ACCURACY OF DIAGNOSIS OF CANCER IN THE
JNIH-ABCC LIFE SPAN STUDY SAMPLE

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お け る 癌 の 診 断 の 正 確 性

ARTHUR STEER, M.D.
CHARLES E. LAND, Ph.D.
IWAO M. MORIYAMA, Ph.D.
TSUTOMU YAMAMOTO, M.D. 山本 務
MASAHIDE ASANO, M.D. 浅野正英
HAYATO SANEFUJI, M.D. 実藤隼人

放影研
RERF

RADIATION EFFECTS RESEARCH FOUNDATION
財 団 法 人 放 射 線 影 響 研 究 所

A cooperative Japan - United States Research Organization
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ARTHUR STEER, M.D.[1]; CHARLES E. LAND, Ph.D.[2]; IWAO M. MORIYAMA, Ph.D.[2];

TSUTOMU YAMAMOTO, M.D.(山本 務)[1]; MASAHIDE ASANO, M.D.(浅野正英)[1];

HAYATO SANEFUJI, M.D.(実藤隼人)[1]

Departments of Pathology[1] and Epidemiology & Statistics[2]
病理部[1] および疫学統計部[2]

SUMMARY

The accuracy of death certificate diagnoses of cancer in the JNIH-ABCC Life Span Study sample (extended) was determined for the period 1961-70 by comparison with autopsy findings. In general, when the death certificate listed cancer as a cause of death it was found at autopsy in a high proportion of cases. However, cancer was not always reported on death certificates, indicating that cancer occurs more frequently than recorded by official mortality statistics. Older persons, persons who die at home, and persons with certain cancers are more likely not to have cancer named on death certificates. It is estimated that in the 10,749 deaths occurring at home or in hospital, there were 32% more deaths due to cancer than certified on death certificates (3095 vs 2345), and for persons aged 70 or more dying at home it is estimated there were 55% more stomach cancers (269 estimated vs 174 listed) and 244% more lung cancers (141 estimated vs 41 lsited) than were certified on death certificates. It is also estimated that total cancer of the uterine cervix occurred 345% more frequently (138 estimated vs 31 listed) than indicated by death certificates. The inability to designate the primary site of a cancer or even the presence of cancer in so many persons who have died of

要　約

1961－70年の間の予研－ABCC寿命調査拡大対象群の死亡者についての死亡診断書に記載されている癌の診断の正確性を剖検所見と比較して求めた. 一般に, 死亡診断書に癌が死因として記載されていた場合, 剖検時において癌が認められる率は高かった. しかし, 癌のすべてが死亡診断書に記載されていたわけではない. このことは公式に発表された死亡統計に記録されているよりも癌の発生頻度が高いことを示す. 高齢者, 自宅死亡者, 特定の種類の癌を有する患者においては, 死亡診断書に癌が記載されていない場合が多い. 自宅または病院で死亡した10,749例において, 死亡診断書に死因として癌が記載されていた者よりも実際には32%（3095例対2345例）も多く癌で死亡していると推定され, また70歳以上の患者で, 自宅で死亡したもののうち, 死亡診断書に胃癌と記載されていた者よりも実際には55%（推定数269例対記載数174例）, 肺癌では244%（推定数141例対記載数41例）も多かったものと推定される. また, 子宮頚管癌総数では, 死亡診断書に記載されたものよりも 345%（推定数138例対記載数31例）もの高い頻度で存在していたものと推定されている. 一般に認められているように, 早期診断によって大きく左右されるこの疾患において, これほど多くの癌死亡

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cancer offers no encouraging prospect of improving cancer cure rates which, it is generally accepted, are heavily dependent on early diagnosis.

INTRODUCTION

Death certificate data are the source for much medical and epidemiologic information although it has long been recognized that the certified causes of death vary greatly in accuracy. Some diseases are more easily diagnosed than others and cause-specific mortality statistics consequently may be of great or little value. Place of death and age are also factors in accuracy of diagnosis. The more sophisticated apparatus and techniques and' the more aggressive diagnostic procedures employed in hospitals compared to home and office practice should result in more accurate diagnoses. Patients who die in hospitals on the average are younger and have shorter episodes than patients who die at home. Physicians are often reluctant to urge elderly patients to undergo extensive or exhausting diagnostic procedures and consequently diagnosis may be less accurate for older persons.

Accuracy of death certificate diagnosis is often assessed by comparison with autopsy diagnosis in the same case. A method frequently used determines for each condition how often the clinical diagnosis was confirmed at autopsy (the confirmation raté) and how often the condition found at autopsy was detected by death certificate diagnosis (the detection rate). A high confirmation rate indicates that few false positive diagnoses were made; that when the condition was diagnosed by the attending physician it was usually found at autopsy. A high detection rate indicates that there were few false negative diagnoses; that when the condition was found at autopsy it had already been entered on the death certificate.

In the usual studies which compare clinical findings with autopsies, the death certificate diagnosis is not independent of the autopsy diagnosis. The results of autopsy studies are frequently taken into account in the medical certification of death. To be sure the microscopic findings are not available at the time of death registration. However, in many areas the practice is to amend the medical certificate of death when the autopsy findings are filed. In the

例の原発部位の指摘またはその有無さえも探知できなかったことは，癌治癒率を改善する上で大きな期待がもてないことを示している．

緒 言

死亡診断書に記載されている死因は，その正確性に大きな差異があることが以前から認められているにもかかわらず，多くの医学的並びに疫学的情報源となっている．ある疾患は他の疾患よりも診断が容易であるため，原因別死亡統計には大きな価値のあるものもあれば，そうでないものもある．死亡の場所および年齢も，診断の正確性と関係のある因子である．病院で使用される精密な装置や技法および積極的な診断法によれば，家庭診療や医院診療に比較して，もっと正確性のある診断が得られるはずである．病院で死亡する人は，自宅で死亡する人よりも，普通年齢的に若く，しかも，その罹病期間は短かい．医師は多くの場合高齢者に対しては詳細で徹底した検診を実施することを差し控えるため，高齢者に対する診断は正確性の点で劣ると考えられる．

