	0	0	0	0	0	0	
1972-74														
ALL AGES ATB	15	2	2	0	3	1	4	0	0	2	0	1	0	
5-9	1	0	0	0	1	0	0	0	0	0	0	0	0	
15-19	1	0	0	0	0	0	0	0	0	1	0	0	0	
25-29	2	0	0	0	0	0	1	0	0	1	0	0	0	
30-34	2	0	1	0	0	0	1	0	0	0	0	0	0	
35-39	1	0	0	0	0	0	0	0	0	0	0	1	0	
40-44	4	1	1	0	1	0	1	0	0	0	0	0	0	
45-49	2	1	0	0	0	1	0	0	0	0	0	0	0	
50-54	1	0	0	0	0	0	1	0	0	0	0	0	0	
55-59	1	0	0	0	1	0	0	0	0	0	0	0	0	
1975-78														
ALL AGES ATB	20	5	4	3	2	1	3	2	0	0	0	0	0	
10-14	2	2	0	0	0	0	0	0	0	0	0	0	0	
15-19	5	2	0	1	1	0	0	1	0	0	0	0	0	
20-24	2	0	0	1	0	0	1	0	0	0	0	0	0	
25-29	3	0	1	1	1	0	0	0	0	0	0	0	0	
30-34	1	0	1	0	0	0	0	0	0	0	0	0	0	
35-39	2	0	1	0	0	0	1	0	0	0	0	0	0	
40-44	4	1	0	0	0	1	1	1	0	0	0	0	0	
45-49	1	0	1	0	0	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 17-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CENTRAL NERVOUS SYSTEM
TUMORS (SPINAL CORD AND NERVES ONLY)

TABLE 17-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	5	2	0	0	0	0	0	0	0	1	1	1	0
	0-4	1	0	0	0	0	0	0	0	0	1	0	0	0
	10-14	1	1	0	0	0	0	0	0	0	0	0	0	0
	20-24	1	0	0	0	0	0	0	0	0	1	0	0	0
	40-44	1	0	0	0	0	0	0	0	0	0	0	1	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	1	1	0	0	0	0	0	0	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
1963-65														
	ALL AGES ATB	1	0	0	0	0	0	0	0	0	0	0	1	0
	40-44	1	0	0	0	0	0	0	0	0	0	0	1	0
1969-71														
	ALL AGES ATB	1	0	0	0	0	0	0	0	0	1	0	0	0
	20-24	1	0	0	0	0	0	0	0	0	1	0	0	0
1972-74														
	ALL AGES ATB	1	1	0	0	0	0	0	0	0	0	0	0	0
	10-14	1	1	0	0	0	0	0	0	0	0	0	0	0
1975-78														
	ALL AGES ATB	1	0	0	0	0	0	0	0	0	1	0	0	0
	0-4	1	0	0	0	0	0	0	0	0	1	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 18-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM NEOPLASMS OF OTHER SITES WHICH WERE HEAVILY IRRADIATED IN THE SPONDYLITIS SERIES TABLE 18-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9		10-99				100+					
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES		
TOTAL 1950-78														
	ALL AGES ATB	436	111	123	30	24	33	56	6	14	10	14	9	6
	0-4	1	0	1	0	0	0	0	0	0	1	0	0	0
	5-9	4	1	1	0	0	0	0	0	0	1	1	0	0
	10-14	9	3	2	3	0	0	0	1	0	0	0	0	0
	15-19	21	4	3	5	1	3	0	0	1	0	2	2	2
	20-24	11	3	2	0	0	0	3	0	0	1	1	0	1
	25-29	13	3	4	0	1	1	2	0	0	0	1	1	0
	30-34	25	6	6	0	2	1	5	0	2	0	0	1	0
	35-39	52	12	16	3	2	3	8	2	1	0	3	1	1
	40-44	58	17	16	4	7	2	8	0	1	0	2	1	0
	45-49	50	11	15	5	3	4	4	1	2	1	2	1	1
	50-54	67	17	18	6	2	11	5	0	1	3	2	2	0
	55-59	57	20	13	2	3	2	9	1	4	2	1	0	0
	60-64	43	10	15	0	1	5	8	0	2	1	0	0	1
	65-69	14	2	4	1	1	0	3	1	1	0	1	0	0
	70-74	10	2	4	1	1	1	1	0	0	0	0	0	0
	75-79	1	0	1	0	0	0	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	30	7	7	3	3	0	7	2	0	0	1	0	0
	20-24	1	0	1	0	0	0	0	0	0	0	0	0	0
	25-29	1	1	0	0	0	0	0	0	0	0	0	0	0
	30-34	2	0	1	0	0	0	1	0	0	0	0	0	0
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	0
	40-44	1	0	0	0	1	0	0	0	0	0	0	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
	50-54	4	2	0	1	0	0	1	0	0	0	0	0	0
	55-59	6	3	1	0	0	0	1	1	0	0	0	0	0
	60-64	1	0	0	0	0	0	1	0	0	0	0	0	0
	65-69	7	1	0	1	1	0	2	1	0	0	1	0	0
	70-74	4	0	1	1	1	0	1	0	0	0	0	0	0
	75-79	1	0	1	0	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	49	8	21	2	2	5	6	0	3	0	0	1	1
	10-14	2	0	1	1	0	0	0	0	0	0	0	0	0
	15-19	1	0	0	0	0	0	0	0	0	0	0	1	0
	25-29	1	0	1	0	0	0	0	0	0	0	0	0	0
	30-34	2	0	1	0	1	0	0	0	0	0	0	0	0
	35-39	4	1	2	0	0	0	0	0	0	0	0	0	1
	40-44	10	5	4	0	0	0	1	0	0	0	0	0	0
	45-49	5	1	2	0	0	2	0	0	0	0	0	0	0
	50-54	7	0	2	1	0	1	2	0	1	0	0	0	0
	55-59	5	0	2	0	1	0	1	0	1	0	0	0	0
	60-64	6	1	1	0	0	1	2	0	1	0	0	0	0
	65-69	2	0	2	0	0	0	0	0	0	0	0	0	0
	70-74	4	0	3	0	0	1	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	48	16	17	2	0	4	2	1	1	0	2	2	1
	10-14	1	0	0	0	0	0	0	1	0	0	0	0	0
	15-19	1	0	0	0	0	0	0	0	0	0	0	0	1
	25-29	1	0	0	0	0	0	1	0	0	0	0	0	0
	35-39	2	1	0	0	0	0	0	0	0	0	1	0	0
	40-44	4	2	1	0	0	0	1	0	0	0	0	0	0
	45-49	4	0	3	0	0	0	0	0	0	0	1	0	0
	50-54	13	4	4	1	0	2	0	0	0	0	0	2	0
	55-59	8	4	2	1	0	0	0	0	1	0	0	0	0
	60-64	11	3	6	0	0	2	0	0	0	0	0	0	0
	65-69	1	0	1	0	0	0	0	0	0	0	0	0	0
	70-74	2	2	0	0	0	0	0	0	0	0	0	0	0
1960-62														
	ALL AGES ATB	46	15	8	5	0	3	8	0	1	2	2	2	0
	10-14	1	0	0	1	0	0	0	0	0	0	0	0	0
	15-19	4	1	2	1	0	0	0	0	0	0	0	0	0
	20-24	1	0	0	0	0	0	0	0	0	0	1	0	0
	30-34	2	0	1	0	0	0	1	0	0	0	0	0	0
	35-39	6	3	0	0	0	0	1	0	0	0	1	1	0
	40-44	3	1	1	1	0	0	0	0	0	0	0	0	0
	45-49	5	1	0	1	0	0	2	0	0	0	0	1	0
	50-54	7	2	0	1	0	2	1	0	0	1	0	0	0
	55-59	6	2	1	0	0	0	2	0	0	1	0	0	0
	60-64	8	4	2	0	0	1	1	0	0	0	0	0	0
	65-69	3	1	1	0	0	0	0	0	1	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 18-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM NEOPLASMS OF OTHER SITES WHICH WERE HEAVILY IRRADIATED IN THE SPONDYLITIS SERIES

TABLE 18-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES FEMALES		MALES FEMALES		MALES FEMALES		MALES FEMALES		MALES FEMALES		MALES FEMALES				
1963-65														
ALL AGES ATB	57	13	17	4	5	4	7	0	2	2	2	0	1	
5-9	1	0	0	0	0	0	0	0	0	0	1	0	0	
10-14	1	0	1	0	0	0	0	0	0	0	0	0	0	
15-19	3	1	1	1	0	0	0	0	0	0	0	0	0	
25-29	1	0	0	0	1	0	0	0	0	0	0	0	0	
30-34	2	0	2	0	0	0	0	0	0	0	0	0	0	
35-39	7	3	1	0	0	1	2	0	0	0	0	0	0	
40-44	4	0	1	0	2	1	0	0	0	0	0	0	0	
45-49	9	3	2	2	0	1	0	0	0	0	0	0	1	
50-54	8	1	4	0	0	2	1	0	0	0	0	0	0	
55-59	13	5	2	1	1	0	1	0	1	1	1	0	0	
60-64	6	0	3	0	1	0	2	0	1	1	0	0	0	
1966-68														
ALL AGES ATB	55	12	13	4	5	3	11	2	1	2	0	0	2	
15-19	3	1	0	2	0	0	0	0	0	0	0	0	0	
20-24	3	1	0	0	0	0	1	0	0	0	0	0	1	
25-29	1	0	1	0	0	0	0	0	0	0	0	0	0	
30-34	3	0	1	0	0	1	0	0	1	0	0	0	0	
35-39	9	0	3	0	2	0	3	1	0	0	0	0	0	
40-44	8	3	2	2	1	0	0	0	0	0	0	0	0	
45-49	9	3	2	0	2	0	1	1	0	0	0	0	0	
50-54	4	0	2	0	0	0	0	0	2	0	0	0	0	
55-59	10	4	2	0	0	1	3	0	0	0	0	0	0	
60-64	4	0	0	0	0	1	2	0	0	0	0	0	1	
65-69	1	0	0	0	0	0	1	0	0	0	0	0	0	
1969-71														
ALL AGES ATB	43	11	10	3	2	3	4	0	3	1	5	0	1	
5-9	1	0	1	0	0	0	0	0	0	0	0	0	0	
10-14	1	0	0	1	0	0	0	0	0	0	0	0	0	
15-19	1	0	0	0	0	0	0	0	0	0	0	0	1	
25-29	2	1	1	0	0	0	0	0	0	0	0	0	0	
30-34	2	0	1	0	0	0	1	0	0	0	0	0	0	
35-39	10	2	4	0	0	1	1	0	1	0	1	0	0	
40-44	7	2	1	0	1	0	2	0	0	0	1	0	0	
45-49	5	1	0	1	0	0	0	0	1	1	1	0	0	
50-54	6	2	0	1	0	1	0	0	0	0	2	0	0	
55-59	5	1	1	0	1	1	0	0	1	0	0	0	0	
60-64	3	2	1	0	0	0	0	0	0	0	0	0	0	
1972-74														
ALL AGES ATB	40	9	12	2	3	7	3	1	1	1	1	0	0	
10-14	1	1	0	0	0	0	0	0	0	0	0	0	0	
15-19	2	0	0	0	0	1	0	0	0	1	0	0	0	
20-24	2	1	0	0	0	0	1	0	0	0	0	0	0	
25-29	4	1	0	0	0	1	1	0	0	0	1	0	0	
30-34	2	1	0	0	1	0	0	0	0	0	0	0	0	
35-39	3	0	1	0	0	1	0	1	0	0	0	0	0	
40-44	9	1	4	1	1	1	1	0	0	0	0	0	0	
45-49	6	0	2	1	0	2	0	0	1	0	0	0	0	
50-54	8	4	2	0	1	1	0	0	0	0	0	0	0	
55-59	1	0	1	0	0	0	0	0	0	0	0	0	0	
60-64	2	0	2	0	0	0	0	0	0	0	0	0	0	
1975-78														
ALL AGES ATB	68	20	18	5	4	4	8	0	2	2	1	4	0	
0-4	1	0	1	0	0	0	0	0	0	0	0	0	0	
5-9	2	1	0	0	0	0	0	0	0	1	0	0	0	
10-14	2	2	0	0	0	0	0	0	0	0	0	0	0	
15-19	6	1	0	1	1	2	0	0	0	0	0	1	0	
20-24	4	1	1	0	0	0	1	0	0	1	0	0	0	
25-29	2	0	1	0	0	0	0	0	0	0	0	1	0	
30-34	10	5	1	0	0	0	2	0	1	0	0	1	0	
35-39	10	2	4	3	0	0	1	0	0	0	0	0	0	
40-44	12	3	2	0	1	0	3	0	1	0	1	1	0	
45-49	6	2	3	0	1	0	0	0	0	0	0	0	0	
50-54	10	2	4	1	1	2	0	0	0	0	0	0	0	
55-59	3	1	1	0	0	0	1	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 19-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF COLON

TABLE 19-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	157	42	48	7	6	15	13	3	4	8	7	2	2
	10-14	2	1	0	0	0	0	0	0	0	0	0	0	1
	15-19	6	1	0	0	0	0	0	1	0	2	2	0	0
	20-24	5	0	2	0	0	0	1	0	0	0	2	0	0
	25-29	5	3	0	2	0	0	0	0	0	0	0	0	0
	30-34	9	1	2	0	2	1	2	0	1	0	0	0	0
	35-39	15	1	5	2	1	1	3	0	0	2	0	0	0
	40-44	21	7	5	0	0	2	2	0	1	2	0	2	0
	45-49	33	11	12	0	1	5	1	0	0	1	2	0	0
	50-54	22	5	8	2	1	2	2	0	1	0	0	0	1
	55-59	28	7	11	0	1	2	2	2	1	1	1	0	0
	60-64	5	3	2	0	0	0	0	0	0	0	0	0	0
	65-69	4	0	1	1	0	2	0	0	0	0	0	0	0
	70-74	2	2	0	0	0	0	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	10	4	3	0	1	1	1	0	0	0	0	0	0
	30-34	1	0	1	0	0	0	0	0	0	0	0	0	0
	35-39	1	0	0	0	0	0	1	0	0	0	0	0	0
	45-49	2	0	1	0	1	0	0	0	0	0	0	0	0
	55-59	3	2	1	0	0	0	0	0	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
	65-69	1	0	0	0	0	1	0	0	0	0	0	0	0
	70-74	1	1	0	0	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	3	1	3	0	0	1	0	0	0	0	0	0	0
	45-49	2	1	1	0	0	0	0	0	0	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
	65-69	2	0	1	0	0	1	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	8	2	3	1	0	1	1	0	0	0	0	0	0
	30-34	1	0	1	0	0	0	0	0	0	0	0	0	0
	40-44	2	1	0	0	0	0	1	0	0	0	0	0	0
	45-49	1	0	0	0	0	1	0	0	0	0	0	0	0
	50-54	1	0	1	0	0	0	0	0	0	0	0	0	0
	55-59	2	1	1	0	0	0	0	0	0	0	0	0	0
	65-69	1	0	0	1	0	0	0	0	0	0	0	0	0
1960-62														
	ALL AGES ATB	8	4	0	0	0	1	2	0	0	1	0	0	0
	30-34	1	0	0	0	0	0	1	0	0	0	0	0	0
	35-39	2	0	0	0	0	0	1	0	0	1	0	0	0
	45-49	2	1	0	0	0	1	0	0	0	0	0	0	0
	50-54	1	1	0	0	0	0	0	0	0	0	0	0	0
	55-59	1	1	0	0	0	0	0	0	0	0	0	0	0
	70-74	1	1	0	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 19-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF COLON

