Trends in Cancer Incidence and Mortality in the United States, 1969-76 [1]

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ABSTRACT—Trends in cancer incidence and mortality in the United States were analyzed over the period 1969 through 1976. The greatest increase in incidence among whites occurred for lung cancer among females (almost 9%/yr), whereas the incidence of cancer of the uterine corpus increased 6% per year. Cancer of the cervix showed the greatest decrease in incidence, an average of 6% per year. Stomach cancer incidence and mortality showed a substantial decline for each sex, and rectal cancer incidence increased for each sex whereas mortality declined. The incidence of cancer of the female breast increased 1.8% per year without inclusion of the rates for 1974 and 1975, when an unusually large increase occurred. Cancer mortality data were presented for the total United States on the basis of data from the National Center for Health Statistics. Emphasis was focused on the comparability of cancer incidence data over the time period studied, given the fact that cancer incidence was measured by the Third National Cancer Survey for the period 1969-71 and by the Surveillance, Epidemiology, and End Results Program for the period 1973-76. Each survey covered approximately 10% of the U.S. population but had four geographic areas in common. Investigation of the comparability of these two surveys revealed that the incidence rates for whites were sufficiently comparable to permit an analysis of trends in cancer incidence over the entire period 1969-1976. Such comparability was not found for blacks. Therefore, cancer incidence data are presented only for whites, but cancer mortality data are presented for both whites and blacks.—JNCI 64: 1091-1103, 1980.

There has been an increasing demand over the past few years for data on current trends in cancer incidence and mortality. Such data are needed to assess changes in the extent of the cancer problem and to provide clues toward the etiology of cancer. Data on cancer mortality rates in the United States have been available for many years from the National Center for Health Statistics (*1*); this has not been the case for corresponding data for cancer incidence. The first large survey of cancer incidence in the United States was done between 1937 and 1939 in 10 large metropolitan areas covering approximately 10% of the U.S. population (*2*). A similar survey covering the same areas was done in 1947 and 1948 (*3*), and in 1969-71 the TNCS was conducted, again covering approximately 10% of the U.S. population (*4*). Thus over the period from 1937 to 1969-71, trends in cancer incidence are represented by only three points in time. These three surveys, however, contain seven geographic areas in common. Analysis of cancer incidence trends over these seven common areas has been presented by Devesa and Silverman (*5*).

SEER was begun in 1973 to obtain annual cancer incidence and patient survival data on a population base. The SEER program represents yet another 10% sample of the U.S. population with only four geographic areas in common with the TNCS. Thus a problem in comparability exists when one attempts to analyze trends in cancer incidence covering the period represented by the three surveys and the period 1973-76 represented by SEER. This problem is further complicated by the fact that not all of the SEER registries were included from the beginning of the program in 1973. At the outset, SEER consisted of eight registries. Two were added in 1974 and a final one in 1976. Thus even within SEER there is a question as to whether the cancer incidence data are comparable over the years it covers (1973 through 1976).

The purposes of this paper, therefore, are the following: 1) to assess the comparability of the cancer incidence rates across the total SEER program over the period 1973-76; 2) to assess the validity of use of the TNCS incidence rates for 1969-71 and the SEER rates for 1973-76 to analyze incidence trends over the period 1969-76; and 3) to present trends in cancer incidence and mortality for 1969-76, where data are sufficiently comparable, for some of the major forms of cancer and to summarize these trends by use of a convenient set of measures.

MATERIALS AND METHODS

The population data used as denominators for the 1969-71 rates were obtained from the U.S. Census. The populations used as denominators for the rates for each year 1973 through 1976 were estimated on the basis of projections prepared by the Bureau of the Census. These projections were computed for each year 1973 through 1975 for each age, sex, and race group for each county in the United States. The aggregate of these projections for the total United States was used as denominators for the mortality rates, and the total of these population groups for the States and counties included in the SEER areas was used as the denominator for the incidence rates. The 1976 estimates were obtained by straight-line projections of the 1973 through 1975 populations for each age, sex, and race group. For

ABBREVIATIONS USED: SEER = Surveillance, Epidemiology, and End Results; SMSA = standard metropolitan statistical area; TNCS = Third National Cancer Survey.

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the SEER areas there were two exceptions to this procedure—New Mexico and Hawaii, for which the Census Bureau did not have adequate data on racial compositions. The population data for these two States were obtained from local sources. All of the rates included in this analysis were age adjusted to the 1970 U.S. population.