死亡診断書の正確性は，多くの場合同じ症例における剖検診断との比較によって評価される．よく用いられる方法では，各疾患状態別に，臨床診断がどの程度の頻度で剖検によって確認されるか，すなわち確認率と，剖検で認められる疾患状態がどの程度の頻度で死亡診断書で発見されるか，すなわち発見率，とを求める．高い確認率が得られた場合は，偽陽性診断がほとんどなかったことを示す．すなわち，担当医によって診断された疾患状態は通常剖検においても認められたことになる．高い発見率は，偽陰性診断がほとんどなかったことを示す．すなわち，剖検で認められた疾患状態は，すでに死亡診断書に記載されていたことを示す．

臨床所見と剖検所見の比較を行う通常の調査では，死亡診断書の診断は剖検診断と無関係ではない．剖検の結果はしばしば，死亡診断書の作成段階で考慮されている．もちろん，死亡届提出の時点では，顕微鏡所見は入手されていないが，多くの地方では，剖検所見を綴じ込める時点で死亡診断書の修正が行われている．癌による死亡である場合は，悪性の有

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case of cancer deaths, a biopsy is frequently taken to ascertain the fact of malignancy. These considerations lead to greater precision in the identification of malignancy at the time of medical certification.

In the JNIH-ABCC Pathology Studies, the medical certifications are independent of autopsies. The medical certificates are completed and the death certificates are already on file before autopsy. In fact, it is the registration of the death which alerts the contactors to seek permission for the autopsy. Therefore, the confirmation and detection rates in these studies are more meaningful than in studies where autopsy findings are used in preparing the returns on causes of death.

Takeda and Kobayashi[1] examined the reliability of cancer diagnosis in Japan. They concluded that cancer in general was underdiagnosed and that the degree of error varied with the type of cancer and to a certain extent with age at death. Jablon et al[2] used confirmation and detection rates to examine the accuracy of death certificates in 1215 JNIH-ABCC Life Span Study sample cases autopsied during the period 1950-62 of which 338 were certified as due to malignancy. They too concluded that malignant disease was underdiagnosed on death certificates and probably underestimated by vital statistics death rates. Diagnosis of malignancy, they found, was no more reliable (confirmation rate) for hospital than for home deaths but cancer was more likely to be detected in persons dying in a hospital. Based on death certificate data Segi et al[3] have shown that, in Japan, mortality rates for different specific cancers have changed in recent years and that prevalence of various cancers varies greatly by age at death and by prefecture. However, it is not clear that a change in accuracy of death certification is related to these altered rates or that there has been any change in the accuracy of death certification.

This report presents data on the occurrence of cancer in a larger series of ABCC cases accumulated during a 10-year period, 1961-70, and examines them for change in accuracy of diagnosis. Confirmation and detection rates for the cases autopsied are presented and in addition an estimate is made of the probable occurrence of fatal cancer in all those who died if these rates were applied to the subjects who were not autopsied.

無を確認するためしばしば組織検査が行われる．このような検査により，死亡診断書の段階での悪性新生物の識別に，より高い精度が得られるようになった．

予研－ABCC病理学的調査では，診察記録は剖検と関係がない．剖検は，診察記録が完成し，死亡診断書が届けられた後に行われる．実際には，死亡届の提出をもとに剖検承諾を求めることにしている．従って，この調査における確認率および発見率は，剖検所見を用いて死亡診断書の死因を記入する調査のそれよりも意義がある．

武田および小林は，[1]　日本における癌診断の信頼度について調べた．その結果，癌の診断は一般に過少になされ，癌の種類および死亡時年齢によってもある程度誤差の度合いに差があるとの結論に達した．Jablon ら[2]は1950－62年の間に予研－ABCC寿命調査の対象群中剖検を受けた者1215例の死亡診断書の正確度を調べるため，確認率および発見率を使用した．そのうち338例が死亡診断書死因が悪性腫瘍であった．彼らも，死亡診断書で悪性新生物の診断が見落とされ，人口動態死亡率においても過少に見積もられている可能性があるとの結論に達した．悪性新生物の診断（確認率）では自宅死亡と病院死亡との間に差は認められなかったが，癌は病院で死亡した症例に発見される可能性が高かった．死亡診断書からの資料をもとに瀬木ら[3]は，日本においては特定の癌による死亡率は近年変動しており，また，癌の種類別有病率における変動は死亡時年齢および在住の県によって大きく異なることを指摘した．しかし，死亡診断書の正確度に認められる変化が，これらの率の変動と関係があるのか，また，死亡診断書自体の正確度に変化があったかどうかは不明である．

本報告では1961年から70年の10年間に集められた多くのABCC剖検例中に認められた癌症例の発生に関する資料を示し，診断の正確度について調べる．剖検例の確認率および発見率を示すと共に，剖検を受けなかった人にこの率を適用した場合の致命的癌発生の可能性について推定した．

METHODS

As part of the study of the delayed effects from
the atomic bombs, intensive surveillance is main-
tained of a mortality study sample of approxi-
mately 100,000 A-bomb survivors and non-
exposed persons who were living in 1950 and
had their Honseki* in or near Hiroshima or
Nagasaki cities.[4] Ascertainment of the fact of
death and review of death certificates are virtually
complete (Use of survey cards approved by
Administration Management Agency). A trained
and experienced team attempts to get permission
for autopsy on all study sample deaths without
regard to place of death, age, sex, cause of death,
or history of radiation exposure. For death
certificates, the underlying cause of death is
determined in accordance with the ICD rules.[5]
All autopsy diagnoses were reviewed by the
senior author and, for cancer, were designated by
the same rules but coded by cell type as well as
primary site.