TABLE 19-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1963-65														
ALL AGES ATB	14	4	4	0	0	1	2	1	0	0	2	0	0	
15-19	1	0	0	0	0	0	0	0	0	0	1	0	0	
20-24	1	0	0	0	0	0	0	0	0	0	1	0	0	
25-29	1	1	0	0	0	0	0	0	0	0	0	0	0	
40-44	1	1	0	0	0	0	0	0	0	0	0	0	0	
45-49	1	1	0	0	0	0	0	0	0	0	0	0	0	
50-54	2	0	1	0	0	0	1	0	0	0	0	0	0	
55-59	6	1	2	0	0	1	1	1	0	0	0	0	0	
60-64	1	0	1	0	0	0	0	0	0	0	0	0	0	
1966-68														
ALL AGES ATB	20	4	10	0	0	1	1	1	1	0	1	0	1	
10-14	1	0	0	0	0	0	0	0	0	0	0	0	1	
30-34	1	0	0	0	0	0	0	0	1	0	0	0	0	
35-39	3	1	2	0	0	0	0	0	0	0	0	0	0	
40-44	4	1	2	0	0	0	1	0	0	0	0	0	0	
45-49	7	1	5	0	0	1	0	0	0	0	0	0	0	
50-54	1	1	0	0	0	0	0	0	0	0	0	0	0	
55-59	2	0	0	0	0	0	0	1	0	0	1	0	0	
60-64	1	0	1	0	0	0	0	0	0	0	0	0	0	
1969-71														
ALL AGES ATB	25	9	8	1	1	1	2	0	0	0	2	0	1	
25-29	2	2	0	0	0	0	0	0	0	0	0	0	0	
30-34	1	0	0	0	0	0	1	0	0	0	0	0	0	
40-44	1	1	0	0	0	0	0	0	0	0	0	0	0	
45-49	7	3	2	0	0	0	0	0	0	0	2	0	0	
50-54	7	2	2	1	0	0	1	0	0	0	0	0	1	
55-59	6	0	4	0	1	1	0	0	0	0	0	0	0	
60-64	1	1	0	0	0	0	0	0	0	0	0	0	0	
1972-74														
ALL AGES ATB	27	4	6	2	3	7	1	2	1	0	0	0	0	
15-19	2	1	0	0	0	0	0	1	0	0	0	0	0	
25-29	1	0	0	1	0	0	0	0	0	0	0	0	0	
30-34	2	0	0	0	1	1	0	0	0	0	0	0	0	
35-39	4	0	1	0	1	1	1	0	0	0	0	0	0	
40-44	5	1	0	0	0	2	0	0	1	1	0	0	0	
45-49	3	0	1	0	0	2	0	0	0	0	0	0	0	
50-54	5	0	2	1	1	1	0	0	0	0	0	0	0	
55-59	4	1	2	0	0	0	0	0	1	0	0	0	0	
60-64	1	1	0	0	0	0	0	0	0	0	0	0	0	
1975-78														
ALL AGES ATB	40	10	11	3	1	1	3	0	1	6	2	2	0	
10-14	1	1	0	0	0	0	0	0	0	0	0	0	0	
15-19	3	0	0	0	0	0	0	0	0	2	1	0	0	
20-24	4	0	2	0	0	0	1	0	0	0	1	0	0	
25-29	1	0	0	1	0	0	0	0	0	0	0	0	0	
30-34	2	1	0	0	1	0	0	0	0	0	0	0	0	
35-39	5	0	2	2	0	0	0	0	0	1	0	0	0	
40-44	8	2	3	0	0	0	0	0	0	1	0	2	0	
45-49	6	4	2	0	0	0	1	0	0	1	0	0	0	
50-54	5	1	2	0	0	1	0	0	1	0	0	0	0	
55-59	3	1	0	0	0	0	1	0	0	1	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 20-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF BRAIN

TABLE 20-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	42	7	15	2	2	2	10	1	0	0	1	2	0
	0-4	1	0	0	0	0	0	0	0	0	0	0	1	0
	5-9	1	0	0	0	0	0	0	1	0	0	0	0	0
	10-14	3	2	0	0	0	0	0	0	0	0	0	0	0
	15-19	3	0	2	0	0	0	1	0	0	0	0	0	0
	20-24	4	0	0	1	1	0	1	0	0	0	1	0	0
	25-29	3	0	2	0	0	0	2	0	0	0	0	0	0
	30-34	4	0	2	0	0	0	1	0	0	0	0	1	0
	35-39	4	2	2	0	0	0	0	0	0	0	0	0	0
	40-44	4	1	1	0	0	0	2	0	0	0	0	0	0
	45-49	7	1	5	0	0	1	0	0	0	0	0	0	0
	50-54	5	1	1	0	0	0	3	0	0	0	0	0	0
	55-59	1	0	0	1	0	0	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	5	1	1	1	0	0	2	0	0	0	0	0	0
	20-24	1	0	0	0	0	0	1	0	0	0	0	0	0
	35-39	1	1	0	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
	50-54	1	0	0	0	0	0	1	0	0	0	0	0	0
	55-59	1	0	0	1	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	6	0	3	1	1	0	0	1	0	0	0	0	0
	5-9	1	0	0	0	0	0	0	1	0	0	0	0	0
	20-24	2	0	0	1	1	0	0	0	0	0	0	0	0
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
	50-54	1	0	1	0	0	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	4	0	1	0	0	1	2	0	0	0	0	0	0
	30-34	1	0	1	0	0	0	0	0	0	0	0	0	0
	40-44	1	0	0	0	0	0	1	0	0	0	0	0	0
	45-49	1	0	0	0	0	1	0	0	0	0	0	0	0
	50-54	1	0	0	0	0	0	1	0	0	0	0	0	0
1960-62														
	ALL AGES ATB	6	1	3	0	0	1	1	0	0	0	0	0	0
	25-29	3	0	1	0	0	1	1	0	0	0	0	0	0
	45-49	2	0	2	0	0	0	0	0	0	0	0	0	0
	50-54	1	1	0	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 20-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF BRAIN

TABLE 20-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1963-65														
	ALL AGES ATB	3	0	1	0	1	0	1	0	0	0	0	0	
	10-14	1	0	0	0	1	0	0	0	0	0	0	0	
	15-19	1	0	0	0	0	0	1	0	0	0	0	0	
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	
1966-68														
	ALL AGES ATB	6	1	2	0	0	0	3	0	0	0	0	0	
	10-14	1	1	0	0	0	0	0	0	0	0	0	0	
	15-19	1	0	1	0	0	0	0	0	0	0	0	0	
	30-34	1	0	0	0	0	0	1	0	0	0	0	0	
	40-44	1	0	0	0	0	0	1	0	0	0	0	0	
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	
	50-54	1	0	0	0	0	0	1	0	0	0	0	0	
1969-71														
	ALL AGES ATB	2	0	2	0	0	0	0	0	0	0	0	0	
	15-19	1	0	1	0	0	0	0	0	0	0	0	0	
	30-34	1	0	1	0	0	0	0	0	0	0	0	0	
1972-74														
	ALL AGES ATB	3	1	2	0	0	0	0	0	0	0	2	0	
	0-4	1	0	0	0	0	0	0	0	0	0	1	0	
	25-29	1	0	1	0	0	0	0	0	0	0	0	0	
	30-34	1	0	0	0	0	0	0	0	0	0	1	0	
	40-44	1	0	1	0	0	0	0	0	0	0	0	0	
	45-49	1	1	0	0	0	0	0	0	0	0	0	0	
1975-78														
	ALL AGES ATB	5	3	0	0	0	0	1	0	0	0	1	0	
	10-14	1	1	0	0	0	0	0	0	0	0	0	0	
	20-24	1	0	0	0	0	0	0	0	0	0	1	0	
	25-29	1	0	0	0	0	0	1	0	0	0	0	0	
	35-39	1	1	0	0	0	0	0	0	0	0	0	0	
	40-44	1	1	0	0	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 21-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF MOUTH AND TONSILS

TABLE 21-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD										
			0-9				10-99				100+		
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES		
TOTAL 1950-78													
	ALL AGES ATB	10	6	1	0	0	2	1	0	0	0	0	0
	25-29	2	2	0	0	0	0	0	0	0	0	0	0
	40-44	1	0	0	0	0	1	0	0	0	0	0	0
	45-49	1	1	0	0	0	0	0	0	0	0	0	0
	50-54	1	0	0	0	0	0	1	0	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0
	60-64	4	3	0	0	0	1	0	0	0	0	0	0
1954-56													
	ALL AGES ATB	2	0	1	0	0	1	0	0	0	0	0	0
	53-59	1	0	1	0	0	0	0	0	0	0	0	0
	60-64	1	0	0	0	0	1	0	0	0	0	0	0
1957-59													
	ALL AGES ATB	1	1	0	0	0	0	0	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0
1963-65													
	ALL AGES ATB	1	1	0	0	0	0	0	0	0	0	0	0
	45-49	1	1	0	0	0	0	0	0	0	0	0	0
1966-68													
	ALL AGES ATB	1	1	0	0	0	0	0	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0
1969-71													
	ALL AGES ATB	3	1	0	0	0	1	1	0	0	0	0	0
	40-44	1	0	0	0	0	1	0	0	0	0	0	0
	50-54	1	0	0	0	0	0	1	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0
1975-78													
	ALL AGES ATB	2	2	0	0	0	0	0	0	0	0	0	0
	25-29	2	2	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 22-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF TONGUE

TABLE 22-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	21	3	8	2	0	3	4	1	0	0	0	0	
	20-24	1	0	0	0	0	0	1	0	0	0	0	0	
	25-29	3	0	1	1	0	0	1	0	0	0	0	0	
	30-34	1	0	0	0	0	0	0	1	0	0	0	0	
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	
	45-49	7	1	3	0	0	1	2	0	0	0	0	0	
	50-54	4	0	2	1	0	1	0	0	0	0	0	0	
	55-59	1	1	0	0	0	0	0	0	0	0	0	0	
	60-64	1	0	1	0	0	0	0	0	0	0	0	0	
	70-74	2	1	0	0	0	1	0	0	0	0	0	0	
1950-53														
	ALL AGES ATB	1	0	1	0	0	0	0	0	0	0	0	0	
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	
1954-56														
	ALL AGES ATB	1	0	0	1	0	0	0	0	0	0	0	0	
	50-54	1	0	0	1	0	0	0	0	0	0	0	0	
1957-59														
	ALL AGES ATB	3	0	1	0	0	1	1	0	0	0	0	0	
	25-29	1	0	1	0	0	0	0	0	0	0	0	0	
	45-49	1	0	0	0	0	0	1	0	0	0	0	0	
	70-74	1	0	0	0	0	1	0	0	0	0	0	0	
1960-62														
	ALL AGES ATB	6	1	3	0	0	1	1	0	0	0	0	0	
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	
	45-49	2	1	0	0	0	0	1	0	0	0	0	0	
	50-54	2	0	1	0	0	1	0	0	0	0	0	0	
	60-64	1	0	1	0	0	0	0	0	0	0	0	0	
1963-65														
	ALL AGES ATB	2	2	0	0	0	0	0	0	0	0	0	0	
	55-59	1	1	0	0	0	0	0	0	0	0	0	0	
	70-74	1	1	0	0	0	0	0	0	0	0	0	0	
1966-68														
	ALL AGES ATB	2	0	1	0	0	0	1	0	0	0	0	0	
	30-34	1	0	0	0	0	0	1	0	0	0	0	0	
	50-54	1	0	1	0	0	0	0	0	0	0	0	0	
1969-71														
	ALL AGES ATB	3	0	1	0	0	1	1	0	0	0	0	0	
	20-24	1	0	0	0	0	0	1	0	0	0	0	0	
	45-49	2	0	1	0	0	1	0	0	0	0	0	0	
1972-74														
	ALL AGES ATB	1	0	0	1	0	0	0	0	0	0	0	0	
	25-29	1	0	0	1	0	0	0	0	0	0	0	0	
1975-78														
	ALL AGES ATB	2	0	1	0	0	0	1	0	0	0	0	0	
	25-29	1	0	0	0	0	0	1	0	0	0	0	0	
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 23-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF LIVER AND GALLBLADDER

TABLE 23-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	512	149	113	34	32	40	41	26	24	15	16	20	2
	0-4	3	1	1	0	0	0	1	0	0	0	0	0	0
	5-9	1	1	0	0	0	0	0	0	0	0	0	0	0
	10-14	11	6	0	3	0	0	0	0	1	0	1	0	0
	15-19	16	4	1	2	2	1	2	0	0	2	1	1	0
	20-24	12	3	2	0	0	0	0	0	3	2	1	1	0
	25-29	20	1	3	2	2	3	0	4	2	0	1	2	0
	30-34	36	9	9	4	2	5	2	0	0	1	1	3	0
	35-39	62	17	15	3	6	2	8	2	3	2	2	2	0
	40-44	94	18	24	6	8	5	11	5	4	2	5	6	0
	45-49	94	27	18	9	6	9	8	9	2	1	3	2	0
	50-54	64	22	15	3	3	7	4	3	4	1	0	2	0
	55-59	49	22	11	2	1	4	2	2	2	1	1	1	0
	60-64	34	12	11	0	1	4	3	0	1	1	0	0	1
	65-69	14	6	1	0	1	0	0	1	2	2	0	0	1
	70-74	1	0	1	0	0	0	0	0	0	0	0	0	0
	80-84	1	0	1	0	0	0	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	40	16	7	2	2	3	1	1	1	0	1	3	1
	35-39	4	2	1	0	1	0	0	0	0	0	0	0	0
	40-44	8	4	1	0	0	0	1	0	0	0	1	1	0
	45-49	5	1	1	1	0	1	0	0	0	0	0	1	0
	50-54	7	3	2	1	0	0	0	1	0	0	0	0	0
	55-59	10	6	0	0	1	2	0	0	0	0	0	1	0
	60-64	3	1	1	0	0	0	0	0	0	0	0	0	1
	65-69	2	1	0	0	0	0	0	0	1	0	0	0	0
	80-84	1	0	1	0	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	42	17	9	2	5	1	2	4	1	1	0	0	0
	20-24	1	0	1	0	0	0	0	0	0	0	0	0	0
	30-34	1	0	0	0	1	0	0	0	0	0	0	0	0
	35-39	2	0	1	0	0	0	0	1	0	0	0	0	0
	40-44	2	0	2	0	0	0	0	0	0	0	0	0	0
	45-49	13	6	1	1	2	0	1	1	0	1	0	0	0
	50-54	6	2	2	0	1	0	1	0	0	0	0	0	0
	55-59	9	6	0	1	0	0	0	1	1	0	0	0	0
	60-64	5	2	2	0	0	1	0	0	0	0	0	0	0
	65-69	3	1	0	0	1	0	0	1	0	0	0	0	0
1957-59														
	ALL AGES ATB	44	15	14	1	4	2	1	2	2	2	0	1	0
	30-34	1	0	0	1	0	0	0	0	0	0	0	0	0
	35-39	4	0	2	0	1	0	0	0	0	0	0	1	0
	40-44	6	3	2	0	0	0	1	0	0	0	0	0	0
	45-49	5	2	1	0	1	1	0	0	0	0	0	0	0
	50-54	8	5	1	0	1	0	0	1	0	0	0	0	0
	55-59	4	2	1	0	0	0	0	1	0	0	0	0	0
	60-64	11	2	6	0	1	1	0	0	1	0	0	0	0
	65-69	5	1	1	0	0	0	0	0	1	2	0	0	0
1960-62														
	ALL AGES ATB	51	16	10	4	3	3	8	2	0	2	0	3	0
	35-39	8	1	1	0	2	0	3	0	0	0	0	1	0
	40-44	6	2	1	0	0	0	1	0	0	1	0	1	0
	45-49	12	4	1	2	1	2	0	2	0	0	0	0	0
	50-54	10	3	3	2	0	0	1	0	0	0	0	1	0
	55-59	8	4	2	0	0	0	2	0	0	0	0	0	0
	60-64	7	2	2	0	0	1	1	0	0	1	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 23-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF LIVER AND GALLBLADDER

