The Prevalence of Cancer Among Adults in the United States: 1987

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No national data exist on the prevalence of cancer in the United States population. The authors report the first estimates of prevalence rates of cancer from a population-based sample of the adult population of the United States. Estimates are based on responses collected from the Cancer Control Supplements of the National Health Interview Survey, a population-based sample survey of all people older than 17 years of age in the United States in 1987. Of 44,123 adults questioned, 1593 said they had a nonskin cancer. In 1987, after adjustments, the overall prevalence rate of all types of cancer, excluding nonmelanoma skin cancer, was 3230 per 100,000 adults; the rates for men and women were 1930 and 4412, respectively. The authors estimate that, in 1987, 5.7 million adults in the United States were survivors of nonskin cancer, 3.3% of the adult population. Approximately 89,000 adults had cancer during childhood, or 1.6% of the total. Approximately 3.6 million people were at least 5-year survivors and 900,000 adults had their disease diagnosed during the year before interview. Despite the potential for underreporting and misclassification, these national estimates are in general accord with figures estimated from other sources. Increasing survival after cancer, especially childhood and adolescent cancer, indicates the importance of continued monitoring to provide information needed to plan for adequate health services.
***Cancer* 1992; 69:2154–2159.**

The number of cancer survivors in the United States grows every year because of the occurrence of more malignant neoplasms, improved survival rates, better diagnosis of early cases, the aging of the population, and reduction in cardiovascular mortality. Better survival rates occur particularly after pediatric cancers.[1] Attempts have been made to estimate the prevalence of cancer in the United States, but, to our knowledge, none has used information from national surveys.[2,3]

Through the National Health Interview Survey (NHIS), the National Center for Health Statistics has been monitoring the health status of the United States population since 1957.[4] In 1987 the National Cancer Institute sponsored two supplements to the NHIS with three areas of concentration, including knowledge about cancer and cancer risk factors, attitudes concerning health in general and cancer symptoms, and self-reported cancer behaviors. We used these data to develop national estimates of the number of adult survivors of cancer. These data are needed to estimate the burden of cancer on health care in the United States.

Methods

The NHIS is a continuing nationwide probability sample of households including civilian, noninstitutionalized people asked to respond to a questionnaire covering personal and demographic characteristics, illnesses, injuries, impairments, and chronic conditions.[4] In 1987, the sample consisted of 47,240 households; the noninterview rate was 6.6%. At the conclusion of the NHIS core interview, one adult household member was selected randomly as a respondent for either of two National Cancer Institute supplement questionnaires: the Cancer Control Supplement or the Epidemiology Supplement. The total sample included an oversample of black and Hispanic people to improve estimates for these demographic subpopulations. Because of the size of the NHIS sample and the broad interests of the National Cancer Institute, a split questionnaire format was selected, with some items, such as history of cancer, common to both.

All respondents were asked the following set of questions about their cancer history: "Did a doctor or other health professional ever tell you that you had

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The authors thank David Annett and William E. Helsel, MS, of Information Management Services, Inc., for assistance with data analysis; the Connecticut Tumor Registry for providing data from Connecticut; and Sadie B. Holmes for secretarial assistance.

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Accepted for publication November 15, 1991.

cancer (including any cancer you have already mentioned)?" If the answer was "Yes," then the next series of questions was asked. "What kind of cancer was it? What part of the body was affected? How old were you when this cancer was first diagnosed by a doctor? Besides this cancer, has a doctor ever told you that you had any other kind of cancer?" Then the same set of questions regarding kind of cancer, part of the body affected, and age at diagnosis was asked for the other cancer. No questions were asked about the stage of cancer, whether the respondent was in active treatment or remission, or what type of treatment was received. Of 44,123 respondents, 2425 people said they had had cancer; 832 reported a skin cancer, and 1593 reported a nonskin cancer.

Weighting procedures were developed by the Bureau of the Census and National Center for Health Statistics to reflect the civilian noninstitutionalized population of the United States in 1987.[4] The multistage sampling procedures used in the NHIS include both stratification and clustering. Software developed by the Research Triangle Institute[5] was used to adjust for the weighted design and for differential nonresponse among certain demographic groups. It also was used to estimate the variance of parameters of interest, such as prevalence rates of cancer.