Place of death was assigned to one of two
categories; hospital (or clinic) and home. A
small number of cases were excluded because
death had occurred away from home or medical
facility as a result of traumatic injury.

Confirmation and detection rates were calculated
for deaths due to cancer using the usual formulas:

For disease "A"

$$\text{Confirmation rate} = \frac{\text{Disease "A" designated on both death certificate \& autopsy}}{\text{Disease "A" designated on death certificate}}$$

$$\text{Detection rate} = \frac{\text{Disease "A" designated on both death certificate \& autopsy}}{\text{Disease "A" designated on autopsy}}$$

Rates were calculated for all malignancies as a
group, and separately for five specific sites by
five age groups, sex, and place of death. The
site-specific cancer data are examined in two
ways; first, confirmation and detection rates for
each site of cancer and second, detection rates
with respect to any form of cancer, for death
classified by autopsy diagnosis. The first method

方　法

原爆の後影響調査の一環として，1950年現在生存
していて，本籍が広島市および長崎市またはその周
辺にあった被爆者および非被爆者100,000人からな
る寿命調査集団について厳格な観察調査が行われて
きた.[4] 死亡の事実の確認および死亡診断書の検討
はほとんど完了している（調査票の使用については
行政管理庁の承認を受けている）. 調査集団に含まれ
ている対象者が死亡した場合，訓練され経験を積ん
だ係員が，死亡の場所，年齢，性，死因および被爆
状態に関係なく剖検の承諾を得るべく努力する. 死
亡診断書における原死因はICD規程[5]によって決定
する. すべての剖検診断は筆頭著者によって再検討
され，癌についても上記規程に従うと同時に，細胞
型および原発部位をもとにコードした.

死亡の場所は病医院と自宅の二つの項目に分類した.
従って，自宅や医療施設以外の場所で外傷のため死
亡した少数例は除外した.

癌による死亡の確認率および発見率は通常の計算式
で求めた：

例えば，疾患Aの場合は次のようにして求めた.

死亡診断書および剖検所見共に疾患A

死亡診断書に疾患A

死亡診断書および剖検所見共に疾患A

剖検診断書に疾患A

率はすべての悪性新生物をまとめて計算すると共に，
五つの特定部位別，5歳年齢群別，性および死亡の
場所別に求めた. 部位別特定癌についての資料は
二つの方法で検討された. すなわち，第1の方法は
各部位の癌における確認率および発見率を用いる
ものであり，第2の方法は剖検診断によって分類さ
れたすべての種類の癌の発見率を用いるものである.

Honseki — Place where family vital statistics are maintained.

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indicates whether the specific cancer site was recognized and the second whether any form of cancer was recognized at the time of death.

Based on autopsy findings improved estimates of the number of deaths from each of several causes within a given sex, age, and place of death grouping can be anticipated from a death certificate diagnosis stratification scheme. For this purpose, the death certificate diagnoses were categorized as ischemic heart disease, stroke, other noncancer diagnoses, cancer of stomach, lung, breast, uterine cervix, leukemia, and "other" cancers. Estimated frequencies and their variances were computed within strata and summed, for each type of cancer, within age, sex, and place of death groupings. An example of the procedure is given in Appendix 1. The estimated frequencies were compared with corresponding frequencies obtained from death certificates, in order to assess the extent to which death-certificate-based vital statistics giving number of deaths from cancers of various types may be biased by death certificate inaccuracies.

第1の方法は，特定の部位の癌が確認されたか否かを示すものであり，第2の方法は，死亡時に種類に関係なく癌が確認されたか否かを示すものである．

剖検所見をもとに，死亡診断層化法によって性，年齢および死亡の場所別に分類した群中における死亡者数の原因別推定の精度の改善が期待できる．このために，死亡診断名を虚血性心疾患，卒中，その他の非癌疾患，胃癌，肺癌，乳癌，子宮頸癌，白血病およびその他の癌に分類した．推定頻度およびその分散を癌の種類，年齢，性および死亡の場所別に層内で計算して合計した．その方法の例を付録1に示す．死亡診断書に基づく人口動態統計から得られる各種癌による死亡数が死亡診断書の不正確性の故に生ずる偏りの程度を評価するために，推定頻度と死亡診断書から得られた頻度とを比較した．

RESULTS

There were 10,749 deaths in the study sample; 57.2% occurred at home and 42.8% in hospitals or clinics (Table 1). Cancer was the certified cause of death in 21% and most of these deaths (68.2%) occurred in hospitals. The autopsy rate was higher (44%) for persons with clinical diagnosis of malignant disease than for others (32%). The overall confirmation rate for cancer was about 95% and did not differ significantly by place of death. The detection rate was lower than the confirmation rate and was lower for home deaths than for hospital or clinic deaths. All factors in the analyses which follow were examined for evidence of a difference by sex but no significant differences were found.

The distribution of cancers as diagnosed on death certificates and as found at autopsies is given in Table 2 by age and place of death. Although the majority died in hospitals or clinics, the proportion of deaths in hospital decreased progressively with increasing age and for those 80 years or older, approximately 60% died at home.