TABLE 23-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1963-65	ALL AGES ATB	58	16	14	5	2	5	3	4	3	1	1	3	1
	10-14	1	0	0	1	0	0	0	0	0	0	0	0	0
	15-19	1	0	0	0	0	0	1	0	0	0	0	0	0
	25-29	3	0	0	0	1	1	0	0	1	0	0	0	0
	30-34	8	0	3	2	0	1	1	0	0	0	1	0	0
	35-39	3	2	1	0	0	0	0	0	0	0	0	0	0
	40-44	6	0	1	1	1	0	0	0	1	1	0	1	0
	45-49	12	3	3	1	0	1	0	3	0	0	0	1	0
	50-54	10	4	3	0	0	1	0	1	0	0	0	1	0
	55-59	6	2	3	0	0	0	0	0	1	0	0	0	0
	60-64	4	2	0	0	0	1	1	0	0	0	0	0	0
	65-69	4	3	0	0	0	0	0	0	0	0	0	0	1
1966-68	ALL AGES ATB	49	12	11	6	3	4	4	1	4	0	3	1	0
	0-4	1	0	1	0	0	0	0	0	0	0	0	0	0
	10-14	1	1	0	0	0	0	0	0	0	0	0	0	0
	15-19	1	0	0	1	0	0	0	0	0	0	0	0	0
	20-24	2	0	1	0	0	0	0	0	0	0	1	0	0
	25-29	3	0	0	1	1	0	0	0	0	0	0	1	0
	30-34	4	3	0	0	0	1	0	0	0	0	0	0	0
	35-39	5	2	1	1	0	0	0	1	0	0	0	0	0
	40-44	14	2	3	2	2	1	1	1	2	0	0	0	0
	45-49	4	2	0	0	0	0	1	0	0	0	1	0	0
	50-54	4	0	0	0	0	2	1	0	1	0	0	0	0
	55-59	7	1	4	1	0	0	0	0	0	0	1	0	0
	60-64	2	1	0	0	0	0	1	0	0	0	0	0	0
	70-74	1	0	1	0	0	0	0	0	0	0	0	0	0
1969-71	ALL AGES ATB	58	21	11	4	2	7	4	4	2	1	1	1	0
	15-19	2	1	0	0	0	0	0	0	0	0	1	0	0
	20-24	3	1	0	0	0	0	0	0	0	1	0	1	0
	25-29	1	0	0	0	0	0	0	1	0	0	0	0	0
	30-34	8	4	1	1	0	2	0	0	0	0	0	0	0
	35-39	9	3	0	1	1	1	0	1	2	0	0	0	0
	40-44	11	2	5	0	1	2	1	2	1	0	0	0	0
	45-49	13	3	4	2	0	2	1	1	0	0	0	0	0
	50-54	6	4	0	0	1	0	1	0	0	0	0	0	0
	55-59	3	1	1	0	0	1	0	0	0	0	0	0	0
	60-64	2	2	0	0	0	0	0	0	0	0	0	0	0
1972-74	ALL AGES ATB	59	10	10	6	4	5	6	2	5	4	4	3	0
	5-9	1	1	0	0	0	0	0	0	0	0	0	0	0
	10-14	3	1	0	1	0	0	0	0	0	0	1	0	0
	15-19	4	1	0	1	1	0	0	0	0	1	0	0	0
	20-24	1	0	0	0	0	0	0	0	1	0	0	0	0
	25-29	2	1	0	0	0	0	0	1	0	0	0	0	0
	30-34	8	0	2	0	1	1	1	0	0	1	0	2	0
	35-39	6	1	2	1	0	0	1	0	0	1	0	0	0
	40-44	14	2	3	2	1	0	2	1	1	0	1	1	0
	45-49	14	2	3	1	1	2	2	0	1	0	2	0	0
	50-54	4	1	0	0	0	1	0	0	2	0	0	0	0
	55-59	2	0	0	0	0	1	0	0	0	1	0	0	0
1975-78	ALL AGES ATB	111	24	27	4	7	10	12	6	6	4	6	5	0
	0-4	2	1	0	0	0	0	1	0	0	0	0	0	0
	10-14	6	4	0	1	0	0	0	1	0	0	0	0	0
	15-19	8	2	1	0	1	1	1	0	0	1	0	1	0
	20-24	5	2	0	0	0	0	0	0	2	1	0	0	0
	25-29	11	0	3	1	0	2	0	2	1	0	1	1	0
	30-34	6	2	3	0	0	0	0	0	0	0	0	1	0
	35-39	21	6	6	0	1	1	4	0	0	1	2	0	0
	40-44	27	3	6	1	4	3	3	2	0	0	3	2	0
	45-49	16	4	4	1	1	0	3	2	1	0	0	0	0
	50-54	9	0	4	0	0	3	0	0	1	1	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 24-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF RECTUM

TABLE 24-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9		10-99				100+					
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES		
TOTAL 1950-78														
	ALL AGES ATB	157	54	33	8	9	17	16	3	5	1	4	3	0
	0-4	1	0	0	0	0	0	1	0	0	0	0	0	0
	5-9	1	1	0	0	0	0	0	0	0	0	0	0	0
	10-14	3	0	0	0	0	1	0	1	0	0	0	0	0
	15-19	4	1	2	0	0	0	0	0	0	0	0	1	0
	20-24	2	0	0	0	0	0	0	0	1	0	0	1	0
	25-29	4	2	1	0	0	0	0	0	1	0	0	0	0
	30-34	9	5	2	0	1	0	0	1	0	0	0	0	0
	35-39	21	8	6	1	1	1	2	1	0	0	1	0	0
	40-44	23	5	8	1	2	2	3	0	1	0	1	0	0
	45-49	24	7	5	1	3	4	3	1	0	0	0	0	0
	50-54	34	11	8	4	1	5	3	0	0	1	0	1	0
	55-59	16	9	2	1	1	2	1	0	0	0	0	0	0
	60-64	11	5	1	0	0	1	2	1	0	0	1	0	0
	65-69	3	0	0	0	0	1	1	0	0	0	1	0	0
	70-74	1	0	0	0	0	0	0	0	1	0	0	0	0
1950-53														
	ALL AGES ATB	12	6	2	0	0	0	0	0	0	1	2	1	0
	25-29	1	1	0	0	0	0	0	0	0	0	0	0	0
	40-44	2	1	0	0	0	0	0	0	0	0	1	0	0
	50-54	3	1	0	0	0	0	0	0	0	1	0	1	0
	55-59	2	1	1	0	0	0	0	0	0	0	0	0	0
	60-64	3	2	1	0	0	0	0	0	0	0	0	0	0
	65-69	1	0	0	0	0	0	0	0	0	0	1	0	0
1954-56														
	ALL AGES ATB	13	6	4	1	0	1	1	0	0	0	0	0	0
	25-29	1	0	1	0	0	0	0	0	0	0	0	0	0
	30-34	1	1	0	0	0	0	0	0	0	0	0	0	0
	35-39	1	1	0	0	0	0	0	0	0	0	0	0	0
	40-44	2	0	2	0	0	0	0	0	0	0	0	0	0
	45-49	3	1	1	0	0	0	1	0	0	0	0	0	0
	50-54	1	1	0	0	0	0	0	0	0	0	0	0	0
	55-59	3	1	0	1	0	1	0	0	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	13	3	1	2	0	2	4	0	1	0	0	0	0
	40-44	2	1	0	0	0	1	0	0	0	0	0	0	0
	45-49	1	0	0	0	0	0	1	0	0	0	0	0	0
	50-54	7	2	1	2	0	0	2	0	0	0	0	0	0
	60-64	2	0	0	0	0	1	1	0	0	0	0	0	0
	70-74	1	0	0	0	0	0	0	0	1	0	0	0	0
1960-62														
	ALL AGES ATB	15	7	2	0	2	2	1	1	0	0	0	0	0
	30-34	1	0	1	0	0	0	0	0	0	0	0	0	0
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	0
	45-49	1	1	0	0	0	0	0	0	0	0	0	0	0
	50-54	4	3	0	0	1	0	0	0	0	0	0	0	0
	55-59	4	2	0	0	1	1	0	0	0	0	0	0	0
	60-64	2	1	0	0	0	0	0	1	0	0	0	0	0
	65-69	2	0	0	0	0	1	1	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 24-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF RECTUM

TABLE 24-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1963-65														
ALL AGES ATB	17	3	4	1	2	2	3	0	0	0	0	0	0	
30-34	2	0	1	0	1	0	0	0	0	0	0	0	0	
35-39	2	1	0	0	0	0	1	0	0	0	0	0	0	
40-44	3	0	2	0	0	0	1	0	0	0	0	0	0	
45-49	3	0	0	0	1	2	0	0	0	0	0	0	0	
50-54	5	3	1	1	0	0	0	0	0	0	0	0	0	
55-59	2	1	0	0	0	0	1	0	0	0	0	0	0	
1966-68														
ALL AGES ATB	17	5	5	1	1	2	3	0	0	0	0	0	0	
25-29	1	1	0	0	0	0	0	0	0	0	0	0	0	
35-39	2	0	0	0	1	0	1	0	0	0	0	0	0	
40-44	2	1	0	0	0	0	1	0	0	0	0	0	0	
45-49	3	2	1	0	0	0	0	0	0	0	0	0	0	
50-54	6	0	3	1	0	2	0	0	0	0	0	0	0	
55-59	2	1	1	0	0	0	0	0	0	0	0	0	0	
60-64	1	0	0	0	0	0	1	0	0	0	0	0	0	
1969-71														
ALL AGES ATB	11	5	2	0	1	1	1	0	1	0	0	0	0	
20-24	1	0	0	0	0	0	0	0	1	0	0	0	0	
35-39	2	2	0	0	0	0	0	0	0	0	0	0	0	
40-44	1	1	0	0	0	0	0	0	0	0	0	0	0	
45-49	3	0	1	0	1	1	0	0	0	0	0	0	0	
50-54	3	1	1	0	0	0	1	0	0	0	0	0	0	
60-64	1	1	0	0	0	0	0	0	0	0	0	0	0	
1972-74														
ALL AGES ATB	29	8	8	3	2	2	1	2	0	0	1	2	0	
5-9	1	1	0	0	0	0	0	0	0	0	0	0	0	
15-19	3	0	2	0	0	0	0	0	0	0	0	1	0	
20-24	1	0	0	0	0	0	0	0	0	0	0	1	0	
30-34	1	1	0	0	0	0	0	0	0	0	0	0	0	
35-39	6	3	1	1	0	0	1	0	0	0	0	0	0	
40-44	7	1	3	1	1	1	0	0	0	0	0	0	0	
45-49	7	2	1	1	1	0	1	1	0	0	0	0	0	
50-54	2	0	1	0	0	1	0	0	0	0	0	0	0	
60-64	1	0	0	0	0	0	0	0	0	0	1	0	0	
1975-78														
ALL AGES ATB	30	9	7	0	1	5	2	2	3	0	1	0	0	
0-4	1	0	0	0	0	0	1	0	0	0	0	0	0	
10-14	3	0	0	0	0	1	0	1	1	0	0	0	0	
15-19	1	1	0	0	0	0	0	0	0	0	0	0	0	
25-29	1	0	0	0	0	0	0	0	1	0	0	0	0	
30-34	4	3	0	0	0	0	0	1	0	0	0	0	0	
35-39	7	1	4	0	0	1	0	0	0	0	1	0	0	
40-44	4	0	1	0	1	0	1	0	1	0	0	0	0	
45-49	3	1	1	0	0	1	0	0	0	0	0	0	0	
50-54	3	0	1	0	0	2	0	0	0	0	0	0	0	
55-59	3	3	0	0	0	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 25-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF BREAST

TABLE 25-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-76														
	ALL AGES ATB	128	0	61	0	12	0	23	0	9	0	14	0	7
	0-4	1	0	1	0	0	0	0	0	0	0	0	0	0
	10-14	14	0	5	0	0	0	3	0	3	0	2	0	1
	15-19	10	0	3	0	0	0	3	0	0	0	3	0	1
	20-24	11	0	6	0	1	0	1	0	1	0	1	0	1
	25-29	11	0	2	0	2	0	4	0	2	0	1	0	0
	30-34	13	0	5	0	2	0	0	0	1	0	3	0	2
	35-39	17	0	12	0	2	0	2	0	0	0	1	0	0
	40-44	18	0	9	0	3	0	5	0	0	0	1	0	0
	45-49	10	0	5	0	0	0	4	0	0	0	1	0	0
	50-54	11	0	7	0	1	0	1	0	1	0	0	0	1
	55-59	4	0	1	0	0	0	1	0	1	0	0	0	1
	60-64	4	0	2	0	0	0	1	0	0	0	1	0	0
	65-69	2	0	1	0	1	0	0	0	0	0	0	0	0
	70-74	1	0	1	0	0	0	0	0	0	0	0	0	0
	75-79	1	0	1	0	0	0	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	12	0	6	0	3	0	0	0	1	0	1	0	1
	25-29	2	0	0	0	1	0	0	0	0	0	1	0	0
	30-34	1	0	0	0	0	0	0	0	1	0	0	0	0
	35-39	3	0	2	0	1	0	0	0	0	0	0	0	0
	40-44	2	0	1	0	1	0	0	0	0	0	0	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
	50-54	2	0	1	0	0	0	0	0	0	0	0	0	1
	70-74	1	0	1	0	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	8	0	2	0	1	0	4	0	0	0	1	0	0
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	0
	40-44	1	0	0	0	0	0	1	0	0	0	0	0	0
	45-49	2	0	0	0	0	0	2	0	0	0	0	0	0
	60-64	3	0	1	0	0	0	1	0	0	0	1	0	0
	65-69	1	0	0	0	1	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	10	0	7	0	0	0	2	0	0	0	0	0	1
	30-34	1	0	1	0	0	0	0	0	0	0	0	0	0
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	0
	40-44	4	0	2	0	0	0	2	0	0	0	0	0	0
	45-49	2	0	2	0	0	0	0	0	0	0	0	0	0
	55-59	1	0	0	0	0	0	0	0	0	0	0	0	1
	75-79	1	0	1	0	0	0	0	0	0	0	0	0	0
1960-62														
	ALL AGES ATB	17	0	8	0	3	0	2	0	3	0	1	0	0
	15-19	1	0	0	0	0	0	1	0	0	0	0	0	0
	25-29	2	0	1	0	0	0	0	0	1	0	0	0	0
	30-34	1	0	0	0	1	0	0	0	0	0	0	0	0
	35-39	4	0	3	0	1	0	0	0	0	0	0	0	0
	40-44	2	0	1	0	0	0	0	0	0	0	1	0	0
	45-49	2	0	1	0	0	0	1	0	0	0	0	0	0
	50-54	4	0	2	0	1	0	0	0	1	0	0	0	0
	55-59	1	0	0	0	0	0	0	0	1	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 25-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF BREAST