Mortality data.—Although data on deaths by specific cause and age, sex, and race of the decedent for the United States are published annually by the National Center for Health Statistics, the detailed data are on computer tapes and are made available to the general public on a much more current basis. For this study, the data on all cancer deaths in the United States were obtained from these public-use tapes. For analysis of the comparability between the areas constituting the TNCS and those included in the SEER program, data on deaths occurring among residents of States and counties included in the areas in question were used. We computed death rates by using as denominators the population of the United States for total mortality rates and the specific populations for the TNCS and SEER areas when mortality rates pertained to those particular areas.

Incidence data.—The fact that cancer incidence data are not available for the total United States gives rise to the comparability problem, the major focus of this analysis. The cancer incidence data for the periods 1969–71 were obtained from the TNCS, which covered approximately 10% of the U.S. population. For the period 1973–76 the incidence data were obtained from the SEER program, a group of 11 population-based cancer registries, also covering approximately 10% of the U.S. population. SEER is an outgrowth of two earlier programs of the National Cancer Institute—namely, the End Results Program for measurement of patient survival and the National Cancer Surveys (of which the TNCS was the most recent) for measurement of cancer incidence. When SEER was established in 1973, there were eight participants. By 1976 it had expanded to include eleven. Its purpose is to measure cancer incidence and patient survival on a continuing basis so that the machinery would not have to be reestablished every few years to measure cancer incidence on a large sample of the U.S. population. The participants in the SEER program were selected on the basis of their demonstrated ability to operate and maintain a population-based cancer-reporting system and for the unique population subgroups that each of them offered. Thus whereas, overall, the participants represented 10% of the total U.S. population, they represented only about 9% of the black population but a much larger proportion of other ethnic subpopulations, e.g., 47% of the American-Japanese, 36% of the American-Chinese, and 15% of the American Indians. The eleven participants included in SEER were five entire States (Connecticut, Iowa, New Mexico, Utah, and Hawaii), five large metropolitan areas (Atlanta, New Orleans, Detroit, San Francisco, and Seattle), and the entire commonwealth of Puerto Rico. For these analyses, data for Puerto Rico will be excluded primarily because data for Puerto Rico were not included in total U.S. mortality data supplied by the National Center for Health Statistics.

Inasmuch as the major focus of this paper is to assess the comparability between incidence rates based on the total area covered by the SEER program and the incidence rates based on the areas covered by the TNCS, the methodology will be discussed in relation to: 1) comparability of data within SEER over the 4-year period for which its data are available and 2) comparability between SEER and TNCS.

Comparability within the SEER program.—The seven participants in SEER (excluding Puerto Rico) at its inception in 1973 were: Detroit, San Francisco, Connecticut, Hawaii, Iowa, New Mexico, and Utah. Seattle and New Orleans were added in 1974; in 1975 the area covered by the Seattle registry was expanded from the original six counties to thirteen counties; in 1976 Atlanta was added. The analysis presented in this paper is based on data from all of the above participants. The question immediately arises as to whether it is valid to use an incidence rate for the total SEER program for each of the four years 1973 through 1976, when areas were added to the program each succeeding year. In other words, if the addition of new areas each year does not appreciably affect the overall rates, the totals including the new areas can be used, thus providing more stable rates because of the use of a larger population base. To address this issue, we compared the incidence rates for all sites of cancer combined and for each of the major sites for the total SEER program as it existed in each of the years 1973 through 1976 with the incidence rates for the original seven SEER areas combined for each of those years. The last rates should be comparable from year to year because they are based on exactly the same areas for each year. Thus if the rates for all areas compare closely with those for the original seven areas, year by year, the rates for all areas could be considered reasonably comparable over that 4-year period. The results of this comparison are presented in table 1 for whites and table 2 for blacks. By definition these rates are identical for 1973. For each remaining year, for all sites combined, the rates among whites for all areas were greater than those for the original seven areas for males, whereas for females these two sets of rates were nearly equal, with the rates for all areas being only slightly lower. Each of these differences for males or females was 1% or less. Among the sex-site groups for each of the years 1974, 1975, and 1976, in only two instances did the rate for the original seven areas differ from that for all areas combined by more than 5%, a 7% difference for female stomach cancer and a 5.3% difference for female rectal cancer. As a matter of fact, in over two-thirds of these groups, the difference between the two rates was less than 2%. Thus for whites it appears that the rate for all areas combined can be taken as reasonably comparable for all sites combined and for each individual site over the 4-year period. The same