Confirmation and detection rates for all cancers as a group and for five specific sites separately are given in Table 3 and Appendix 2. Confirma-

結　果

対象集団中に10,749の死亡例があり，その57.2%は自宅で，残り42.8%は病医院で死亡している（表1）．死因が癌となっていたものは21%で，この大部分（68.2%）は病院で死亡した．剖検率は臨床診断が悪性疾患であった症例において高かった（44%対32%）．全体としての癌の確認率は約95%であって，死亡の場所による有意な差はなかった．発見率は確認率よりも低く，また，病医院死亡よりも自宅死亡者において低かった．下記の各要因について性による差を調べたが，有意な差は認められなかった．

死亡診断書で診断され，また剖検で認められた癌の分布は，年齢および死亡の場所別に表2に示した．大部分の患者が病医院で死亡したにもかかわらず，年齢の上昇と共に病院での死亡は漸次減少し，80歳以上では60%が自宅で死亡していた．

全癌と五つの特定部位別の癌における確認率と発見率は表3および付録2に示す．確認率には，年齢，

TABLE 1 DEATHS AND AUTOPSIES DETECTION AND CONFIRMATION RATES FOR CANCER
BY PLACE OF DEATH, HIROSHIMA & NAGASAKI 1961-70

表 1 癌による死亡および剖検数ならびに発見率および確認率: 死亡の場所別
広島・長崎, 1961 - 70年

	Total	Home	Hospital
Total deaths	10749	6147	4602
Total cancer by death certificate	2345	746	1599
Autopsies	3708	1786	1922
Autopsies with cancer on death certificate	1022	260	762
Autopsies with cancer at autopsy	1256	369	887
Cancer on both death certificate and autopsy	961	247	714
Confirmation rate	94.0	95.0	93.7
Detection rate	76.5	66.9	80.5

TABLE 2 DIAGNOSES OF CANCER ON DEATH CERTIFICATES AND AT AUTOPSY
BY PLACE AND AGE AT DEATH

表 2 死亡診断書および剖検診断が癌であった症例数: 死亡の場所および
死亡時年齢別

Cancer Diagnosis	Place of Death	Total	Age at Death				
			-49	50-59	60-69	70-79	80 +
Death certificate	Home	746	31	102	219	279	115
	Hospital	1599	239	289	542	452	77
	% Hospital	68.2	88.5	73.9	71.2	61.8	40.1
Autopsy	Home	369	8	28	102	140	91
	Hospital	887	117	133	304	279	54
	% Hospital	70.6	93.6	82.6	74.9	66.6	37.2

tion rates do not vary significantly by age, cancer site, or place of death. Detection rates, however, vary considerably. Thye are higher for younger persons and for deaths in hospital or clinic and differ according to cancer type. Almost all breast cancers and leukemias found at autopsy were diagnosed on death certificates. The detection rates for stomach and lung cancers were lower especially for those dying at home and at age 70 or older.   Cancer of the uterine cervix was diagnosed infrequently.   Although 55 women had carcinoma of the cervix at autopsy none of the 14 who died at home and only 10 of the 41 who died in hospitals had this diagnosis on death certificate.

Detection rates were calculated separately for both site-specific cancer and presence of any malignancy by age and place of death (Table 4). It is evident that the presence of cancer is recognized even though the primary site is not

癌の部位および死亡の場所による有意な変動はない. 反面, 発見率は相当変動する. すなわち, 若年者および病医院における死亡では高く, また, 癌の種類によって率が異なる. 剖検で認められたすべての乳癌および白血病は, 死亡診断書に記載されていた. 胃癌および肺癌の発見率は低く, 自宅死亡者および70歳以上の者においては特に低かった. 子宮頚癌は少数しか認められなかった. 剖検時に子宮頚癌の認められた婦人患者が55例いたが, 死亡診断書にこれが記載されていたのは, 自宅死亡者14例中1例もなく, また, 病院死亡者41例中10例のみであった.

発見率は部位別特定癌と全悪性新生物それぞれにつき年齢および死亡の場所別に計算された (表4). 死亡診断書に原発部位が正確に記載されていなくても, 癌の存在が探知されていたことは明白である.

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TABLE 3 CONFIRMATION AND DETECTION RATES FOR ALL CANCERS, STOMACH, LUNG, BREAST, & CERVICAL CANCER & LEUKEMIA BY AGE AND PLACE OF DEATH

表3　全癌, 胃癌, 肺癌, 孔癌, 子宮頸癌および白血病の確認率および発見率：年齢および死亡の場所別

Type of Cancer & Place of Death	Number*	Total Rate		Age at Death −49 Rate		50-59 Rate		60-69 Rate		70-79 Rate		80 + Rate	
		Confirm	Detect	Confirm	Detect	Confirm	Detect	Confirm	Detect	Confirm	Detect	Confirm	Detect
All Cancers													
Home	246/369	95.0	66.9	71.4	62.5	100	85.7	97.7	82.4	94.1	67.9	92.9	42.9
Hospital	715/887	93.8	80.6	96.0	81.2	96.6	85.7	92.4	83.6	94.4	78.5	86.8	61.1
Stomach Cancer													
Home	87/135	82.1	64.4	100.0	66.7	87.5	87.5	75.6	77.5	91.9	66.7	72.2	39.4
Hospital	205/253	85.1	81.0	89.3	83.3	87.1	79.8	85.7	88.6	83.5	75.9	75.0	64.3
Lung Cancer													
Home	25/ 64	92.6	39.1	-	-	100.0	66.7	91.7	55.0	91.7	39.3	100.0	7.7
Hospital	87/138	82.9	52.6	33.3	16.7	85.7	85.7	91.3	71.2	73.7	70.0	100.0	44.4
Breast Cancer													
Home	8/ 9	87.5	88.9	0	0	100.0	100.0	100.0	100.0	100.0	66.7	87.5	100.0
Hospital	24/ 30	100.0	80.0	100.0	70	100.0	80.0	100.0	80.0	100.0	100.0	-	-
Cervical Cancer													
Home	0/ 14	-	0	-	0	-	0	-	0	-	0	-	0
Hospital	10/ 41	90.9	24.4	100.0	28.6	75.0	37.5	100.0	18.8	100.0	25.0	-	0
Leukemia													
Home	1/ 1	100.0	100.0	-	-	-	-	-	-	100.0	100.0	-	-
Hospital	26/ 28	83.9	92.9	81.3	92.9	100.0	100.0	85.7	100.0	75.0	75.0	-	-

* = Number diagnosed on death certificate/number diagnosed at autopsy

− = No diagnoses on death certificate or at autopsy

0 = Cancer diagnosed on death certificate but not confirmed at autopsy, or present at autopsy but not on death certificate