TABLE 25-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9		10-99				100+					
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	
1963-65														
	ALL AGES ATB	15	0	10	0	0	0	2	0	1	0	2	0	0
	10-14	1	0	0	0	0	0	0	0	1	0	0	0	0
	25-29	1	0	0	0	0	0	1	0	0	0	0	0	0
	30-34	2	0	2	0	0	0	0	0	0	0	0	0	0
	35-39	4	0	2	0	0	0	1	0	0	0	1	0	0
	40-44	2	0	2	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	0	0	0	0	0	0	0	0	1	0	0
	50-54	2	0	2	0	0	0	0	0	0	0	0	0	0
	60-64	1	0	1	0	0	0	0	0	0	0	0	0	0
	65-69	1	0	1	0	0	0	0	0	0	0	0	0	0
1966-68														
	ALL AGES ATB	14	0	7	0	1	0	3	0	1	0	1	0	1
	10-14	1	0	0	0	0	0	1	0	0	0	0	0	0
	20-24	3	0	2	0	0	0	0	0	0	0	0	0	1
	25-29	2	0	0	0	1	0	0	0	1	0	0	0	0
	30-34	1	0	0	0	0	0	0	0	0	0	1	0	0
	35-39	2	0	1	0	0	0	1	0	0	0	0	0	0
	40-44	1	0	1	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
	50-54	3	0	2	0	0	0	1	0	0	0	0	0	0
1969-71														
	ALL AGES ATB	13	0	1	0	2	0	4	0	2	0	3	0	1
	10-14	5	0	1	0	0	0	1	0	2	0	1	0	0
	15-19	3	0	0	0	0	0	2	0	0	0	1	0	0
	30-34	2	0	0	0	0	0	0	0	0	0	1	0	1
	40-44	2	0	0	0	2	0	0	0	0	0	0	0	0
	45-49	1	0	0	0	0	0	1	0	0	0	0	0	0
1972-74														
	ALL AGES ATB	14	0	9	0	1	0	3	0	0	0	0	0	1
	10-14	3	0	2	0	0	0	0	0	0	0	0	0	1
	20-24	3	0	2	0	1	0	0	0	0	0	0	0	0
	25-29	1	0	0	0	0	0	1	0	0	0	0	0	0
	30-34	2	0	2	0	0	0	0	0	0	0	0	0	0
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	0
	40-44	2	0	1	0	0	0	1	0	0	0	0	0	0
	55-59	2	0	1	0	0	0	1	0	0	0	0	0	0
1975-78														
	ALL AGES ATB	25	0	11	0	1	0	5	0	1	0	5	0	2
	0-4	1	0	1	0	0	0	0	0	0	0	0	0	0
	10-14	4	0	2	0	0	0	1	0	0	0	1	0	0
	15-19	6	0	3	0	0	0	0	0	0	0	2	0	1
	20-24	5	0	2	0	0	0	1	0	1	0	1	0	0
	25-29	3	0	1	0	0	0	2	0	0	0	0	0	0
	30-34	3	0	0	0	1	0	0	0	0	0	1	0	1
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	0
	40-44	2	0	1	0	0	0	1	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 26-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF UTERUS

TABLE 26-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9		10-99						100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	
TOTAL 1950-76														
	ALL AGES ATB	332	0	180	0	42	0	75	0	12	0	15	0	8
	3-9	3	0	1	0	0	0	1	0	0	0	1	0	0
	10-14	5	0	1	0	4	0	0	0	0	0	0	0	0
	15-19	13	0	4	0	5	0	1	0	0	0	1	0	2
	20-24	22	0	9	0	1	0	6	0	0	0	3	0	3
	25-29	26	0	13	0	3	0	9	0	0	0	0	0	1
	30-34	38	0	25	0	5	0	6	0	2	0	0	0	0
	35-39	43	0	26	0	2	0	12	0	2	0	1	0	0
	40-44	50	0	26	0	3	0	12	0	4	0	3	0	0
	45-49	54	0	30	0	10	0	9	0	3	0	0	0	2
	50-54	29	0	20	0	1	0	6	0	0	0	2	0	0
	55-59	25	0	15	0	1	0	6	0	1	0	2	0	0
	60-64	13	0	5	0	2	0	4	0	0	0	2	0	0
	65-69	7	0	3	0	2	0	2	0	0	0	0	0	0
	70-74	2	0	1	0	0	0	1	0	0	0	0	0	0
	75-79	2	0	1	0	1	0	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	43	0	18	0	6	0	13	0	3	0	3	0	0
	25-29	2	0	0	0	0	0	2	0	0	0	0	0	0
	30-34	4	0	3	0	1	0	0	0	0	0	0	0	0
	35-39	8	0	4	0	0	0	3	0	0	0	1	0	0
	40-44	10	0	2	0	1	0	3	0	3	0	1	0	0
	45-49	7	0	3	0	3	0	1	0	0	0	0	0	0
	50-54	3	0	2	0	0	0	1	0	0	0	0	0	0
	55-59	4	0	2	0	0	0	1	0	0	0	1	0	0
	60-64	3	0	1	0	1	0	1	0	0	0	0	0	0
	70-74	1	0	0	0	0	0	1	0	0	0	0	0	0
	75-79	1	0	1	0	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	43	0	22	0	8	0	8	0	1	0	3	0	1
	15-19	1	0	1	0	0	0	0	0	0	0	0	0	0
	20-24	2	0	1	0	0	0	0	0	0	0	0	0	1
	25-29	3	0	1	0	2	0	0	0	0	0	0	0	0
	30-34	3	0	2	0	1	0	0	0	0	0	0	0	0
	35-39	3	0	2	0	0	0	1	0	0	0	0	0	0
	40-44	7	0	6	0	0	0	1	0	0	0	0	0	0
	45-49	6	0	1	0	2	0	3	0	0	0	0	0	0
	50-54	6	0	4	0	1	0	0	0	0	0	1	0	0
	55-59	4	0	1	0	0	0	2	0	1	0	0	0	0
	60-64	6	0	2	0	1	0	1	0	0	0	2	0	0
	65-69	2	0	1	0	1	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	35	0	23	0	4	0	5	0	1	0	0	0	2
	15-19	1	0	1	0	0	0	0	0	0	0	0	0	0
	25-29	1	0	1	0	0	0	0	0	0	0	0	0	0
	30-34	2	0	2	0	0	0	0	0	0	0	0	0	0
	35-39	8	0	6	0	0	0	2	0	0	0	0	0	0
	40-44	5	0	3	0	1	0	1	0	0	0	0	0	0
	45-49	10	0	4	0	1	0	2	0	1	0	0	0	2
	50-54	3	0	3	0	0	0	0	0	0	0	0	0	0
	55-59	2	0	2	0	0	0	0	0	0	0	0	0	0
	60-64	1	0	1	0	0	0	0	0	0	0	0	0	0
	65-69	1	0	0	0	1	0	0	0	0	0	0	0	0
	75-79	1	0	0	0	1	0	0	0	0	0	0	0	0
1960-62														
	ALL AGES ATB	32	0	15	0	4	0	10	0	0	0	3	0	0
	15-19	1	0	0	0	1	0	0	0	0	0	0	0	0
	20-24	1	0	0	0	0	0	0	0	0	0	1	0	0
	25-29	1	0	1	0	0	0	0	0	0	0	0	0	0
	30-34	4	0	3	0	0	0	1	0	0	0	0	0	0
	35-39	2	0	0	0	0	0	2	0	0	0	0	0	0
	40-44	6	0	1	0	2	0	2	0	0	0	1	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
	50-54	6	0	4	0	0	0	2	0	0	0	0	0	0
	55-59	7	0	3	0	1	0	2	0	0	0	1	0	0
	60-64	1	0	1	0	0	0	0	0	0	0	0	0	0
	65-69	2	0	1	0	0	0	1	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 26-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF UTERUS

TABLE 26-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1963-65	ALL AGES ATB	22	0	10	0	2	0	8	0	2	0	0	0	0
	20-24	1	0	0	0	1	0	0	0	0	0	0	0	0
	25-29	3	0	1	0	0	0	2	0	0	0	0	0	0
	30-34	3	0	1	0	1	0	1	0	0	0	0	0	0
	35-39	7	0	4	0	0	0	1	0	2	0	0	0	0
	40-44	2	0	1	0	0	0	1	0	0	0	0	0	0
	45-49	2	0	1	0	0	0	1	0	0	0	0	0	0
	50-54	1	0	0	0	0	0	1	0	0	0	0	0	0
	55-59	2	0	1	0	0	0	1	0	0	0	0	0	0
	70-74	1	0	1	0	0	0	0	0	0	0	0	0	0
1966-68	ALL AGES ATB	38	0	24	0	3	0	9	0	2	0	0	0	0
	10-14	1	0	0	0	1	0	0	0	0	0	0	0	0
	15-19	1	0	0	0	0	0	1	0	0	0	0	0	0
	20-24	1	0	0	0	0	0	1	0	0	0	0	0	0
	25-29	4	0	2	0	1	0	1	0	0	0	0	0	0
	30-34	8	0	3	0	1	0	3	0	1	0	0	0	0
	35-39	3	0	2	0	0	0	1	0	0	0	0	0	0
	40-44	7	0	6	0	0	0	1	0	0	0	0	0	0
	45-49	7	0	5	0	0	0	1	0	1	0	0	0	0
	50-54	2	0	2	0	0	0	0	0	0	0	0	0	0
	55-59	3	0	3	0	0	0	0	0	0	0	0	0	0
	65-69	1	0	1	0	0	0	0	0	0	0	0	0	0
1969-71	ALL AGES ATB	40	0	22	0	4	0	9	0	3	0	0	0	2
	5-9	1	0	1	0	0	0	0	0	0	0	0	0	0
	10-14	2	0	0	0	2	0	0	0	0	0	0	0	0
	20-24	6	0	2	0	0	0	2	0	0	0	0	0	2
	25-29	3	0	1	0	0	0	2	0	0	0	0	0	0
	30-34	8	0	5	0	1	0	1	0	1	0	0	0	0
	35-39	4	0	4	0	0	0	0	0	0	0	0	0	0
	40-44	4	0	1	0	0	0	2	0	1	0	0	0	0
	45-49	8	0	6	0	1	0	0	0	1	0	0	0	0
	50-54	1	0	1	0	0	0	0	0	0	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
	60-64	1	0	0	0	0	0	1	0	0	0	0	0	0
	65-69	1	0	0	0	0	0	1	0	0	0	0	0	0
1972-74	ALL AGES ATB	34	0	16	0	9	0	5	0	0	0	4	0	0
	5-9	1	0	0	0	0	0	0	0	0	0	1	0	0
	10-14	1	0	0	0	1	0	0	0	0	0	0	0	0
	15-19	5	0	2	0	3	0	0	0	0	0	0	0	0
	20-24	5	0	2	0	0	0	1	0	0	0	2	0	0
	25-29	4	0	3	0	0	0	1	0	0	0	0	0	0
	30-34	4	0	4	0	0	0	0	0	0	0	0	0	0
	35-39	2	0	0	0	1	0	1	0	0	0	0	0	0
	40-44	4	0	1	0	1	0	1	0	0	0	1	0	0
	45-49	4	0	1	0	3	0	0	0	0	0	0	0	0
	50-54	2	0	2	0	0	0	0	0	0	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
	60-64	1	0	0	0	0	0	1	0	0	0	0	0	0
1975-78	ALL AGES ATB	45	0	30	0	2	0	8	0	0	0	2	0	3
	5-9	1	0	0	0	0	0	1	0	0	0	0	0	0
	10-14	1	0	1	0	0	0	0	0	0	0	0	0	0
	15-19	4	0	0	0	1	0	0	0	0	0	1	0	2
	20-24	6	0	4	0	0	0	2	0	0	0	0	0	0
	25-29	5	0	3	0	0	0	1	0	0	0	0	0	1
	30-34	2	0	2	0	0	0	0	0	0	0	0	0	0
	35-39	6	0	4	0	1	0	1	0	0	0	0	0	0
	40-44	5	0	5	0	0	0	0	0	0	0	0	0	0
	45-49	9	0	8	0	0	0	1	0	0	0	0	0	0
	50-54	5	0	2	0	0	0	2	0	0	0	1	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 27-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF PROSTATE