We defined the prevalence rate for individual sites as the number of cancers of that site/type divided by the number of adults; totals in each table reflect the total number of affected adults divided by the number of adults in the population. Because some people reported more than one cancer, the totals are less than the sum of the individual cancer sites. Rates are reported where the numbers were considered stable; rates were not reported if the ratio of the rate to its standard error was less than 3 (*i.e.*, if the standard error exceeded 33% of the rate).

Results

In 1987, the prevalence rate of nonskin cancer among adults in the United States population was 3230 per 100,000 (Table 1). The overall prevalence rate was higher for women than men (4402 *versus* 1930, respectively). Based on these rates, approximately 5.7 million American adults who had a history of cancer were alive in 1987: 4.1 million women and 1.6 million men.

The most common cancer site among men was colon/rectum (378 per 100,000), followed by the prostate (324 per 100,000), digestive system other than colon/rectum (283 per 100,000), lung/larynx (199 per 100,000), and bladder (169 per 100,000). The corresponding ranking in an incidence series such as the Surveillance, Epidemiology and End-Results program (SEER)[1] of the National Cancer Institute is as follows: prostate, lung/larynx, colon/rectum, bladder, and oral/pharynx; the different order results from the effects of differential survival.

Table 1. Prevalence of Cancer (per 100,000) in the Adult United States Population in 1987 by Sex

Cancer site/type	Sex		Total (SE)
	Male (SE)	*Female (SE)*	
No. with cancer	393	1200	1593
Digestive	655 (56)	489 (46)	568 (36)
Colon/rectum	378 (46)	312 (40)	343 (30)
Other digestive	283 (39)	177 (27)	227 (23)
Lung/larynx	199 (30)	90 (24)	142 (21)
Melanoma	136 (31)	83 (19)	108 (17)
Breast	0 —	1332 (89)	1332 (89)
Total female genital	0 —	1914 (93)	1914 (93)
Cervix	0 —	775 (64)	775 (64)
Corpus	0 —	926 (64)	926 (64)
Ovary	0 —	125 (24)	125 (24)
Other	0 —	102 (18)	102 (18)
Total male genital	388 (50)	0 —	388 (50)
Prostate	324 (45)	0 —	324 (45)
Testis	61 (19)	0 —	61 (19)
Bladder	169 (39)	70 (13)	117 (20)
Kidney	103 (22)	44 (15)	72 (13)
Hodgkin's disease	44 (21)	53 (18)	49 (14)
Leukemia/lymphoma	99 (22)	120 (22)	110 (16)
All other sites	275 (42)	382 (51)	331 (34)
Total*	1930 (103)	4402 (143)	3230 (90)

SE: standard error.
* Total excludes nonmelanoma skin cancers.

Among women, the five most prevalent sites were breast (1332 per 100,000), corpus uteri (926 per 100,000), cervix uteri (775 per 100,000), colon/rectum (343 per 100,000), and other areas of the digestive system (277 per 100,000). The corresponding incidence ranking is as follows: breast, colon/rectum, lung/larynx, corpus uteri, and ovary.[1] Relative survival after lung cancer is poor for women, as it is for men; survival after breast cancer is quite good, so it ranks first in both incidence and prevalence.

When examined according to the race of the survivor (Table 2), the total prevalence of nonskin cancer in non-Hispanic black people was approximately half the rate in non-Hispanic white people (1950 *versus* 3679, respectively), and for Hispanic people the rate was 1546. (Data for Hispanic people and other race/ethnic groups do not appear in Table 2 because of small numbers and large standard errors). Also, the most common cancer was not the same in each group. For white and black non-Hispanic people, breast was the most common site, followed by corpus uteri and colon/rectum.