cannot be said for blacks, however, as evidenced by table 2, which shows that the rate for all areas combined was higher than that for the original seven areas among males for the years 1974 and 1975. However, the reverse is true for females for 1974, 1975, and 1976. Although the differences between rates for the original seven areas and the corresponding rates for all areas were small for all sites combined, in almost one-half of the sex-site subgroups this difference was greater than 5%. In eight of these site-sex-year subgroups this difference exceeded 10%. Therefore, it seems safe to conclude that the rates for all SEER areas over the 4-year period for blacks are not comparable. This is not surprising in view of the fact that the two southern registries with large black populations were added after SEER had begun—New Orleans in 1974 and Atlanta in 1976—and their rates differed from those of the other two areas with large black populations—Detroit and San Francisco.

Comparability between SEER and TNCS.—Although the TNCS and SEER represent two different 10% nonrandom samples of the U.S. population, four areas were common to the two surveys: Atlanta, Detroit, Iowa, and San Francisco-Oakland. These areas represent 55% of the total population of the TNCS and 54% of the SEER population. Cancer incidence rates among whites for specific site-sex groups were computed for each year 1969-71 and 1973-76 for these four areas combined. Inasmuch as these rates can be considered comparable over that total time period because they were based on the same geographic areas, they serve as a standard against which to compare the composite trends made up of total TNCS rates for 1969-71 and total SEER rates for 1973-76. The results of these comparisons for all sites combined among whites are shown in text-figure 1.

Inspection of text-figure 1 reveals that the composite rates followed very closely those for the four common areas for the white population. To assess the generality of this conclusion, we computed the ratio of the rates for the four common areas to the corresponding rates for all areas for each year within each sex-site group, the standard error of the ratio within each group, and the slope of the trend in the ratio. A constant ratio over time (small standard error) indicates that the two sets of rates follow the same pattern from year to year. If the ratio is constant at unity, it indicates that the two sets of rates are also at the same level. A positive or negative slope in the ratio over time indicates that the two sets of rates have different trends. Each sex-site group was examined with these criteria in mind. The only cancers for which the level of the overall rates differed from that of the rates for the four common areas were melanomas for both males and females,

TABLE 1.—*Age-adjusted (1970 U.S. population) cancer incidence rates per 100,000 population for selected sites by sex, all SEER areas versus original seven SEER areas, by year, 1973-76: Whites*