TABLE 4 DETECTION RATES FOR SPECIFIC CANCERS BY PLACE AND AGE AT DEATH

表 4 　特定癌の発見率: 死亡の場所および死亡時年齢別

Site	Place	Detected	Age at Death					
			-49	50-59	60-69	70-79	80 +	Total
Stomach	Home	*a Number	3	8	40	51	33	135
		b % this site	67	88	78	67	39	64
		c % as cancer	67	100	90	78	42	74
	Hospital	Number	30	34	88	87	14	253
		% this site	83	80	89	76	64	81
		% as cancer	97	91	97	87	64	91
Lung	Home	Number	0	3	20	28	13	64
		% this site	-	67	55	39	8	39
		% as cancer	-	67	70	43	23	48
	Hospital	Number	6	14	59	40	9	138
		% this site	17	86	71	70	44	53
		% as cancer	17	86	83	83	56	72
Breast	Home	Number	0	4	1	3	1	9
		% this site	-	100	100	67	100	89
		% as cancer	-	100	100	67	100	89
	Hospital	Number	10	10	5	5	0	30
		% this site	70	80	80	100	-	80
		% as cancer	80	100	80	100	-	90
Cervix	Home	Number	1	2	6	4	1	14
		% this site	0	0	0	0	0	0
		% as cancer	100	100	100	75	100	93
	Hospital	Number	7	8	16	8	2	41
		% this site	29	38	19	25	0	24
		% as cancer	71	88	88	75	50	80
Leukemia	Home	Number	0	0	0	1	0	1
		% this site	-	-	-	100	-	
		% as cancer	-	-	-	100	-	100
	Hospital	Number	14	4	6	4	0	28
		% this site	93	100	100	75	-	93
		% as cancer	93	100	100	75	-	93

*a = Number of autopsy diagnoses of cancer at this site.
 b = % detected by death certificate as cancer of this site.
 c = % detected as cancer without regard to site.

correctly stated on the death certificate. This is especially true of carcinoma of the cervix. For home deaths, 13 of the 14 women with this diagnosis at autopsy were certified as cancer deaths but cervical cancer was diagnosed in none. Similarly 33 of the 41 women dying in hospitals were certified as cancer deaths but only 10 as cervical cancer deaths.

The number of deaths due to all cancers and to five specific sites were estimated for all deaths based on autopsy findings as described above. Table 5 gives the number reported on death

このことは特に子宮頚癌の場合に認められた. 自宅死亡例のうち剖検で子宮頚癌と診断された14例中13例は死亡診断書に癌と記載されていたが, 子宮頚癌と診断されたものは1例もなかった. 同様に病院死亡例のうち剖検診断で子宮頚癌のあった41例中33例は死亡診断書に癌と記載されながら, 子宮頚癌と診断されたのは10例のみであった.

上述したように, 全癌および五つの特定部位癌による死亡数は, 剖検所見のある全死亡例をもとに推定された. 表5には, 死亡診断書に記載された数と

TABLE 5 DEATHS BY TYPE OF CANCER, ACCORDING TO DEATH CERTIFICATE
& ESTIMATED FROM AUTOPSY DATA, BY AGE AT DEATH

表 5　死亡診断書および剖検資料により推定した癌の種類別死亡者数：死亡時年齢別

Cause	Place of Death	Source	Age at Death					Total
			-49	50-59	60-69	70-79	80 +	
			MALE					
Total Cancer	Home	Death Cert.	31	102	219	279	115	746
		Autopsy:est.	31.5	117.9	276.1	436.1	285.5	1147.1
		±SD	5.7	6.9	12.4	21.2	20.4	33.1
	Hospital	Death Cert.	239	289	542	452	77	1599
		Autopsy:est.	297.7	328.4	639.3	567.2	115.4	1948.0
		±SD	12.1	9.0	15.6	13.6	8.2	26.9
	Total	Death Cert.	270	391	761	731	192	2345
		Autopsy:est.	329.1	446.3	915.4	1003.3	401.0	3095.1
		±SD	13.3	11.3	19.9	25.2	21.9	42.6
Stomach	Home	Death Cert.	15	44	102	125	49	335
		Autopsy:est.	17.0	37.8	105.7	169.6	99.7	429.9
		±SD	2.3	4.1	9.4	12.4	13.6	21.2
	Hospital	Death Cert.	76	97	212	155	25	565
		Autopsy:est.	80.4	102.7	205.6	176.5	31.2	596.5
		±SD	5.7	6.8	8.8	8.7	5.0	16.0
	Total	Death Cert.	91	141	314	280	74	900
		Autopsy:est.	97.5	140.6	311.2	346.1	131.0	1026.3
		±SD	6.2	8.0	12.9	15.1	14.5	26.6
Lung	Home	Death Cert.	2	6	23	36	5	72
		Autopsy:est.	1.3	10.7	49.6	95.5	45.7	202.8
		±SD	.3	3.8	8.0	12.5	10.2	18.5
	Hospital	Death Cert.	10	30	65	66	10	181
		Autopsy:est.	21.1	31.5	99.4	99.9	20.4	272.3
		±SD	5.8	3.3	7.5	8.8	3.7	13.8
	Total	Death Cert.	12	36	88	102	15	253
		Autopsy:est.	22.4	42.2	149.1	195.4	66.0	475.0
		±SD	5.8	5.0	11.0	15.3	10.9	23.1
			FEMALE					
Breast Cancer	Home	Death Cert.	1	6	2	2	3	14
		Autopsy:est.	1.7	· 6.0	2.0	5.9	3.0	18.5
		±SD	0.3	· 0	0	3.3	0	3.4
	Hospital	Death Cert.	21	·13	9	8	0	51
		Autopsy:est.	29.3	16.7	11.6	8.0	0	65.5
		±SD	3.7	1.6	2.0	0	0	4.5
	Total	Death Cert.	22	19	11	10	3	65
		Autopsy:est.	31.0	22.7	13.6	13.9	3.0	84.1
		±SD	3.7	1.6	2.0	3.3	0	5.6
Cervical Cancer	Home	Death Cert.	0	1	1	0	0	2
		Autopsy:est.	2	9.7	19.1	9.2	2.9	42.9
		±SD	1.4	4.9	5.4	3.4	2.3	8.7
	Hospital	Death Cert.	6	10	7	6	0	29
		Autopsy:est.	20.3	19.0	32.9	18.8	4.5	95.4
		±SD	5.0	4.2	4.8	3.7	2.4	9.3
	Total	Death Cert.	6	11	8	6	0	31
		Autopsy:est.	22.3	28.7	52.0	28.0	7.4	138.2
		±SD	5.2	6.4	7.2	5.4	3.3	12.7