Table 2. Prevalence of Cancer (per 100,000) in the Adult United States Population in 1987 by Race of Respondent

	Race	
	White non-Hispanic	*Black non-Hispanic*
Cancer site/type	*Rate (SE)*	*Rate (SE)*
No. with cancer	1388	152‡
Digestive tract	633 (42)	449 (96)
Colon/rectum	396 (36)	229 (62)
Other digestive	241 (25)	220 (65)
Lung/larynx	163 (27)	—†
Melanoma	136 (22)	—†
Breast	1543 (110)	755 (168)
Total female genital	2179 (114)	1103 (167)
Cervix	907 (80)	239 (88)
Corpus	1033 (76)	672 (121)
Ovary	127 (28)	191 (83)
Prostate	331 (48)	359 (117)
Bladder	139 (24)	—†
Leukemia/lymphoma	129 (20)	—†
Total*	3679 (107)	1950 (176)

SE: standard error.

* Total excludes nonmelanoma skin cancers.

† Numbers inadequate for analysis.

‡ Forty-four Hispanics and 9 others also interviewed.

However, in Hispanic people, cancer of the corpus uteri was reported most frequently, followed by breast and other digestive tract cancers. Despite incidence rates among black and Hispanic people that are higher for cancer of the cervix than cancer of the corpus uteri, the higher prevalence rates of cancer of the corpus uteri compared with cervical cancers within each race suggest some misclassification of cervical cancers as cancer of the corpus or uterus not otherwise specified, grouped here with corpus. With few exceptions, prevalence rates were highest among white people, lowest among Hispanic people, and intermediate in black people. For instance, for all female genital cancers combined, the rate for Hispanic people was 746 (standard error = 198), compared with 1103 for black and 2179 for white people. Large racial differences may reflect differences in incidence rates, the most extreme example being melanoma: no black or Hispanic people reported having melanoma.

For nonskin cancers, prevalence rates increased from 1047 among adults younger than 35 years of age to 9648 in patients older than 74 years of age—a ninefold difference (Table 3). Steeply increasing cancer prevalence rates with older age at interview result from increasing incidence with advancing years for most types of cancer, such as prostate, digestive, and breast cancer and leukemia. Almost 10% of people who were 75 years of age or older had a history of a cancer diagnosis.

The percentage distribution of adults by their age at cancer diagnosis and according to the type of cancer (Table 4) indicates again the generally high prevalence at older ages, except for cancers typical of young ages, such as Hodgkin's disease. Of the total number of adult survivors, 1.6% reported having cancer during childhood (ages 0 to 14). We estimate that, in 1987, approximately 89,000 adults in the United States were survivors of childhood cancer; of these, approximately 6000 were survivors of leukemia and another 31,000 were survivors of Hodgkin's disease.

In the United States population in 1987, we estimate that approximately 892,000 adults had a nonskin cancer diagnosed within the last year (Table 5). The number of 5-year survivors of nonskin cancer was 3.5 million. Among women who were 5-year survivors, 36% had survived a cancer of the genital tract.

Among people who said they had a first cancer, 8% reported having a second cancer. This represents approximately 456,000 adults in the United States who had survived two cancers.

Discussion

The long-term consequences of surviving cancer are not trivial. Although most people have a good quality of life, some groups of survivors are at risk for major complications, both short and long term.[6] Among the most serious of these is the risk of a recurrence or development of a second cancer.[7] Other consequences include disabilities such as mental or motor retardation, growth

Table 3. Prevalence of Cancer (per 100,000) in the Adult United States Population in 1987 by Age at Interview

	Age at interview (yr)				
Cancer site/type	*18–34*	*35–54*	*55–64*	*65–74*	*75+*
No. with cancer	190	341	323	411	328
Digestive	—†	143	835	2057	3010
Colon/rectum	—†	—†	533	1356	1797
Other digestive	—†	75	302	701	1255
Lung/larynx	—†	—†	340	702	—†
Melanoma	—†	113	178	262	—†
Breast	53	949	2799	3568	3881
Total female genital	1205	2119	2963	2441	2114
Cervix	782	867	776	667	498
Corpus	274	1020	1679	1603	1260
Total male genital	—†	95	438	1366	3283
Prostate	—†	—†	291	1340	3186
Bladder	—†	—†	235	412	600
Leukemia/lymphoma	—†	64	166	268	381
Total*	1047	2285	5548	7984	9648

* Total excludes nonmelanoma skin cancer.