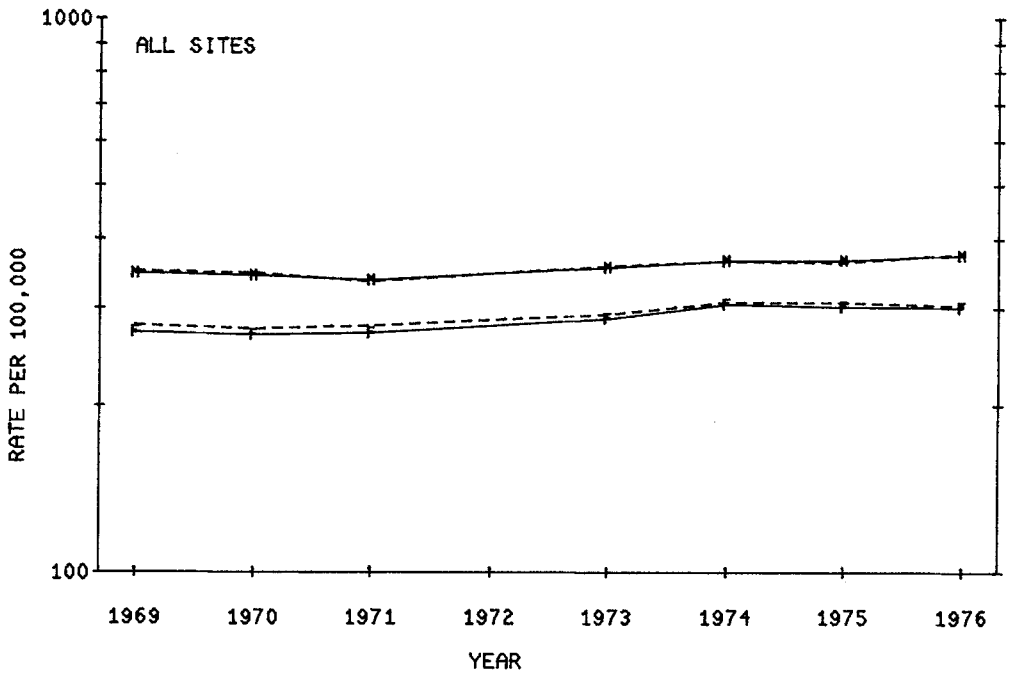
Site	Sex	1973: original seven areas[a]	1974[b]		1975		1976[c]	
			All areas	Original seven areas	All areas	Original seven areas	All areas	Original seven areas
All sites	♂	355.5	365.3	362.9	365.8	362.3	374.0	370.7
	♀	287.3	305.2	306.6	301.8	303.8	301.2	303.1
Stomach	♂	13.8	13.1	13.2	12.7	12.8	12.6	13.2
	♀	6.1	5.9	6.1	5.4	5.6	5.6	6.0
Colon excluding rectum	♂	34.2	37.3	37.4	35.5	36.3	36.9	37.6
	♀	29.7	30.1	30.5	30.6	31.7	31.4	32.1
Rectum	♂	18.8	19.3	19.4	18.3	18.3	19.4	19.9
	♀	11.3	11.2	11.3	12.0	12.2	11.4	12.0
Pancreas	♂	12.7	11.2	11.2	12.5	12.7	11.5	11.4
	♀	7.5	8.0	8.0	7.2	7.4	8.0	8.0
Lung	♂	72.3	74.5	72.9	76.4	74.9	77.8	75.1
	♀	17.7	20.0	19.6	21.8	21.5	23.7	22.6
Melanoma	♂	5.8	6.3	6.2	6.4	6.3	6.8	6.6
	♀	5.1	5.5	5.5	6.0	5.9	6.1	5.9
Breast	♀	81.0	92.5	93.5	86.2	86.9	83.5	84.3
Cervix	♀	12.6	11.5	11.2	10.7	10.7	10.6	10.8
Corpus + uterus NOS[d]	♀	29.0	31.1	30.4	32.4	31.7	31.2	31.1
Ovary	♀	14.2	14.9	15.1	14.2	14.7	13.6	13.9
Prostate gland	♂	61.0	62.1	61.4	64.8	62.4	68.6	66.8
Bladder	♂	25.5	27.1	26.7	26.8	26.5	26.4	25.8
	♀	6.1	6.9	7.0	6.9	6.9	7.3	7.1
Kidney	♂	9.4	9.1	8.8	9.0	8.7	9.6	9.6
	♀	4.4	4.1	4.1	4.0	4.1	4.8	4.8
Leukemia	♂	13.2	13.4	13.5	12.5	12.5	13.1	13.1
	♀	7.8	7.5	7.6	7.3	7.4	7.1	7.2

[a] The original seven SEER areas were: San Francisco–Oakland (SMSA), Connecticut (State), metropolitan Detroit, Hawaii (State), Iowa (State), New Mexico (State), and Utah (State).
[b] Metropolitan New Orleans and the Seattle–Puget Sound areas joined SEER in 1974.
[c] Metropolitan Atlanta became a SEER participant in 1976.
[d] Not otherwise specified.

TABLE 2.—*Age-adjusted (1970 U.S. population) cancer incidence rates per 100,000 population for selected sites by sex, all SEER areas versus original seven SEER areas, by year, 1973–76: Blacks*