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Table 5 (Cont.)　　表5　（続き）

Cause	Place of Death	Source	Age at Death					Total
			-49	50-59	60-69	70-79	80 +	
Leukemia	Home	Death Cert.	0	0	2	2	1	5
		Autopsy:est.	0	0	1.7	1.9	1	5.0
		±SD	0	0	.1	.1	0	.2
	Hospital	Death Cert.	25	7	13	6	0	51
		Autopsy:est.	23.5	7	11.4	7.2	0	49.1
		±SD	4.0	0	1.0	1.7	0	4.4
	Total	Death Cert.	25	7	15	8	1	56
		Autopsy:est.	23.5	7	13.1	9.1	1	53.7
		±SD	4.0	0	1.0	1.7	0	4.4

certificates and the estimated number by age and place of death. Figure 1 depicts in semilog graphs the percentage of death-certificate-diagnosed cancers among estimated deaths from cancer by age and place of death, with 90% upper and lower confidence limits. It is evident that cancer is underdiagnosed for most categories, particularly in the elderly. The fact that the upper confidence limits are in most cases well below 100% is evidence that the observed underdiagnosis is unlikely to be due to sampling variation. In some groups, such as lung cancer in 80-year-old persons dying at home, almost 90% are not diagnosed even at the time of death.
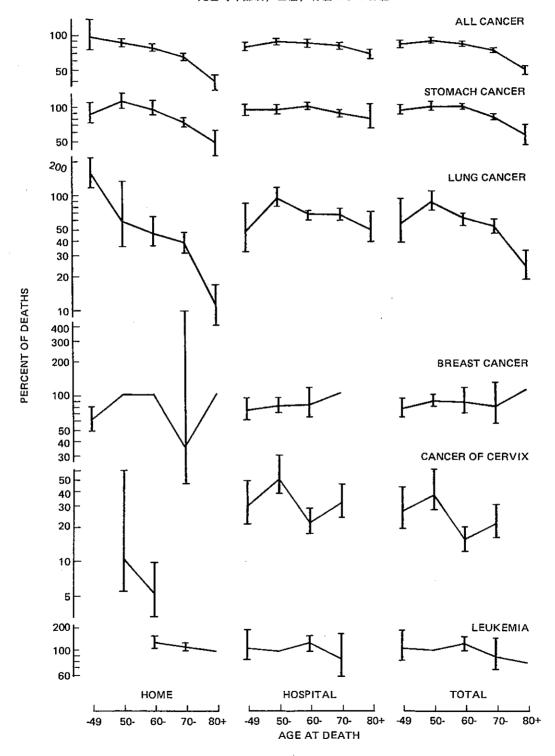
DISCUSSION

The high confirmation rates indicate that the diagnosis of cancer on death certificates is reliable whether made on young or old patients, men or women, patients who die at home or in hospitals or clinics, and with little variation for different types of cancer. This had been reported previously on the same study sample and there has been no significant change in confirmation rates since then. Detection rates were not as high as confirmation rates and there has been no improvement in detection rates since the last report.[6] The combined result of errors of confirmation and detection for cancer in general and for cancer of stomach, lung, and cervix in particular is to underestimate the number of deaths occurring from these causes, especially in older persons dying at home. The estimates suggest that for all cancers at all ages there are 30% more deaths due to cancer than indicated by death certificates. For the two most frequent cancers, stomach and lung, there are 55% and

年齢および死亡の場所による推定数を示す。図1は，90%の上下信頼限界における年齢および死亡の場所別に癌による推定死亡数に含まれる死亡診断書記載の癌症例の百分率を半対数グラフで示す。ほとんどの種類の癌が見落とされていることは明白であり，特に老齢者において目立っている。ほとんどの場合，信頼の上限界が100%を相当下回っているということは，観察された見落としが抽出変動によるものであるという可能性のないことを示す。一部のもの，例えば80歳の自宅死亡の肺癌患者の場合には，そのほとんど90%が死亡時においても診断されていない。

考　察

確認率が高いことは，死亡診断書に癌と診断されていれば，年齢，性および自宅または病医院死亡に関係なく，それが信頼できることを示し，しかも癌の種類による差異も少ない。このことは同じ調査集団について以前に報告されたところであり，以来確認率には有意の変化はない。発見率は確認率ほど高くなく，また前回の報告[6]以来発見率の改善はみられない。全癌および特に胃，肺および子宮頚癌の確認および発見の両者合計における誤差の原因は，これらの疾患の結果生ずる死亡者の数，特に自宅で死亡する高齢者の数，を過少評価していることにある。推定によると死亡診断書に記載してある癌による死亡よりは，実際には全年齢にわたって全癌の死亡数は30%も高い。最も頻度の高い二つの癌である胃癌および肺癌では，70歳以上の例では死亡診断書に記載されているものよりも自宅死亡者の率の方がそれぞれ

FIGURE 1 ESTIMATE OF THE PERCENT OF DEATHS DUE TO CANCER DIAGNOSED ON DEATH
CERTIFICATES BY PLACE OF DEATH, AGE AT DEATH, & TYPE OF CANCER

図1　癌による推定死亡数に含まれる死亡診断書記載の癌症例の百分率：死亡の場所および
死亡時年齢別，全癌，胃癌および肺癌

355% more deaths, respectively, in persons aged 70 or older and dying at home than indicated by death certificates. Evidently cancer is still an even greater problem in Japan than published vital statistics would suggest.