TABLE 27-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
ALL AGES ATB	37	20	0	4	0	4	0	6	0	1	0	2	0	
5-9	1	0	0	0	0	0	0	0	0	0	0	1	0	
15-19	1	0	0	0	0	0	0	1	0	0	0	0	0	
25-29	1	1	0	0	0	0	0	0	0	0	0	0	0	
30-34	2	1	0	1	0	0	0	0	0	0	0	0	0	
35-39	1	1	0	0	0	0	0	0	0	0	0	0	0	
40-44	7	2	0	1	0	2	0	1	0	0	0	1	0	
45-49	6	3	0	1	0	2	0	2	0	0	0	2	0	
50-54	9	5	0	1	0	0	0	2	0	1	0	0	0	
60-64	4	4	0	0	0	0	0	0	0	0	0	0	0	
65-69	3	3	0	0	0	0	0	0	0	0	0	0	0	
1950-53														
ALL AGES ATB	1	1	0	0	0	0	0	0	0	0	0	0	0	
65-69	1	1	0	0	0	0	0	0	0	0	0	0	0	
1954-56														
ALL AGES ATB	1	1	0	0	0	0	0	0	0	0	0	0	0	
60-64	1	1	0	0	0	0	0	0	0	0	0	0	0	
1957-59														
ALL AGES ATB	3	2	0	1	0	0	0	0	0	0	0	0	0	
45-49	1	0	0	1	0	0	0	0	0	0	0	0	0	
60-64	1	1	0	0	0	0	0	0	0	0	0	0	0	
65-69	1	1	0	0	0	0	0	0	0	0	0	0	0	
1960-62														
ALL AGES ATB	2	2	0	0	0	0	0	0	0	0	0	0	0	
50-54	2	2	0	0	0	0	0	0	0	0	0	0	0	
1963-65														
ALL AGES ATB	4	2	0	0	0	0	0	1	0	1	0	0	0	
15-19	1	0	0	0	0	0	0	1	0	0	0	0	0	
40-44	1	1	0	0	0	0	0	0	0	0	0	0	0	
50-54	1	0	0	0	0	0	0	0	0	1	0	0	0	
65-69	1	1	0	0	0	0	0	0	0	0	0	0	0	
1966-68														
ALL AGES ATB	6	3	0	0	0	0	0	2	0	0	0	1	0	
5-9	1	0	0	0	0	0	0	0	0	0	0	1	0	
40-44	1	0	0	0	0	0	0	1	0	0	0	0	0	
45-49	1	1	0	0	0	0	0	0	0	0	0	0	0	
50-54	1	0	0	0	0	0	0	1	0	0	0	0	0	
60-64	2	2	0	0	0	0	0	0	0	0	0	0	0	
1969-71														
ALL AGES ATB	3	1	0	0	0	2	0	0	0	0	0	0	0	
30-34	1	1	0	0	0	0	0	0	0	0	0	0	0	
40-44	1	0	0	0	0	1	0	0	0	0	0	0	0	
45-49	1	0	0	0	0	1	0	0	0	0	0	0	0	
1972-74														
ALL AGES ATB	7	5	0	0	0	0	0	2	0	0	0	0	0	
25-29	1	1	0	0	0	0	0	0	0	0	0	0	0	
35-39	1	1	0	0	0	0	0	0	0	0	0	0	0	
45-49	3	2	0	0	0	0	0	1	0	0	0	0	0	
50-54	2	1	0	0	0	0	0	1	0	0	0	0	0	
1975-78														
ALL AGES ATB	10	3	0	3	0	2	0	1	0	0	0	1	0	
30-34	1	0	0	1	0	0	0	0	0	0	0	0	0	
40-44	4	1	0	1	0	1	0	0	0	0	0	1	0	
45-49	2	0	0	0	0	1	0	1	0	0	0	0	0	
50-54	3	2	0	1	0	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 28-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF TESTIS

TABLE 28-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	4	3	0	0	0	1	0	0	0	0	0	0	
	5-9	1	1	0	0	0	0	0	0	0	0	0	0	
	10-14	1	1	0	0	0	0	0	0	0	0	0	0	
	35-39	1	0	0	0	0	1	0	0	0	0	0	0	
	50-54	1	1	0	0	0	0	0	0	0	0	0	0	
1966-68														
	ALL AGES ATB	1	0	0	0	0	1	0	0	0	0	0	0	
	35-39	1	0	0	0	0	1	0	0	0	0	0	0	
1969-71														
	ALL AGES ATB	2	2	0	0	0	0	0	0	0	0	0	0	
	5-9	1	1	0	0	0	0	0	0	0	0	0	0	
	10-14	1	1	0	0	0	0	0	0	0	0	0	0	
1972-74														
	ALL AGES ATB	1	1	0	0	0	0	0	0	0	0	0	0	
	50-54	1	1	0	0	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 29-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF KIDNEY AND SUPRARENALS

TABLE 29-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	28	7	10	2	0	3	3	0	0	1	2	0	0
	10-14	2	0	0	0	0	0	0	0	0	1	1	0	0
	20-24	1	0	0	0	0	0	0	0	0	0	1	0	0
	25-29	1	0	0	0	0	0	1	0	0	0	0	0	0
	30-34	3	1	1	0	0	0	1	0	0	0	0	0	0
	35-39	2	1	1	0	0	0	0	0	0	0	0	0	0
	40-44	7	1	4	0	0	2	0	0	0	0	0	0	0
	45-49	5	2	0	2	0	1	0	0	0	0	0	0	0
	50-54	2	1	1	0	0	0	0	0	0	0	0	0	0
	55-59	2	0	2	0	0	0	0	0	0	0	0	0	0
	60-64	3	1	1	0	0	0	1	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	2	1	0	0	0	0	1	0	0	0	0	0	0
	40-44	1	1	0	0	0	0	0	0	0	0	0	0	0
	60-64	1	0	0	0	0	0	1	0	0	0	0	0	0
1960-62														
	ALL AGES ATB	4	1	3	0	0	0	0	0	0	0	0	0	0
	40-44	1	0	1	0	0	0	0	0	0	0	0	0	0
	45-49	1	1	0	0	0	0	0	0	0	0	0	0	0
	50-54	1	0	1	0	0	0	0	0	0	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
1963-65														
	ALL AGES ATB	8	1	3	1	0	1	1	0	0	0	1	0	0
	20-24	1	0	0	0	0	0	0	0	0	0	1	0	0
	25-29	1	0	0	0	0	0	1	0	0	0	0	0	0
	30-34	1	1	0	0	0	0	0	0	0	0	0	0	0
	35-39	1	0	1	0	0	0	0	0	0	0	0	0	0
	45-49	2	0	0	1	0	1	0	0	0	0	0	0	0
	55-59	1	0	1	0	0	0	0	0	0	0	0	0	0
	60-64	1	0	1	0	0	0	0	0	0	0	0	0	0
1966-68														
	ALL AGES ATB	2	1	0	0	0	0	0	0	0	1	0	0	0
	10-14	1	0	0	0	0	0	0	0	0	1	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
1969-71														
	ALL AGES ATB	4	1	0	1	0	0	1	0	0	0	1	0	0
	10-14	1	0	0	0	0	0	0	0	0	0	1	0	0
	30-34	1	0	0	0	0	0	1	0	0	0	0	0	0
	45-49	2	1	0	1	0	0	0	0	0	0	0	0	0
1972-74														
	ALL AGES ATB	5	1	3	0	0	1	0	0	0	0	0	0	0
	30-34	1	0	1	0	0	0	0	0	0	0	0	0	0
	40-44	3	0	2	0	0	1	0	0	0	0	0	0	0
	50-54	1	1	0	0	0	0	0	0	0	0	0	0	0
1975-78														
	ALL AGES ATB	3	1	1	0	0	1	0	0	0	0	0	0	0
	35-39	1	1	0	0	0	0	0	0	0	0	0	0	0
	40-44	2	0	1	0	0	1	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 30-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF BLADDER

TABLE 30-1

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
TOTAL 1950-78														
	ALL AGES ATB	78	29	16	1	1	8	5	4	3	5	3	2	1
	10-14	2	1	1	0	0	0	0	0	0	0	0	0	0
	15-19	2	0	0	0	0	1	1	0	0	0	0	0	0
	25-29	1	0	1	0	0	0	0	0	0	0	0	0	0
	30-34	4	2	0	0	0	0	0	1	0	0	1	0	0
	35-39	4	1	1	0	0	0	1	1	0	0	0	0	0
	40-44	10	4	0	0	0	0	0	3	0	2	0	1	0
	45-49	14	3	4	0	0	3	2	0	1	1	0	0	0
	50-54	16	6	5	1	0	0	1	0	1	1	1	0	1
	55-59	15	6	3	0	0	3	0	0	1	1	1	0	0
	60-64	5	3	0	0	1	0	0	0	0	0	1	0	0
	65-69	2	1	1	0	0	0	0	0	0	0	0	0	0
	70-74	3	2	0	0	0	1	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	4	2	0	0	0	2	0	0	0	0	0	0	0
	30-34	1	1	0	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	0	0	0	1	0	0	0	0	0	0	0
	55-59	1	0	0	0	0	1	0	0	0	0	0	0	0
	65-69	1	1	0	0	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	6	3	1	0	1	0	0	0	0	1	0	0	0
	55-59	2	1	0	0	0	0	0	0	0	1	0	0	0
	60-64	2	1	0	0	1	0	0	0	0	0	0	0	0
	65-69	1	0	1	0	0	0	0	0	0	0	0	0	0
	70-74	1	1	0	0	0	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	5	3	1	0	0	1	0	0	0	0	0	0	0
	40-44	1	1	0	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	1	0	0	0	0	0	0	0	0	0	0
	50-54	1	1	0	0	0	0	0	0	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
	70-74	1	0	0	0	0	1	0	0	0	0	0	0	0
1960-62														
	ALL AGES ATB	7	5	0	1	0	0	0	0	0	0	1	0	0
	40-44	1	1	0	0	0	0	0	0	0	0	0	0	0
	50-54	2	1	0	1	0	0	0	0	0	0	0	0	0
	55-59	1	1	0	0	0	0	0	0	0	0	0	0	0
	60-64	2	1	0	0	0	0	0	0	0	0	1	0	0
	70-74	1	1	0	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 30-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF BLADDER

TABLE 30-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9				10-99				100+			
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES			
1963-65														
ALL AGES ATB	10	0	6	0	0	0	1	0	2	0	1	0	0	
25-29	1	0	1	0	0	0	0	0	0	0	0	0	0	
45-49	4	0	3	0	0	0	0	0	1	0	0	0	0	
50-54	2	0	1	0	0	0	1	0	0	0	0	0	0	
55-59	3	0	1	0	0	0	0	0	1	0	1	0	0	
1966-68														
ALL AGES ATB	9	3	1	0	0	1	0	2	0	1	1	0	0	
35-39	2	0	1	0	0	0	0	1	0	0	0	0	0	
40-44	1	0	0	0	0	0	0	1	0	0	0	0	0	
45-49	2	1	0	0	0	0	0	0	0	1	0	0	0	
50-54	1	0	0	0	0	0	0	0	0	0	1	0	0	
55-59	3	2	0	0	0	1	0	0	0	0	0	0	0	
1969-71														
ALL AGES ATB	10	2	1	0	0	1	2	2	0	1	0	1	0	
10-14	1	0	1	0	0	0	0	0	0	0	0	0	0	
15-19	1	0	0	0	0	0	1	0	0	0	0	0	0	
40-44	3	0	0	0	0	0	0	2	0	0	0	1	0	
45-49	1	0	0	0	0	0	1	0	0	0	0	0	0	
50-54	3	2	0	0	0	0	0	0	0	1	0	0	0	
55-59	1	0	0	0	0	1	0	0	0	0	0	0	0	
1972-74														
ALL AGES ATB	12	5	5	0	0	1	0	0	0	0	0	0	1	
30-34	1	1	0	0	0	0	0	0	0	0	0	0	0	
35-39	1	1	0	0	0	0	0	0	0	0	0	0	0	
45-49	2	1	0	0	0	1	0	0	0	0	0	0	0	
50-54	7	2	4	0	0	0	0	0	0	0	0	0	1	
55-59	1	0	1	0	0	0	0	0	0	0	0	0	0	
1975-78														
ALL AGES ATB	15	6	1	0	0	2	2	0	1	2	0	1	0	
10-14	1	1	0	0	0	0	0	0	0	0	0	0	0	
15-19	1	0	0	0	0	1	0	0	0	0	0	0	0	
30-34	2	0	0	0	0	0	0	0	1	0	0	1	0	
35-39	1	0	0	0	0	0	1	0	0	0	0	0	0	
40-44	4	2	0	0	0	0	0	0	0	2	0	0	0	
45-49	3	1	0	0	0	1	1	0	0	0	0	0	0	
55-59	3	2	1	0	0	0	0	0	0	0	0	0	0	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 31-1 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF OTHER SITES WHICH WERE LIGHTLY IRRADIATED IN THE SPONDYLITIS SERIES (LIP, VULVA, VAGINA, PENIS, SCROTUM, JAW, NOSE)

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD											
			0-9		10-99				100+					
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	
TOTAL 1950-78														
	ALL AGES ATB	64	18	17	4	8	2	7	2	4	0	1	1	0
	5-9	1	1	0	0	0	0	0	0	0	0	0	0	0
	15-19	2	0	1	0	1	0	0	0	0	0	0	0	0
	20-24	4	0	1	0	1	1	1	0	0	0	0	0	0
	25-29	1	1	0	0	0	0	0	0	0	0	0	0	0
	30-34	3	1	0	0	0	0	0	0	1	0	0	1	0
	35-39	9	1	3	0	2	1	0	0	0	0	0	0	0
	40-44	8	3	3	0	0	0	1	0	1	0	0	0	0
	45-49	13	3	0	1	3	0	3	2	1	0	0	0	0
	50-54	6	1	2	2	1	0	0	0	0	0	0	0	0
	55-59	10	4	1	1	0	0	2	0	1	0	1	0	0
	60-64	4	1	3	0	0	0	0	0	0	0	0	0	0
	65-69	1	0	1	0	0	0	0	0	0	0	0	0	0
	70-74	2	2	0	0	0	0	0	0	0	0	0	0	0
1950-53														
	ALL AGES ATB	4	4	0	0	0	0	0	0	0	0	0	0	0
	50-54	1	1	0	0	0	0	0	0	0	0	0	0	0
	55-59	2	2	0	0	0	0	0	0	0	0	0	0	0
	70-74	1	1	0	0	0	0	0	0	0	0	0	0	0
1954-56														
	ALL AGES ATB	8	1	3	1	0	0	1	0	0	0	0	0	0
	35-39	2	0	2	0	0	0	0	0	0	0	0	0	0
	40-44	1	1	0	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	0	0	0	0	1	0	0	0	0	0	0
	50-54	1	0	0	1	0	0	0	0	0	0	0	0	0
	60-64	2	0	2	0	0	0	0	0	0	0	0	0	0
	65-69	1	0	1	0	0	0	0	0	0	0	0	0	0
1957-59														
	ALL AGES ATB	10	2	2	0	3	0	1	1	1	0	0	0	0
	15-19	1	0	0	0	1	0	0	0	0	0	0	0	0
	35-39	1	0	0	0	1	0	0	0	0	0	0	0	0
	40-44	2	1	1	0	0	0	0	0	0	0	0	0	0
	45-49	3	0	0	0	1	0	1	1	0	0	0	0	0
	55-59	2	1	0	0	0	0	0	0	1	0	0	0	0
	60-64	1	0	1	0	0	0	0	0	0	0	0	0	0
1960-62														
	ALL AGES ATB	8	3	3	1	1	0	0	0	0	0	0	0	0
	40-44	2	0	2	0	0	0	0	0	0	0	0	0	0
	45-49	2	1	0	0	1	0	0	0	0	0	0	0	0
	50-54	2	0	1	1	0	0	0	0	0	0	0	0	0
	60-64	1	1	0	0	0	0	0	0	0	0	0	0	0
	70-74	1	1	0	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 31-2 THE LIFE SPAN STUDY SAMPLE (EXTENDED) DEATHS FROM CANCER OF OTHER SITES WHICH WERE LIGHTLY IRRADIATED IN THE SPONDYLITIS SERIES (LIP, VULVA, VAGINA, PENIS, SCROTUM, JAW, NOSE) TABLE 31-2