Site	Sex	1973: original seven areas[a]	1974[b]		1975		1976[c]	
			All areas	Original seven areas	All areas	Original seven areas	All areas	Original seven areas
All sites	♂	450.8	442.9	434.2	433.7	425.2	452.1	452.2
	♀	281.0	285.0	293.9	292.8	302.0	280.1	283.7
Stomach	♂	27.5	25.6	21.8	22.8	21.1	20.3	19.3
	♀	9.7	10.7	10.6	11.1	10.2	9.2	7.2
Colon excluding rectum	♂	31.7	34.5	35.7	32.1	34.4	37.8	38.4
	♀	29.4	27.6	27.1	32.8	33.6	32.4	31.6
Rectum	♂	11.6	13.7	13.0	11.8	10.7	12.6	11.7
	♀	11.9	10.4	10.8	11.0	11.3	8.6	7.9
Pancreas	♂	16.1	20.8	19.2	15.9	15.9	17.7	20.7
	♀	11.8	11.8	12.7	12.0	13.2	11.1	11.7
Lung	♂	109.1	108.0	104.9	107.6	103.2	112.8	113.8
	♀	21.6	22.2	22.2	23.9	24.0	25.6	28.3
Melanoma	♂	0.4	0.3	0.2	0.9	0.9	1.3	1.1
	♀	0.7	0.4	0.6	0.5	0.7	1.1	1.3
Breast	♀	66.6	76.7	80.5	74.9	77.2	66.7	69.2
Cervix	♀	30.2	23.4	24.1	26.6	28.3	26.4	25.4
Corpus + uterus NOS[d]	♀	14.7	13.8	13.5	15.7	16.9	15.2	15.5
Ovary	♀	9.9	9.3	10.5	10.0	10.7	8.9	10.6
Prostate gland	♂	107.8	97.8	101.6	104.9	106.3	107.9	104.6
Bladder	♂	10.7	12.2	11.4	12.2	11.7	13.2	14.7
	♀	3.8	5.9	6.1	5.7	6.4	6.1	6.0
Kidney	♂	8.7	7.9	8.5	8.2	7.7	9.0	9.7
	♀	4.4	5.0	5.1	4.6	4.2	3.8	4.6
Leukemia	♂	12.9	12.2	11.6	9.3	9.9	9.2	9.2
	♀	8.1	6.9	7.6	4.9	4.5	6.1	6.1

[a] The original seven SEER areas were: San Francisco–Oakland (SMSA), Connecticut (State), metropolitan Detroit, Hawaii (State), Iowa (State), New Mexico (State), and Utah (State).
[b] Metropolitan New Orleans and the Seattle–Puget Sound areas joined SEER in 1974.
[c] Metropolitan Atlanta became a SEER participant in 1976.
[d] Not otherwise specified.



TEXT-FIGURE 1.—Age-adjusted U.S. cancer incidence rates per 100,000 population for all TNCS areas in 1969–71 and all SEER areas in 1973–76 compared with the four common areas, for each sex, all sites combined—whites. M, male; F, female; _____, all areas; _ _ _ _ _, four common areas.

cancers of the uterine corpus, and cancers of the ovary, the largest difference being 8% for melanomas among females. For each of these categories, however, the ratio was relatively constant, which thus indicated that the overall rates followed the same pattern as that for the rates for the four common areas but at a somewhat different level. The only categories exhibiting a trend in the ratio were cancers of the cervix and leukemias among females. In each of these categories, the composite rate was higher than the rates for the four common areas for 1969–71 and lower over the period 1973–76, but the differences in trend were not large. For each of the other categories, the composite rate closely followed that for the four common areas at approximately the same level. Therefore, the use of incidence rates for the TNCS areas for 1969–71 and for the SEER areas for 1973–76 appears to provide a good approximation to trends over that total time period for the white population.

Summary of trends.—To describe the trend in cancer incidence for each sex-site group, we fitted an exponential curve of the form $Y=ae^{bt}$ to the observed points. If we let $e^b=c$, then this reduces to $Y=ac^t$, and $(c-1)$ 100 is the average annual percent change in the rate. Thus this value for each sex-site group is a convenient summary of the trend over that 7-year period.

However, the extent to which this function fits the data varies from group to group. Incidence rates for whites are shown in table 3, mortality rates for whites in table 4, and mortality rates for blacks in table 5. Each table presents the average annual percent change in each of the sex-site-specific rates and the corresponding 95% confidence interval for that estimate. For some sites the confidence intervals were wide, which indicated considerable variation around the trend line. Therefore, one should view these estimates of average annual percent change only as a crude descriptive measure and should take into account the size of the confidence interval when considering the precision of the measure. For cancers of the stomach, lung, cervix, uterine corpus, and melanoma these estimates have relatively small standard errors, whereas for cancers of the pancreas, colon, ovary, and kidney, for example, the estimates are much less precise.

RESULTS

Age-adjusted incidence rates for all sites combined increased from 346.6 per 100,000 in 1969 to 374.0 in 1976 among white males and from 271.5 to 301.2 among white females over that same time period (table 3). This represents an average annual increase of 1.3 and 2.0%, respectively. Over that same time period, mortality rates for all sites combined increased from 195.0 to 210.2 for white males and from 129.0 to 133.8 for white females, or average annual increases of 0.9 and 0.2%, respectively. The mortality trends for blacks

TABLE 3.—*Age-adjusted[a] cancer incidence rates per 100,000 population for selected sites by sex and year, average annual percent change, and 95% confidence interval for percent change, TNCS areas 1969–71 and SEER areas 1973–76: Whites*