Several interrelated factors influence the detection rate. The primary site and type of malignancy are important. Tissues readily accessible to examination, such as breast and uterine cervix, should be easily detected, yet the detection rate is high for the former and low for the latter. The detection rate is high for leukemia not only because diagnostic procedures are relatively simple but also because in Hiroshima and Nagasaki leukemia is regarded as an A-bomb-associated disease and in the two cities there is an intensive examination program for persons with hematologic disorders. Deep seated tumors are diagnosed with greater difficulty. Elderly patients, particularly those who die at home and who presumably have not been examined in a hospital or clinic, have the lowest detection rate. It is surprising that the presence of cancer was not yet diagnosed in so many patients in whom cancer had run its entire course and was the cause of death. Low detection rates were especially prominent for cancer of the lung and cervix suggesting that diagnosis, if made at all, is reached late in the course of disease. Lung cancer has a notoriously poor prognosis and diagnosis must be reached early for successful treatment. The natural history for cervical cancer usually includes a long preinvasive carcinoma-in-situ stage followed by local invasion. Early diagnosis leads to a high cure rate and is dependent on a high index of suspicion.

This observation, that even terminal cancer may not be diagnosed, is discouraging in view of the accepted belief that improvement in cure rates for cancer will come about largely through earlier diagnosis. Cancer of the uterine cervix in older women needs to be given more attention and they should not be denied methods for early detection including Papanicolaou smears.

55％と 355％も高い．従って，日本においては癌は，人口動態統計が示すよりも大きな問題であることが分かる．

発見率は，相関のある数箇の因子によって影響を受ける．原発部位と悪性腫瘍の種類は重要である．検査が容易に実施できる乳房および子宮頚部のような組織では，発見は容易であるはずであるが，発見率は前者では高いが後者では低い．白血病の発見率は高いが，これは診断方法が比較的簡便であるばかりでなく，広島および長崎では白血病は原爆と関係のある疾患とされており，血液学的異常のある人を探知するための強力な調査計画が実施されている理由によるものと思われる．深部腫瘍の診断はもっと困難である．高齢者，特に自宅死亡者で病医院で診察を受けていない人においては発見率は最も低い．癌が非常に多くの患者においてその全過程を経過し，死因となっているにもかかわらず診断されずにいることは驚くに値する．肺および子宮頚癌の発見率は特に低く，診断がなされたとしても，疾患経過の遅い時期になされていることを示唆している．肺癌の予後は非常に悪く，治療効果を得るには，早期診断が必要である．子宮頚癌では，通常侵襲前に長い潜在癌期後に局部的侵襲が起こる．早期診断は高い治癒率につながるので，この疾患に対しては強い疑いをもって臨むことが必要である．

末期癌でさえ診断できないこともあるという結果が得られたことは，癌の治癒率改善が，主として早期診断によって得られるという一般的な見解からすれば，落胆せざるを得ない．高齢婦人における子宮頚癌については，もっと注意を払うべきであり，パパニコロー塗布検査を含む早期発見のための方法を適用すべきである．

APPENDIX 1 CALCULATION OF ESTIMATED OCCURRENCE OF FATAL LUNG CANCER IN WOMEN AGE 70-79 WHO DIED AT HOME

付録 1　自宅死亡の70－79歳の女性における致命的肺癌の推定発生数の計算

DEATH CERTIFICATE AND AUTOPSY DIAGNOSES FOR WOMEN, AGED 70-79 AT TIME OF DEATH WHO DIED AT HOME

自宅死亡の死亡時70－79歳の女性の死亡診断および剖検診断

Death Certificate Diagnoses	Total Deaths	Total Autopsies	Autopsy Diagnoses							Total Cancer
			Non Cancer	Stomach	Lung	Cervix	Breast	Leukemia	Other	
Noncancer										
IHD	70	13	12	0	0	0	0	0	1	1
Stroke	289	86	84	0	2	0	0	0	0	2
Other	523	135	121	5	2	1	1	0	5	14
Total	882	234	217	5	4	1	1	0	6	17
Cancer										
Stomach	52	14	2	12	0	0	0	0	0	12
Lung	9	5	1	0	4	0	0	0	0	4
Breast	2	2	0	0	0	0	2	0	0	2
Cervix	0	0	0	0	0	0	0	0	0	0
Leukemia	1	0	0	0	0	0	0	0	0	0
Other	50	28	2	3	0	3	0	0	20	26
Total	114	49	5	15	4	3	2	0	20	44
All Total	996	283	222	20	8	4	3	0	26	61

Since none of the 13 autopsies among those with death certificate diagnosis of ischemic heart disease died of lung cancer, the estimated frequency for this stratum is zero, with zero estimated variance. The autopsy diagnosis was lung cancer for 2 of 86 autopsies, out of 289 stroke deaths according to death certificate. The estimated frequency for the entire stratum is $(289)(2/86) = 6.7$, with estimated variance $(289-86)(289)(2/86)(1-2/86)/85 = 15.68$. Estimated frequencies and variances corresponding to death certificate diagnoses are: 7.8 and 22.10 for other noncancer, 7.2 and 1.44 for lung cancer, and 0 and 0 for stomach, breast and cervical cancer, leukemia and other cancers. For strata with no autopsies or with too few autopsies to obtain a good estimate, such as that corresponding to a death certificate cause of leukemia in the present sample, some pooling of ages, sexes, and places of death was done. However, no autopsied leukemia death certificate case was diagnosed as having died of lung cancer, so the estimate and variance for this stratum are 0 and 0, respectively. The sum of the estimates is 21.7 and the sum of the variances is 39.22, giving a standard deviation of 6.3.