YEAR	AGE ATB	TOTAL	T-65 TOTAL DOSE IN RAD										
			0-9		10-99				100+				
			HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI		HIROSHIMA		NAGASAKI
MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES		
1963-65													
	ALL AGES ATB	4	1	1	0	0	0	1	0	1	0	0	0
	30-34	1	1	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	0	0	0	0	0	0	1	0	0	0
	55-59	2	0	1	0	0	0	1	0	0	0	0	0
1966-68													
	ALL AGES ATB	9	0	0	2	4	0	1	1	1	0	0	0
	20-24	1	0	0	0	1	0	0	0	0	0	0	0
	35-39	1	0	0	0	1	0	0	0	0	0	0	0
	40-44	1	0	0	0	0	0	0	0	1	0	0	0
	45-49	3	0	0	1	1	0	0	1	0	0	0	0
	50-54	1	0	0	0	1	0	0	0	0	0	0	0
	55-59	2	0	0	1	0	0	1	0	0	0	0	0
1969-71													
	ALL AGES ATB	6	2	2	0	0	1	1	0	0	0	0	0
	20-24	2	0	1	0	0	1	0	0	0	0	0	0
	25-29	1	1	0	0	0	0	0	0	0	0	0	0
	40-44	1	0	0	0	0	0	1	0	0	0	0	0
	45-49	1	1	0	0	0	0	0	0	0	0	0	0
	50-54	1	0	1	0	0	0	0	0	0	0	0	0
1972-74													
	ALL AGES ATB	6	3	0	0	0	1	1	0	1	0	1	1
	20-24	1	0	0	0	0	0	1	0	0	0	0	0
	30-34	2	0	0	0	0	0	0	0	1	0	0	1
	35-39	2	1	0	0	0	1	0	0	0	0	0	0
	45-49	1	1	0	0	0	0	0	0	0	0	0	0
	55-59	2	1	0	0	0	0	0	0	0	0	1	0
1975-78													
	ALL AGES ATB	7	2	4	0	0	0	1	0	0	0	0	0
	5-9	1	1	0	0	0	0	0	0	0	0	0	0
	15-19	1	0	1	0	0	0	0	0	0	0	0	0
	35-39	3	0	3	0	0	0	0	0	0	0	0	0
	40-44	1	1	0	0	0	0	0	0	0	0	0	0
	45-49	1	0	0	0	0	0	1	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 32-1 ANKYLOSING SPONDYLITIS SERIES NUMBER OF PERSON-YEARS AT RISK 1935-1969

TABLE 32-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
AGE AT OBSERVATION															
ALL AGES AT EXPOSURE, TOTAL 1.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	112973	174	46	1462	311	6358	1366	21025	4186	25828	5183	21877	4473	15455	3209
10-14	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
15-19	285	2	1	37	7	73	14	99	7	46	1	0	0	0	0
20-24	2668	28	5	124	43	699	103	957	112	522	35	40	0	0	0
25-29	7733	45	8	300	47	1432	217	2683	392	1876	226	437	32	39	0
30-34	13153	35	5	344	54	1676	227	3636	669	3733	587	1591	197	371	28
35-39	17200	27	5	262	36	1640	226	3788	700	4419	853	3272	517	1288	164
40-44	18922	21	11	162	33	1207	178	3604	707	4516	816	3934	763	2557	414
45-49	17352	8	8	111	28	735	130	2604	546	4113	822	3952	745	2942	609
50-54	14072	4	0	64	17	394	112	1655	404	2868	692	3610	725	2975	553
55-59	9835	4	0	37	8	235	55	934	290	1801	493	2413	587	2476	502
60-64	5928	0	3	14	15	159	47	567	140	958	312	1398	410	1497	409
65-69	3206	1	2	4	14	61	38	327	105	570	163	671	246	745	261
70-74	1610	0	2	2	7	31	27	121	61	292	101	356	122	343	148
75-79	703	1	0	2	3	12	9	38	35	88	51	153	66	155	71
80-84	235	1	0	2	0	1	1	10	13	21	28	36	31	57	35
85+	70	0	0	0	0	3	1	2	4	7	5	12	12	10	14
AGE <15 AT EXPOSURE, 1.5-2.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	9	0	0	2	1	2	0	4	0	0	0	0	0	0	0
10-14	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
15-19	8	0	0	2	1	2	0	3	0	0	0	0	0	0	0
AGE <15 AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	22	0	0	3	0	5	0	8	0	6	0	0	0	0	0
15-19	22	0	0	3	0	5	0	8	0	6	0	0	0	0	0
AGE <15 AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	19	0	0	0	0	4	0	5	0	9	0	1	0	0	0
15-19	5	0	0	0	0	1	0	1	0	4	0	0	0	0	0
20-24	14	0	0	0	0	3	0	4	0	6	0	1	0	0	0
AGE <15 AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	13	0	0	0	0	2	0	1	0	5	0	6	0	0	0
20-24	12	0	0	0	0	2	0	1	0	4	0	5	0	0	0
25-29	2	0	0	0	0	0	0	0	0	1	0	1	0	0	0
AGE <15 AT EXPOSURE, 11.5-14.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	12	0	0	0	0	0	0	0	0	4	0	5	0	3	0
20-24	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
25-29	12	0	0	0	0	0	0	0	0	4	0	5	0	3	0
AGE <15 AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	11	0	0	0	0	0	0	0	0	0	0	6	0	5	0
25-29	6	0	0	0	0	0	0	0	0	0	0	3	0	4	0
30-34	5	0	0	0	0	0	0	0	0	0	0	3	0	2	0
AGE <15 AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	6	0	0	0	0	0	0	0	0	0	0	2	0	4	0
30-34	6	0	0	0	0	0	0	0	0	0	0	2	0	4	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 32-2 ANKYLOSING SPONDYLITIS SERIES NUMBER OF PERSON-YEARS AT RISK 1935-1969

TABLE 32-2

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR														
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9		
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	
AGE <15 AT EXPOSURE, 20.5-23.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	4	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0
30-34	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
35-39	3	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0
AGE 15-24 AT EXPOSURE, 1.5-2.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	1708	33	8	154	31	534	78	643	79	137	10	0	0	0	0	0
15-19	151	2	1	26	5	39	9	53	4	14	0	0	0	0	0	0
20-24	1032	22	5	86	21	326	48	391	44	84	5	0	0	0	0	0
25-29	524	10	3	42	6	169	21	199	31	39	5	0	0	0	0	0
AGE 15-24 AT EXPOSURE, 2.5-3.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	3396	12	0	100	31	770	107	1253	166	878	76	0	0	0	0	0
15-19	99	0	0	6	2	26	5	35	3	22	1	0	0	0	0	0
20-24	1262	6	0	37	20	320	47	461	50	302	20	0	0	0	0	0
25-29	2034	6	0	57	10	424	56	757	115	554	55	0	0	0	0	0
AGE 15-24 AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	2680	0	0	25	5	204	41	780	117	1074	136	278	21	0	0	0
20-24	322	0	0	1	2	47	8	93	17	118	9	25	0	0	0	0
25-29	1595	0	0	20	3	120	26	481	69	645	77	144	10	0	0	0
30-34	763	0	0	4	0	37	7	206	31	311	50	108	10	0	0	0
AGE 15-24 AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	2391	0	0	3	0	47	18	354	53	803	125	899	90	0	0	0
20-24	25	0	0	0	0	2	1	7	1	8	0	8	0	0	0	0
25-29	662	0	0	1	0	10	11	129	18	214	32	230	18	0	0	0
30-34	1624	0	0	3	0	35	7	213	34	553	90	624	66	0	0	0
35-39	80	0	0	0	0	1	0	5	1	27	4	37	6	0	0	0
AGE 15-24 AT EXPOSURE, 11.5-14.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	2253	0	0	0	0	9	1	103	27	535	78	857	126	479	38	0
25-29	153	0	0	0	0	0	0	16	2	40	6	54	4	31	0	0
30-34	1065	0	0	0	0	6	1	48	18	268	39	403	55	212	15	0
35-39	1035	0	0	0	0	3	0	39	7	228	33	400	67	236	22	0
AGE 15-24 AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	1902	0	0	0	0	0	0	28	9	221	39	664	103	747	91	0
25-29	4	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0
30-34	376	0	0	0	0	0	0	4	4	69	11	121	20	135	12	0
35-39	1292	0	0	0	0	0	0	23	6	135	26	458	70	513	62	0
40-44	231	0	0	0	0	0	0	2	0	17	3	84	13	97	17	0
AGE 15-24 AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	1212	0	0	0	0	0	0	5	0	62	20	395	56	576	97	0
30-34	38	0	0	0	0	0	0	0	0	4	0	15	1	17	0	0
35-39	461	0	0	0	0	0	0	2	0	23	13	163	25	202	34	0
40-44	712	0	0	0	0	0	0	3	0	36	7	217	30	357	63	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 32-3 ANKYLOSING SPONDYLITIS SERIES NUMBER OF PERSON-YEARS AT RISK 1935-1969

TABLE 32-3

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
AGE 15-24 AT EXPOSURE, 20.5-23.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	668	0	0	0	0	0	0	0	0	19	4	140	31	413	61
35-39	96	0	0	0	0	0	0	0	0	1	1	31	5	49	9
40-44	407	0	0	0	0	0	0	0	0	15	3	82	21	252	35
45-49	164	0	0	0	0	0	0	0	0	4	0	27	5	113	17
AGE 15-24 AT EXPOSURE, 23.5-26.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	268	0	0	0	0	0	0	0	0	1	0	42	15	181	29
35-39	4	0	0	0	0	0	0	0	0	0	0	2	0	3	0
40-44	106	0	0	0	0	0	0	0	0	1	0	9	9	77	11
45-49	155	0	0	0	0	0	0	0	0	1	0	31	7	101	17
50-54	3	0	0	0	0	0	0	0	0	0	0	1	0	2	1
AGE 15-24 AT EXPOSURE, 26.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	101	0	0	0	0	0	0	0	0	0	0	7	1	70	23
40-44	7	0	0	0	0	0	0	0	0	0	0	0	0	6	1
45-49	51	0	0	0	0	0	0	0	0	0	0	6	1	29	15
50-54	43	0	0	0	0	0	0	0	0	0	0	2	0	34	8
AGE 25-34 AT EXPOSURE, 1.5-2.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	4148	51	11	342	49	1188	176	1670	313	269	59	0	0	0	0
25-29	1457	20	5	127	19	437	67	578	86	102	16	0	0	0	0
30-34	2103	25	5	179	25	589	83	852	176	141	29	0	0	0	0
35-39	567	7	2	36	5	162	27	241	50	45	13	0	0	0	0
AGE 25-34 AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	8534	26	1	255	47	1580	188	3230	593	2228	386	0	0	0	0
25-29	1284	10	0	53	9	272	37	523	71	275	34	0	0	0	0
30-34	4361	10	1	129	27	816	101	1652	306	1139	180	0	0	0	0
35-39	2690	7	1	72	11	491	50	1055	217	814	172	0	0	0	0
AGE 25-34 AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	7047	0	0	63	6	466	69	1698	251	3136	580	659	120	0	0
30-34	2414	0	0	27	3	183	28	605	94	1090	167	188	28	0	0
35-39	3595	0	0	28	2	239	38	866	131	1589	324	323	57	0	0
40-44	1039	0	0	8	2	45	4	226	27	457	89	148	34	0	0
AGE 25-34 AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	6381	0	0	12	0	121	15	801	98	2033	370	2484	446	0	0
30-34	397	0	0	2	0	10	2	56	8	158	21	126	15	0	0
35-39	3068	0	0	5	0	61	10	402	54	969	182	1190	195	0	0
40-44	2805	0	0	5	0	48	3	336	36	875	162	1115	225	0	0
45-49	110	0	0	0	0	3	0	7	1	31	6	53	11	0	0
AGE 25-34 AT EXPOSURE, 11.5-14.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	5992	0	0	0	0	33	0	220	39	1162	149	2504	482	1193	210
35-39	1410	0	0	0	0	14	0	62	10	279	36	637	89	251	33
40-44	3086	0	0	0	0	12	0	116	24	612	81	1260	272	608	101
45-49	1496	0	0	0	0	7	0	42	6	271	33	607	121	334	75

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

111

TABLE 32-4 ANKYLOSING SPONDYLITIS SERIES NUMBER OF PERSON-YEARS AT RISK 1935-1969

TABLE 32-4

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
AGE AT OBSERVATION															
AGE 25-34 AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	5036	0	0	0	0	4	0	61	3	494	62	1547	259	2179	427
35-39	85	0	0	0	0	1	0	1	1	11	1	33	3	32	3
40-44	2144	0	0	0	0	2	0	32	3	225	28	665	107	927	157
45-49	2507	0	0	0	0	2	0	25	0	241	32	760	137	1075	236
50-54	300	0	0	0	0	0	0	4	0	17	2	90	13	145	31
AGE 25-34 AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2907	0	0	0	0	0	0	16	0	116	22	647	104	1508	295
40-44	438	0	0	0	0	0	0	7	0	23	5	127	16	233	29
45-49	1490	0	0	0	0	0	0	5	0	56	13	439	55	758	165
50-54	979	0	0	0	0	0	0	5	0	37	5	280	33	517	101
AGE 25-34 AT EXPOSURE, 20.5-23.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1380	0	0	0	0	0	0	0	0	34	0	292	46	890	117
45-49	490	0	0	0	0	0	0	0	0	19	0	117	16	295	44
50-54	720	0	0	0	0	0	0	0	0	11	0	144	27	477	62
55-59	170	0	0	0	0	0	0	0	0	5	0	31	4	119	12
AGE 25-34 AT EXPOSURE, 23.5-26.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	521	0	0	0	0	0	0	0	0	6	0	69	11	387	49
45-49	45	0	0	0	0	0	0	0	0	2	0	6	2	32	4
50-54	262	0	0	0	0	0	0	0	0	2	0	34	6	197	24
55-59	209	0	0	0	0	0	0	0	0	2	0	27	3	156	21
60-64	5	0	0	0	0	0	0	0	0	0	0	2	0	2	1
AGE 25-34 AT EXPOSURE, 26.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	159	0	0	0	0	0	0	0	0	0	0	20	0	117	22
50-54	48	0	0	0	0	0	0	0	0	0	0	11	0	29	8
55-59	73	0	0	0	0	0	0	0	0	0	0	4	0	56	13
60-64	36	0	0	0	0	0	0	0	0	0	0	5	0	30	2
65-69	3	0	0	0	0	0	0	0	0	0	0	0	0	3	0
AGE 35-44 AT EXPOSURE, 1.5-2.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	3238	21	10	174	28	825	148	1439	318	229	47	0	0	0	0
35-39	1316	9	2	87	10	369	67	538	118	82	14	0	0	0	0
40-44	1546	12	7	74	16	350	69	719	156	118	27	0	0	0	0
45-49	376	1	2	13	3	86	13	182	44	29	5	0	0	0	0
AGE 35-44 AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	6934	15	7	120	31	1122	161	2750	608	1793	327	0	0	0	0
35-39	1277	5	0	34	9	280	37	554	108	216	35	0	0	0	0
40-44	3653	9	4	59	13	587	87	1451	327	938	177	0	0	0	0
45-49	2003	2	3	27	10	255	37	745	173	639	114	0	0	0	0
AGE 35-44 AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	5719	0	0	36	15	260	39	1323	259	2662	532	503	91	0	0
40-44	2345	0	0	16	3	154	14	640	128	1038	207	127	19	0	0
45-49	2716	0	0	19	10	90	23	556	114	1313	267	270	54	0	0
50-54	658	0	0	1	2	16	3	126	18	311	59	106	17	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 32-5 ANKYLOSING SPONDYLITIS SERIES NUMBER OF PERSON-YEARS AT RISK 1935-1969