† Numbers inadequate for analysis.

Table 4. Percent Distribution of Adults in the United States in 1987 With a History of Cancer by Age at Diagnosis

Cancer site/type	Age at diagnosis (yr)						
	0–14	*15–24*	*25–34*	*35–44*	*45–54*	*55–64*	*65+*
No. with cancer	18	139	243	230	259	312	377‡
Digestive system	0†	4.3	5.3	10.3	14.5	25.6	40.1
Lung/larynx	2.6	1.5	0.4	2.0	13.4	34.2	46.1
Melanoma	6.1	7.1	19.4	22.8	10.9	20.6	13.2
Breast	0	0.2	5.9	15.4	31.0	24.4	23.2
Total female genital	0.1	19.2	33.3	20.1	12.7	9.2	5.3
Prostate	0	0	1.0	2.3	0	19.3	77.3
Bladder	0	0	4.4	3.9	17.1	42.4	32.2
Hodgkin's disease	36.7	33.3	14.5	9.8	0	3.0	2.7
Leukemia/lymphoma	3.3	9.0	7.3	9.4	16.7	26.3	28.0
Total*	1.6	9.4	15.5	14.2	17.2	20.2	22.0

* Total excludes nonmelanoma skin cancer.
† Denotes true zero, *i.e.*, no respondents.
‡ Fifteen respondents either refused or did not know.

deficits, limb amputations, blindness, and impaired fertility.[8–10]

The prevalence of cancer was estimated earlier with the use of data from the Connecticut Tumor Registry (CTR) for 1982.[2] We compared our sex-specific rates with updated rates from the CTR, age-adjusted to the 1987 (estimated) population for adults older than 17 years of age (Table 6). (The previously published rates were age-adjusted to the *total* United States population; here we adjust to the adult population because the NHIS interviewed adults only). In general, the two sources provide fairly similar estimates. Twenty-one of 32 comparisons yielded estimates that were lower for the self-reporting adults in the United States than in the CTR, perhaps because some respondents did not know of their cancer diagnosis, a situation more common several decades ago than today.[11,12] Some patterns may reflect differences between the United States compared with Connecticut in the underlying proportions of minority groups, which vary in their risk for cancer. Furthermore, even within race, cancer incidence[13] and mortality[14] rates vary geographically, with rates for many sites higher in the Northeast than other areas of the country.

Table 5. Numbers of Adults in the United States in 1987 Who Had Cancer Diagnosed Within the Last Year, and the Number Who Were 5-Year Survivors (Rounded to the Nearest 1000)

Cancer site/type	No. with a diagnosis of cancer within the last year	No. of adults who had survived cancer for 5 years or more
Digestive	172,000	592,000
Colon/rectum	107,000	352,000
Other digestive	65,000	244,000
Lung/larynx	88,000	85,000
Melanoma	27,000	104,000
Breast	243,000	707,000
Total female genital	189,000	1,269,000
Cervix	97,000	484,000
Corpus	55,000	658,000
Ovary	35,000	60,000
Prostate	82,000	84,000
Bladder	29,000	124,000
Kidney	25,000	81,000
Thyroid	13,000	96,000
Bone/cartilage	19,000	29,000
Hodgkin's disease	2000	77,000
Leukemia/lymphoma	35,000	92,000
All other cancers	55,000	320,000
Total nonskin	892,000	3,520,000

Note: Numbers may not sum because some respondents reported more than one cancer.

In 4 of 32 comparisons between adults in the United States and the CTR, the differences were greater than 100%—for men reporting cancer of the bladder and bone and for women reporting cancer of the uterine corpus and bone. Possible explanations could be inclusion of metastases from other primary sites to bone, difficulties in defining malignant neoplasms of the bladder, and problems specifying cervix uteri rather than corpus or uterus. The CTR estimates include *in situ* cancer with each of the female genital sites. It is unclear whether women are more inclined to report *in situ* cervical cancer as cancer, or not to report it at all.