死亡診断書の診断名が虚血性心疾患であった13剖検例中肺癌による死亡はなかったので，この層の推定頻度は0で，推定分散も0である．死亡診断書の診断名が卒中であった289例中，剖検を受けた86例のうち2例の剖検診断が肺癌であった．全層の推定頻度は（289）（2／86）＝6.7で推定分散は（289－86）（289）（2／86）（1－2／86）＝15.68である．死亡診断書の診断名に相当する推定頻度および分散は非癌例では7.8と22.10で，肺癌例では7.2と1.44であり，胃癌，乳癌および子宮頚癌，白血病およびその他の癌例では0と0であった．剖検例のない層または有効な推定を得るのに剖検例の少な過ぎる層，例えば本調査対象群内における死亡診断書記載の白血病のような場合は，年齢，性および死亡の場所を若干プールした．しかし，死亡診断書に白血病と記載され，剖検を受けた例では，肺癌で死亡したものはなかったので，この層の推定および分散はそれぞれ0であった．推定の合計は21.7で，分散の合計は39.22であり，標準偏差は6.3であった．

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APPENDIX 2 CONFIRMATION AND DETECTION RATES FOR CANCER BY CANCER TYPE, PLACE OF DEATH & AGE, HIROSHIMA & NAGASAKI 1961-1970
付録 2　癌の確認および発見率: 癌の種類, 死亡の場所および年齢別, 広島・長崎, 1961－70年

Cancer Type	Place of Death	Age	Total with this Diagnosis on Death Certificate	Autopsies			Confirmation Rate	Detection Rate
				With Death Certificate Diagnosis	With Autopsy Diagnosis	With Both Diagnoses		
All Cancer	Home	-49	31	7	8	5	71.4	62.5
		50-59	102	24	28	24	100.0	85.7
		60-69	219	86	102	84	97.7	82.4
		70-79	279	101	140	95	94.1	67.9
		80 +	115	42	91	39	92.9	42.9
		Total	746	260	369	247	95.0	66.9
	Hospital	-49	239	99	117	95	96.0	81.2
		50-59	289	118	133	114	96.6	85.7
		60-69	542	275	304	254	92.4	83.6
		70-79	452	232	279	219	94.4	78.5
		80 +	77	38	54	33	86.8	61.1
		Total	1599	762	887	715	93.8	80.6
Stomach	Home	-49	15	2	3	2	100.0	66.7
		50-59	44	8	8	7	100.0	87.5
		60-69	102	41	40	31	75.6	77.5
		70-79	125	37	51	34	91.9	66.7
		80 +	49	18	33	13	72.2	39.4
		Total	335	106	135	87	82.1	64.4
	Hospital	-49	76	28	30	25	89.3	83.3
		50-59	97	31	34	27	87.1	79.8
		60-69	212	91	88	78	85.7	88.6
		70-79	155	79	87	66	83.5	75.9
		80 +	25	12	14	9	75.0	64.3
		Total	565	241	253	205	85.1	81.0
Lung	Home	-49	2	-	-	-	-	-
		50-59	6	2	3	2	100	66.7
		60-69	23	12	20	11	91.7	55.0
		70-79	36	12	28	11	91.7	39.3
		80 +	5	1	13	1	100.0	7.7
		Total	72	27	64	25	92.6	39.1
	Hospital	-49	10	3	6	1	33.3	16.7
		50-59	30	14	14	12	85.7	85.7
		60-69	63	46	59	42	91.3	71.2
		70-79	66	38	40	28	73.7	70.0
		80 +	10	4	9	4	100.0	44.4
		Total	179	105	138	87	82.9	52.6
Breast	Home	-49	1	0	0	0	-	-
		50-59	6	4	4	4	100	100.0
		60-69	2	1	1	1	100	100.0
		70-79	2	2	3	2	100	66.7
		80 +	3	1	1	-		100.0
		Total	14	8	9	7		88.9
	Hospital	-49	21	7	10	7	100.0	70.0
		50-59	13	8	10	8	100.0	80.0
		60-69	9	4	5	4	100.0	80.0
		70-79	8	5	5	5	100.0	100.0
		80 +	0	0	0	0	-	-
		Total	51	24	30	24	100.0	80.0

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APPENDIX 2 (Cont.) 付録 2 （続き）

Cancer Type	Place of Death	Age	Total with this Diagnosis on Death Certificate	Autopsies			Confirmation Rate	Detection Rate
				With Death Certificate Diagnosis	With Autopsy Diagnosis	With Both Diagnoses		
Cervix	Home	-49	0	0	1	0	-	0
		50-59	1	0	2	0	-	0
		60-69	1	0	6	0	-	0
		70-79	0	0	4	0	-	0
		80 +	0	0	1	0	-	0
		Total	2	0	14	0	-	0
	Hospital	-49	6	2	7	2	100.0	28.6
		50-59	10	4	8	3	75.0	37.5
		60-69	7	3	16	3	100.0	18.8
		70-79	6	2	8	2	100.0	25.0
		80 +	0	0	2	0	-	0
		Total	29	11	41	10	90.9	24.4
Leukemia	Home	-49	0	0	0	0	-	-
		50-59	0	0	0	0	-	-
		60-69	2	0	0	0	-	-
		70-79	2	1	1	1	100.0	100.0
		80 +	1	0	0	0	-	-
		Total	5	1	1	1	100.0	100.0
	Hospital	-49	25	16	14	13	81.3	92.9
		50-59	7	4	4	4	100.0	100.0
		60-69	13	7	6	6	85.7	100.0
		70-79	6	4	5	3	75.0	80.0
		80 +	0	0	0	0	-	-
		Total	51	31	29	26	83.9	93.1

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