TABLE 32-5

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
AGE 35-44 AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	5121	0	0	4	4	60	18	550	77	1671	366	1965	385	0	0
40-44	403	0	0	1	0	10	2	72	8	164	28	101	18	0	0
45-49	2739	0	0	3	2	33	8	325	42	941	218	966	202	0	0
50-54	1919	0	0	1	2	18	9	150	27	551	136	867	158	0	0
55-59	60	0	0	0	0	0	0	3	1	15	4	32	7	0	0
AGE 35-44 AT EXPOSURE, 11.5-14.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	4745	0	0	0	0	19	9	106	26	835	159	2087	451	891	162
45-49	1415	0	0	0	0	4	1	49	8	318	64	636	129	176	31
50-54	2403	0	0	0	0	13	6	41	15	377	74	1075	238	473	92
55-59	927	0	0	0	0	2	3	17	3	140	22	377	85	242	38
AGE 35-44 AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	3952	0	0	0	0	0	2	36	11	293	47	1198	279	1738	349
45-49	91	0	0	0	0	0	0	2	1	13	1	36	5	29	5
50-54	2070	0	0	0	0	0	1	20	4	184	21	678	156	834	174
55-59	1626	0	0	0	0	0	1	15	7	87	25	458	109	796	150
60-64	166	0	0	0	0	0	0	1	1	9	1	47	9	79	20
AGE 35-44 AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2207	0	0	0	0	0	0	4	6	58	15	565	101	1171	287
50-54	521	0	0	0	0	0	0	2	0	20	4	145	28	269	54
55-59	1186	0	0	0	0	0	0	3	4	25	8	293	50	644	160
60-64	500	0	0	0	0	0	0	0	2	13	4	128	23	258	74
AGE 35-44 AT EXPOSURE, 20.5-23.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	866	0	0	0	0	0	0	0	0	19	7	142	24	551	124
55-59	454	0	0	0	0	0	0	0	0	10	2	90	8	278	67
60-64	335	0	0	0	0	0	0	0	0	9	5	40	15	217	50
65-69	78	0	0	0	0	0	0	0	0	1	0	12	2	56	8
AGE 35-44 AT EXPOSURE, 23.5-26.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	271	0	0	0	0	0	0	0	0	1	0	35	9	200	27
55-59	42	0	0	0	0	0	0	0	0	1	0	7	2	31	2
60-64	158	0	0	0	0	0	0	0	0	1	0	20	3	122	12
65-69	70	0	0	0	0	0	0	0	0	0	0	8	4	46	12
70-74	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
AGE 35-44 AT EXPOSURE, 26.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	62	0	0	0	0	0	0	0	0	0	0	8	2	40	12
60-64	28	0	0	0	0	0	0	0	0	0	0	4	0	21	3
65-69	27	0	0	0	0	0	0	0	0	0	0	5	2	16	5
70-74	8	0	0	0	0	0	0	0	0	0	0	0	0	4	4
AGE 45-54 AT EXPOSURE, 1.5-2.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1669	8	2	60	9	332	81	764	208	159	48	0	0	0	0
45-49	729	4	2	28	3	159	29	339	87	60	19	0	0	0	0
50-54	775	3	0	30	6	143	43	351	97	81	23	0	0	0	0
55-59	165	2	0	3	1	31	9	74	24	17	5	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 32-6 ANKYLOSING SPONDYLITIS SERIES NUMBER OF PERSON-YEARS AT RISK 1935-1969

TABLE 32-6

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
AGE 45-54 AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	3550	4	1	53	6	330	64	1329	374	1055	312	0	0	0	0
45-49	775	3	1	22	1	98	22	330	72	177	51	0	0	0	0
50-54	1850	2	0	25	5	157	46	691	167	563	175	0	0	0	0
55-59	925	0	0	7	3	75	17	308	116	314	85	0	0	0	0
AGE 45-54 AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2868	0	0	10	4	78	13	489	137	1335	396	312	94	0	0
50-54	1278	0	0	6	3	43	4	250	53	617	177	96	28	0	0
55-59	1300	0	0	1	1	32	8	196	72	599	178	161	52	0	0
60-64	290	0	0	2	0	4	2	43	12	119	42	54	13	0	0
AGE 45-54 AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2502	0	0	0	0	28	6	121	33	732	229	1041	313	0	0
50-54	245	0	0	0	0	5	0	16	6	97	18	81	21	0	0
55-59	1393	0	0	0	0	16	4	66	17	420	120	568	182	0	0
60-64	838	0	0	0	0	5	2	38	11	208	89	380	105	0	0
65-69	27	0	0	0	0	1	0	1	0	7	2	12	5	0	0
AGE 45-54 AT EXPOSURE, 11.5-14.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2166	0	0	0	0	2	2	39	7	243	77	697	292	462	146
55-59	761	0	0	0	0	1	2	14	2	98	23	370	67	132	33
60-64	1043	0	0	0	0	0	0	20	6	106	44	397	149	238	84
65-69	363	0	0	0	0	1	0	5	0	39	11	130	56	91	29
AGE 45-54 AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1600	0	0	0	0	0	0	12	3	64	13	411	137	709	253
55-59	51	0	0	0	0	0	0	1	0	3	0	18	2	21	6
60-64	919	0	0	0	0	0	0	9	3	34	5	249	67	414	138
65-69	575	0	0	0	0	0	0	2	0	26	6	130	61	251	97
70-74	56	0	0	0	0	0	0	0	0	2	0	15	7	22	12
AGE 45-54 AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	704	0	0	0	0	0	0	0	1	20	5	110	37	382	149
60-64	187	0	0	0	0	0	0	0	1	5	0	32	6	116	27
65-69	368	0	0	0	0	0	0	0	0	13	5	57	23	192	78
70-74	148	0	0	0	0	0	0	0	0	2	0	21	8	74	44
AGE 45-54 AT EXPOSURE, 20.5-23.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	218	0	0	0	0	0	0	0	0	3	3	31	6	118	54
65-69	109	0	0	0	0	0	0	0	0	3	3	18	1	61	23
70-74	93	0	0	0	0	0	0	0	0	1	0	11	7	47	26
75-79	17	0	0	0	0	0	0	0	0	0	0	2	0	10	5
AGE 45-54 AT EXPOSURE, 23.5-26.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	46	0	0	0	0	0	0	0	0	0	0	7	4	25	11
65-69	5	0	0	0	0	0	0	0	0	0	0	2	0	3	0
70-74	29	0	0	0	0	0	0	0	0	0	0	5	4	15	6
75-79	12	0	0	0	0	0	0	0	0	0	0	0	0	7	5

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 32-7 ANKYLOSING SPONDYLITIS SERIES NUMBER OF PERSON-YEARS AT RISK 1935-1969

TABLE 32-7

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR														
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9		
		AGE AT OBSERVATION	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
AGE 45-54 AT EXPOSURE, 26.5+ YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	14	0	0	0	0	0	0	0	0	0	0	0	0	2	9	3
70-74	7	0	0	0	0	0	0	0	0	0	0	0	0	2	5	0
75-79	7	0	0	0	0	0	0	0	0	0	0	0	0	0	4	3
AGE 55+ AT EXPOSURE, 1.5-2.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	761	4	3	20	10	126	41	379	90	60	26	0	0	0	0	0
55-59	262	2	0	12	2	46	8	144	26	15	8	0	0	0	0	0
60-64	276	0	2	4	6	45	19	133	31	25	11	0	0	0	0	0
65-69	139	1	1	3	2	18	7	66	24	11	7	0	0	0	0	0
70-74	60	0	1	1	1	12	6	28	5	6	2	0	0	0	0	0
75-79	19	1	0	1	1	5	1	7	3	2	0	0	0	0	0	0
80-84	2	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0
85+	3	0	0	0	0	1	1	0	1	1	0	0	0	0	0	0
AGE 55+ AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	1516	0	3	27	20	150	50	528	150	456	132	0	0	0	0	0
55-59	232	0	0	15	2	31	5	94	21	51	14	0	0	0	0	0
60-64	667	0	1	7	8	71	22	236	59	209	55	0	0	0	0	0
65-69	377	0	1	1	7	26	14	125	39	123	42	0	0	0	0	0
70-74	168	0	1	1	3	15	7	55	19	49	18	0	0	0	0	0
75-79	53	0	0	2	0	5	3	16	7	20	1	0	0	0	0	0
80-84	15	0	0	2	0	0	1	3	3	4	2	0	0	0	0	0
85+	6	0	0	0	0	2	0	1	3	1	0	0	0	0	0	0
AGE 55+ AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	1144	0	0	2	12	47	18	176	73	534	141	101	41	0	0	0
60-64	413	0	0	2	1	30	3	79	15	194	52	25	12	0	0	0
65-69	433	0	0	0	6	11	12	65	31	201	53	42	15	0	0	0
70-74	210	0	0	0	3	5	3	20	12	104	30	25	10	0	0	0
75-79	68	0	0	0	3	2	1	8	12	29	5	6	4	0	0	0
80-84	19	0	0	0	0	1	0	4	3	7	3	2	0	0	0	0
85+	1	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0
AGE 55+ AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	900	0	0	0	0	9	18	73	27	237	81	338	117	0	0	0
60-64	68	0	0	0	0	5	1	8	1	26	6	15	6	0	0	0
65-69	438	0	0	0	0	4	6	46	10	119	29	172	52	0	0	0
70-74	252	0	0	0	0	0	9	11	13	66	23	95	35	0	0	0
75-79	112	0	0	0	0	0	3	6	3	22	15	40	22	0	0	0
80-84	29	0	0	0	0	0	0	3	2	4	7	14	0	0	0	0
85+	2	0	0	0	0	0	0	1	0	0	1	1	0	0	0	0
AGE 55+ AT EXPOSURE, 11.5-14.4 YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	680	0	0	0	0	1	4	25	18	74	46	271	87	111	44	0
65-69	189	0	0	0	0	1	0	19	2	26	4	82	24	23	9	0
70-74	309	0	0	0	0	0	3	5	10	36	23	126	35	56	17	0
75-79	130	0	0	0	0	0	2	2	5	7	10	52	21	19	13	0
80-84	45	0	0	0	0	0	0	1	1	3	10	11	7	9	5	0
85+	7	0	0	0	0	0	0	0	0	3	1	0	1	3	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 32-8 ANKYLOSING SPONDYLITIS SERIES NUMBER OF PERSON-YEARS AT RISK 1935-1969

TABLE 32-8

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
AGE 55+ AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	457	0	0	0	0	0	4	11	32	21	90	47	188	65	
65-69	8	0	0	0	0	0	1	0	1	0	2	1	2	0	
70-74	231	0	0	0	0	0	4	3	22	4	51	14	100	33	
75-79	149	0	0	0	0	0	0	5	4	14	26	23	56	22	
80-84	53	0	0	0	0	0	0	3	3	2	8	6	23	9	
85+	17	0	0	0	0	0	0	0	2	2	3	4	6	0	
AGE 55+ AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	196	0	0	0	0	0	0	1	10	15	29	27	79	36	
70-74	41	0	0	0	0	0	0	0	6	2	8	1	19	6	
75-79	107	0	0	0	0	0	0	0	3	7	17	14	46	20	
80-84	34	0	0	0	0	0	0	1	1	5	0	9	12	8	
85+	14	0	0	0	0	0	0	0	1	2	5	4	1	2	
AGE 55+ AT EXPOSURE, 20.5-23.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	63	0	0	0	0	0	0	0	2	3	12	13	19	15	
75-79	28	0	0	0	0	0	0	0	2	1	8	2	12	2	
80-84	25	0	0	0	0	0	0	0	0	1	1	7	7	10	
85+	10	0	0	0	0	0	0	0	0	1	3	3	0	3	
AGE 55+ AT EXPOSURE, 23.5-26.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	16	0	0	0	0	0	0	0	0	0	2	4	5	7	
75-79	4	0	0	0	0	0	0	0	0	0	2	1	2	0	
80-84	10	0	0	0	0	0	0	0	0	0	1	3	3	3	
85+	5	0	0	0	0	0	0	0	0	0	0	1	0	4	
AGE 55+ AT EXPOSURE, 26.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	8	0	0	0	0	0	0	0	0	0	0	0	3	5	
80-84	3	0	0	0	0	0	0	0	0	0	0	0	3	0	
85+	5	0	0	0	0	0	0	0	0	0	0	0	0	5	

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 33-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM LEUKEMIA

TABLE 33-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1939-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
AGE AT OBSERVATION		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
ALL AGES AT EXPOSURE, TOTAL 1.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	26	0	0	0	0	0	1	10	0	7	2	3	0	3	0
25-29	3	0	0	0	0	0	0	2	0	1	0	0	0	0	0
30-34	2	0	0	0	0	0	1	1	0	0	0	0	0	0	0
35-39	3	0	0	0	0	0	0	1	0	1	0	1	0	0	0
40-44	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
45-49	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0
50-54	5	0	0	0	0	0	0	1	0	2	0	2	0	0	0
55-59	4	0	0	0	0	0	0	1	0	1	1	0	0	1	0
60-64	3	0	0	0	0	0	0	1	0	0	0	0	0	2	0
65-69	4	0	0	0	0	0	0	2	0	0	0	0	0	2	0
70-74	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
AGE 15-24 AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
25-29	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
AGE 25-34 AT EXPOSURE, 1.5-2.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	3	0	0	0	0	0	1	2	0	0	0	0	0	0	0
25-29	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0
30-34	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0
AGE 25-34 AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
30-34	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
AGE 25-34 AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0
35-39	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0
AGE 25-34 AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
35-39	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
AGE 35-44 AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	3	0	0	0	0	0	0	1	0	2	0	0	0	0	0
40-44	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
45-49	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0
AGE 35-44 AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
50-54	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 33-2 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM LEUKEMIA

TABLE 33-2

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
AGE 35-44 AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2	0	0	0	0	0	0	1	0	0	0	1	0	0	0
50-54	2	0	0	0	0	0	0	1	0	0	0	1	0	0	0
AGE 35-44 AT EXPOSURE, 11.5-14.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
55-59	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
AGE 35-44 AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
50-54	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
AGE 45-54 AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0
55-59	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0
AGE 45-54 AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2	0	0	0	0	0	0	0	0	1	1	0	0	0	0
50-54	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
55-59	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
AGE 45-54 AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	3	0	0	0	0	0	0	0	0	0	0	0	0	3	0
60-64	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
65-69	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0
AGE 45-54 AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
60-64	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
AGE 55+ AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0
60-64	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
65-69	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0
AGE 55+ AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0
80-84	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 34-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM SELECTED TUMORS COMMON TO BOTH SERIES