Our results are also in good agreement with estimates prepared by the American Cancer Society, which estimated the following for 1987: With the exclusion of skin cancer, "over 5 million Americans alive today have a history of cancer, 3 million of them diagnosed five or

Table 6. Comparison Between Prevalence Rates Estimated From National United States Sample and Rates Estimated From the Connecticut Tumor Registry

	United States adults 1987		Connecticut Tumor Registry*	
Cancer site/type	*Male*	*Female*	*Male*	*Female*
Colon/rectum	378	312	537	519
Other digestive	283	177	210	123
Lung/larynx	199	90	305	143
Melanoma	136	83	148	148
Breast	0	1332	0	1485
Cervix	0	775	0	1070
Corpus	0	926	0	452
Ovary	0	125	0	147
Prostate	324	0	510	0
Testis	61	0	91	0
Bladder	169	70	351	116
Kidney	103	44	97	50
Hodgkin's disease	44	53	57	45
Leukemia/lymphoma	99	120	156	138
Brain/CNS	18	34	30	27
Thyroid	31	114	38	110
Bone/cartilage	26	43	9	7
Connective tissue	33	27	33	26
Total nonskin	1930	4412	2565	4500

CNS: central nervous system.

* Connecticut Tumor Registry rates age-adjusted by sex to 1987 United States population using NHIS weights, adults only. Cancers were recoded to International Classification of Diseases, 9th revision. For comparability with self-reported cancers, we included *in situ* disease with breast (5% of the total) and cervix (83% of the total). Corpus includes uterus, not otherwise specified. Totals count only individuals. Each site is counted separately, so totals are less than the sum of individual sites.

Note: Rates per 100,000.

more years ago."[15] These numbers compare favorably with our estimates of 5.7 million adult cancer survivors and 3.5 million 5-year survivors. The American Cancer Society estimate (in 1991) of 1.1 million new cancer cases in 1987 (based on SEER data from 1985 to 1987)[16] compares with our estimate of 892,000 (Table 5). The numbers in Table 5 of cancers diagnosed within the last year underestimate the annual incidence in the United States because some people will not survive a year from diagnosis. Based on data from the Surveillance, Epidemiology and End-Results program, 60% to 70% of people in whom cancer is diagnosed will survive at least 1 year.

People who survived for more than 5 years constitute almost two-thirds (63%) of the total number of survivors. The groups with the highest proportion of long-term survivors had Hodgkin's disease (90%) and cancer of the corpus uteri (77%). At the other extreme, long-term survivors of cancer of the lung/larynx constituted only 34% of the total number of people with that history.

We have not presented estimates for nonmelanotic skin cancer in the tables because this site may be particularly subject to underreporting. Our estimates for skin cancer prevalence rates are 2407 for men, 1657 for women, and 2012 overall, suggesting that two million men and 1.5 million women had skin cancer, with 656,000 cases diagnosed within the last year. The prevalence of people with skin cancer increased almost 40-fold, from 173 in the youngest age group of respondents to 6905 in patients older than 74 years of age. The American Cancer Society estimates the diagnosis of between 500,000 and 600,000 new skin cancer cases yearly, similar to our figure of 656,000. However, because survival rates are quite high, we believe that the total estimate of 3.5 million must be too low, most likely because of recall error. Underreporting also may particularly affect our estimate of 89,000 survivors of childhood cancer; people in whom cancer was diagnosed during infancy were more likely not to know that they had cancer than those who were older at diagnosis.[11]

Other sources of error in estimation may arise because of exclusion of members of the military serving on United States soil and people living in institutions. The Bureau of the Census estimates that approximately 4.2 million people would be excluded from the NHIS (approximately 1.7 million military members on United States soil and another 2.5 million people in institutions, both numbers ascertained at the time of the 1980 census). The net impact that omission of these groups would have on estimates of cancer prevalence may not be great. Patients with cancer or survivors will be overrepresented in nursing homes and constitute part of the institutionalized population; however, they will be underrepresented in the military.

We present the first estimates based on a national sample of the numbers of United States residents who report having had cancer in the past. The needs of cancer survivors for continuing surveillance are being recognized increasingly by advocacy groups, physicians, and scientists who are concerned about the problems that come with the cancer experience. These data should help in planning for the future needs of this ever-growing segment of the population.

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