TABLE 34-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
AGE AT OBSERVATION		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	186	0	0	1	0	4	0	16	2	40	6	62	4	46	5
35-39	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
40-44	9	0	0	0	0	1	0	1	0	3	1	1	0	2	0
45-49	26	0	0	0	0	1	0	3	0	9	0	5	0	6	0
50-54	32	0	0	1	0	2	0	1	0	10	0	13	0	3	0
55-59	34	0	0	0	0	0	0	2	1	3	2	9	1	12	4
60-64	39	0	0	0	0	0	0	3	0	11	1	14	0	10	0
65-69	21	0	0	0	0	0	0	2	0	2	1	8	0	8	0
70-74	14	0	0	0	0	0	0	2	0	2	1	6	0	2	1
75-79	6	0	0	0	0	0	0	1	0	1	0	3	2	2	0
80-84	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0
AGE 15-24 AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
35-39	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
AGE 15-24 AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0
40-44	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0
AGE 25-34 AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2	0	0	0	0	0	0	1	0	0	0	1	0	0	0
40-44	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
45-49	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
AGE 25-34 AT EXPOSURE, 11.5-14.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	4	0	0	0	0	0	0	0	0	2	0	2	0	0	0
45-49	4	0	0	0	0	0	0	0	0	2	0	2	0	0	0
AGE 25-34 AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	9	0	0	0	0	0	0	1	0	2	0	2	0	4	0
40-44	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
45-49	6	0	0	0	0	0	0	1	0	1	0	0	0	4	0
50-54	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0
AGE 25-34 AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
50-54	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
AGE 25-34 AT EXPOSURE, 20.5-23.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	3	0	0	0	0	0	0	0	0	0	0	0	0	4	1
45-49	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0
50-54	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
55-59	2	0	0	0	0	0	0	0	0	0	0	0	0	1	1
AGE 35-44 AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	5	0	0	0	0	2	0	1	0	2	0	0	0	0	0
40-44	3	0	0	0	0	1	0	1	0	1	0	0	0	0	0
45-49	2	0	0	0	0	1	0	0	0	1	0	0	0	0	0
AGE 35-44 AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	5	0	0	0	0	0	0	1	0	3	1	0	0	0	0
40-44	2	0	0	0	0	0	0	0	0	1	1	0	0	0	0
45-49	3	0	0	0	0	0	0	1	0	2	0	0	0	0	0
AGE 35-44 AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	18	0	0	0	0	0	0	3	0	5	0	10	0	0	0
45-49	7	0	0	0	0	0	0	2	0	2	0	3	0	0	0
50-54	11	0	0	0	0	0	0	1	0	3	0	7	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 34-2 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM SELECTED TUMORS COMMON TO BOTH SERIES

TABLE 34-2

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
AGE 35-44 AT EXPOSURE, 11.5-14.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	9	0	0	0	0	1	0	0	0	3	0	4	0	0	1
45-49	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
50-54	6	0	0	0	0	1	0	0	0	2	0	3	0	0	0
55-59	2	0	0	0	0	0	0	0	0	0	0	1	0	0	1
AGE 35-44 AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	12	0	0	0	0	0	0	0	0	0	0	4	0	7	1
50-54	3	0	0	0	0	0	0	0	0	0	0	2	0	1	0
55-59	7	0	0	0	0	0	0	0	0	0	0	2	0	4	1
60-64	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0
AGE 35-44 AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	11	0	0	0	0	0	0	0	0	0	0	4	0	6	1
50-54	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
55-59	6	0	0	0	0	0	0	0	0	0	0	1	0	4	1
60-64	4	0	0	0	0	0	0	0	0	0	0	3	0	1	0
AGE 35-44 AT EXPOSURE, 20.5-23.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	4	0	0	0	0	0	0	0	0	0	0	0	0	4	0
55-59	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0
60-64	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0
AGE 35-44 AT EXPOSURE, 23.5-26.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	2	0	0	0	0	0	0	0	0	0	0	0	0	2	0
60-64	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
65-69	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
AGE 35-44 AT EXPOSURE, 26.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
70-74	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
AGE 45-54 AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	6	0	0	1	0	1	0	1	1	4	0	0	0	0	0
50-54	3	0	0	1	0	1	0	0	1	1	0	0	0	0	0
55-59	3	0	0	0	0	0	0	1	1	3	0	0	0	0	0
AGE 45-54 AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	6	0	0	0	0	0	0	1	0	6	1	0	0	0	0
50-54	3	0	0	0	0	0	0	0	0	3	0	0	0	0	0
55-59	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0
60-64	3	0	0	0	0	0	0	0	0	3	0	0	0	0	0
AGE 45-54 AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	14	0	0	0	0	0	0	0	0	5	1	7	1	0	0
50-54	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
55-59	3	0	0	0	0	0	0	0	0	0	1	1	1	0	0
60-64	9	0	0	0	0	0	0	0	0	4	0	5	0	0	0
65-69	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
AGE 45-54 AT EXPOSURE, 11.5-14.4 YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	16	0	0	0	0	0	0	0	0	2	1	10	0	3	0
55-59	5	0	0	0	0	0	0	0	0	0	0	4	0	1	0
60-64	9	0	0	0	0	0	0	0	0	2	1	4	0	2	0
65-69	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 34-3 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM SELECTED TUMORS COMMON TO BOTH SERIES

TABLE 34-3

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR															
		1933-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9			
		AGE AT OBSERVATION		MALES		FEMALES		MALES		FEMALES		MALES		FEMALES			
AGE 45-54 AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE																	
ALL AGES AT OBSERVATION	6	0	0	0	0	0	0	0	0	0	0	3	0	2	1		
60-64	2	0	0	0	0	0	0	0	0	0	0	1	0	1	0		
65-69	2	0	0	0	0	0	0	0	0	0	0	1	0	1	0		
70-74	2	0	0	0	0	0	0	0	0	0	0	1	0	0	1		
AGE 45-54 AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE																	
ALL AGES AT OBSERVATION	7	0	0	0	0	0	0	0	0	0	0	0	0	7	0		
60-64	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0		
65-69	6	0	0	0	0	0	0	0	0	0	0	0	0	6	0		
AGE 45-54 AT EXPOSURE, 20.5-23.4 YEARS SINCE EXPOSURE																	
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0		
70-74	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0		
AGE 55+ AT EXPOSURE, 2.5-5.4 YEARS SINCE EXPOSURE																	
ALL AGES AT OBSERVATION	5	0	0	0	0	0	0	3	0	0	2	0	0	0	0		
60-64	2	0	0	0	0	0	0	2	0	0	0	0	0	0	0		
65-69	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0		
70-74	2	0	0	0	0	0	0	1	0	0	1	0	0	0	0		
AGE 55+ AT EXPOSURE, 5.5-8.4 YEARS SINCE EXPOSURE																	
ALL AGES AT OBSERVATION	8	0	0	0	0	0	0	3	0	3	0	2	0	0	0		
60-64	4	0	0	0	0	0	0	1	0	2	0	1	0	0	0		
65-69	3	0	0	0	0	0	0	2	0	1	0	0	0	0	0		
70-74	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0		
AGE 55+ AT EXPOSURE, 8.5-11.4 YEARS SINCE EXPOSURE																	
ALL AGES AT OBSERVATION	6	0	0	0	0	0	0	1	0	2	0	2	1	0	0		
65-69	2	0	0	0	0	0	0	0	0	1	0	1	0	0	0		
70-74	2	0	0	0	0	0	0	1	0	1	0	0	0	0	0		
75-79	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0		
AGE 55+ AT EXPOSURE, 11.5-14.4 YEARS SINCE EXPOSURE																	
ALL AGES AT OBSERVATION	8	0	0	0	0	0	0	0	0	1	0	6	0	1	0		
65-69	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0		
70-74	3	0	0	0	0	0	0	0	0	1	0	2	0	0	0		
75-79	2	0	0	0	0	0	0	0	0	0	0	1	0	1	0		
AGE 55+ AT EXPOSURE, 14.5-17.4 YEARS SINCE EXPOSURE																	
ALL AGES AT OBSERVATION	5	0	0	0	0	0	0	0	1	0	0	1	1	2	0		
70-74	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0		
75-79	4	0	0	0	0	0	0	0	1	0	0	1	1	1	0		
AGE 55+ AT EXPOSURE, 17.5-20.4 YEARS SINCE EXPOSURE																	
ALL AGES AT OBSERVATION	2	0	0	0	0	0	0	0	0	0	0	1	0	1	0		
70-74	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0		
80-84	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0		
AGE 55+ AT EXPOSURE, 20.5-23.4 YEARS SINCE EXPOSURE																	
ALL AGES AT OBSERVATION	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0		
80-84	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0		

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 35-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM CANCER OF PHARYNX

TABLE 35-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR															
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9			
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES		
AGE AT OBSERVATION																	
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE																	
ALL AGES AT OBSERVATION	3	0	0	1	0	0	0	0	0	0	0	0	0	2	0	0	0
50-54	2	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0
55-59	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

122

TABLE 36-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM CANCER OF ESOPHAGUS

TABLE 36-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
AGE AT OBSERVATION															
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	10	0	0	0	0	0	0	0	0	1	1	6	0	2	0
40-44	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
50-54	3	0	0	0	0	0	0	0	0	1	0	2	0	0	0
55-59	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
60-64	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
70-74	3	0	0	0	0	0	0	0	0	0	1	2	0	0	0
75-79	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 37-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM CANCER OF STOMACH

TABLE 37-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
AGE AT OBSERVATION		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	39	0	0	0	0	1	0	5	0	6	3	16	1	5	2
40-44	2	0	0	0	0	0	0	0	0	1	1	0	0	0	0
45-49	5	0	0	0	0	1	0	2	0	0	0	1	0	1	0
50-54	3	0	0	0	0	0	0	0	0	0	0	3	0	0	0
55-59	6	0	0	0	0	0	0	0	0	1	2	2	0	0	1
60-64	6	0	0	0	0	0	0	0	0	1	0	3	0	2	0
65-69	9	0	0	0	0	0	0	2	0	1	0	4	0	2	0
70-74	6	0	0	0	0	0	0	1	0	2	0	2	0	0	1
75-79	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
80-84	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

123

TABLE 38-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM CANCER OF PANCREAS

TABLE 38-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
AGE AT OBSERVATION		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	13	0	0	0	0	0	0	1	1	4	0	4	1	2	0
45-49	3	0	0	0	0	0	0	0	0	1	0	1	0	1	0
50-54	4	0	0	0	0	0	0	1	0	2	0	0	0	1	0
60-64	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
70-74	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
75-79	3	0	0	0	0	0	0	0	1	0	0	1	1	0	0
80-84	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

RRF TR 4-84

TABLE 39-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM CANCER OF LARYNX

TABLE 39-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR														
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9		
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	
AGE AT OBSERVATION																
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	3	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0
55-59	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
65-69	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
70-74	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 40-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM CANCER OF LUNG AND PLEURA

TABLE 40-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
AGE AT OBSERVATION															
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	111	0	0	0	0	3	0	10	0	28	0	29	1	37	3
35-39	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
40-44	6	0	0	0	0	1	0	1	0	2	0	1	0	1	0
45-49	18	0	0	0	0	0	0	3	0	8	0	3	0	4	0
50-54	17	0	0	0	0	2	0	0	0	6	0	7	0	2	0
55-59	23	0	0	0	0	0	0	2	0	2	0	5	0	11	3
60-64	30	0	0	0	0	0	0	3	0	9	0	10	0	8	0
65-69	10	0	0	0	0	0	0	0	0	1	0	3	0	6	0
70-74	3	0	0	0	0	0	0	1	0	0	0	0	0	2	0
75-79	3	0	0	0	0	0	0	0	0	0	0	0	1	2	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 41-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM CANCER OF OVARIES

TABLE 41-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR														
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9		
AGE AT OBSERVATION		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE																
ALL AGES AT OBSERVATION	4	0	0	0	0	0	0	0	0	1	0	2	0	1	0	0
55-59	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0	0
60-64	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
65-69	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 42-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM CANCER OF SKIN

TABLE 42-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
AGE AT OBSERVATION		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES

NOTE: THERE WERE NO DEATHS FROM THIS CAUSE

TABLE 43-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM CANCER OF BONES (EXCLUDING JAW AND NOSE)

TABLE 43-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
AGE AT OBSERVATION		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	3	0	0	0	0	0	0	0	0	1	0	2	0	0	0
50-54	3	0	0	0	0	0	0	0	0	1	0	2	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 44-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM MULTIPLE MYELOMA

TABLE 44-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
AGE AT OBSERVATION		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	3	0	0	0	0	0	0	0	0	1	0	2	0	0	0
40-44	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0
50-54	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
70-74	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 45-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM OTHER LYMPHOMAS

TABLE 45-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
AGE AT OBSERVATION		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	12	0	0	0	0	1	0	1	0	1	0	3	3	2	1
30-34	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0
40-44	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
45-49	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0
55-59	4	0	0	0	0	0	0	0	0	0	0	2	0	1	1
65-69	2	0	0	0	0	0	0	0	0	0	0	0	2	0	0
70-74	2	0	0	0	0	0	0	0	0	1	0	0	0	1	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

127

TABLE 46-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM CENTRAL NERVOUS SYSTEM
TUMORS (SPINAL CORD AND NERVES ONLY)

TABLE 46-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
AGE AT OBSERVATION		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	4	0	0	1	0	0	0	0	0	1	0	0	0	2	0
25-29	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0
40-44	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
45-49	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
75-79	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED

TABLE 47-1 ANKYLOSING SPONDYLITIS SERIES DEATHS FROM NEOPLASMS OF OTHER SITES WHICH WERE HEAVILY IRRADIATED

TABLE 47-1

AGE AT EXPOSURE YEARS SINCE EXPOSURE	TOTAL	CALENDAR YEAR													
		1935-40		1941-45		1946-50		1951-55		1956-60		1961-5		1966-9	
AGE AT OBSERVATION		MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES	MALES	FEMALES
ALL AGES AT EXPOSURE, TOTAL 2.5+ YEARS SINCE EXPOSURE															
ALL AGES AT OBSERVATION	21	0	0	0	0	0	0	6	1	5	0	6	0	3	0
40-44	2	0	0	0	0	0	0	0	0	0	0	2	0	0	0
45-49	5	0	0	0	0	0	0	2	1	2	0	0	0	0	0
50-54	2	0	0	0	0	0	0	0	0	2	0	0	0	0	0
55-59	3	0	0	0	0	0	0	1	0	1	0	1	0	0	0
60-64	2	0	0	0	0	0	0	1	0	0	0	1	0	0	0
65-69	5	0	0	0	0	0	0	2	0	0	0	1	0	2	0
70-74	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
80-84	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0

NOTE: LINES WITH ALL ENTRIES 0 ARE OMITTED