Site	Sex	Incidence rate per 100,000 population							Average annual percent change	95% confidence interval	
		1969	1970	1971	1973	1974	1975	1976			
All sites	♂	346.6	343.7	337.2	355.5	365.3	365.8	374.0	1.3	0.74	1.86
	♀	271.5	268.6	270.9	287.3	305.2	301.8	301.2	2.0	1.28	2.72
Stomach	♂	15.4	14.1	13.4	13.8	13.1	12.7	12.6	−2.3	−3.34	−1.26
	♀	7.1	7.0	6.3	6.1	5.9	5.4	5.6	−3.7	−4.70	−2.70
Colon excluding rectum	♂	34.5	33.2	32.4	34.2	37.3	35.5	36.9	1.5	0.29	2.71
	♀	30.6	28.9	28.6	29.7	30.1	30.6	31.4	0.7	−0.22	1.62
Rectum	♂	17.5	17.8	18.1	18.8	19.3	18.3	19.4	1.3	0.60	2.00
	♀	11.1	10.6	10.6	11.3	11.2	12.0	11.4	1.2	0.18	2.22
Pancreas	♂	12.1	12.1	12.3	12.7	11.2	12.5	11.5	−0.5	−1.96	0.96
	♀	7.5	7.3	7.0	7.5	8.0	7.2	8.0	0.9	−0.61	2.41
Lung	♂	70.6	71.5	70.0	72.3	74.5	76.4	77.8	1.4	0.87	1.93
	♀	13.3	14.4	15.5	17.7	20.0	21.8	23.7	8.6	8.06	9.14
Melanoma	♂	4.4	4.7	4.7	5.8	6.3	6.4	6.8	6.8	5.75	7.85
	♀	4.1	4.2	4.8	5.1	5.5	6.0	6.1	6.2	5.32	7.08
Breast[b]	♀	73.9	76.1	75.1	81.0	92.5	86.2	83.5	1.8	1.17	2.43
Cervix	♀	16.0	14.5	14.3	12.6	11.5	10.7	10.6	−5.9	−6.67	−5.13
Corpus + uterus NOS[c]	♀	22.6	22.7	24.6	29.0	31.1	32.4	31.2	5.9	4.48	7.32
Ovary	♀	14.9	14.2	13.6	14.2	14.9	14.2	13.6	−0.4	−1.61	0.81
Prostate gland	♂	59.0	57.4	56.7	61.0	62.1	64.8	68.6	2.3	1.27	3.33
Bladder	♂	23.8	23.3	23.4	25.5	27.1	25.8	26.4	2.3	1.31	3.29
	♀	6.3	5.9	6.3	6.1	6.9	6.9	7.3	2.5	1.01	3.99
Kidney	♂	9.0	8.7	8.2	9.4	9.1	9.0	9.6	1.2	−0.20	2.60
	♀	4.3	4.0	3.8	4.4	4.1	4.0	4.8	1.3	−1.09	3.69
Leukemia	♂	13.2	13.6	12.2	13.2	13.4	12.5	13.1	−0.2	−1.51	1.11
	♀	8.0	7.6	7.2	7.8	7.5	7.3	7.1	−1.0	−2.14	0.14

[a] 1970 U.S. population was used as standard.
[b] 1974 and 1975 were not included in the computation of trend for breast cancer.
[c] Not otherwise specified.

TABLE 4.—*Age-adjusted[a] cancer mortality rates per 100,000 population for selected sites by sex and year, average annual percent change, and 95% confidence interval for percent change, United States, 1969–71 and 1973–76: Whites*

Site	Sex	Mortality rate per 100,000 population							Average annual percent change	95% confidence interval	
		1969	1970	1971	1973	1974	1975	1976			
All sites	♂	195.0	199.5	204.0	203.6	206.5	206.6	210.2	0.9	0.60	1.20
	♀	129.0	132.4	134.2	131.3	132.2	131.9	133.8	0.2	−0.20	0.60
Stomach	♂	10.6	10.4	10.0	9.4	9.2	8.8	8.7	−2.9	−3.13	−2.67
	♀	5.3	5.1	5.0	4.5	4.4	4.3	4.1	−3.6	−3.95	−3.25
Colon excluding rectum	♂	18.7	19.0	19.5	19.4	20.3	20.1	20.7	1.3	0.90	1.70
	♀	16.2	16.8	16.7	16.5	16.6	16.2	16.5	0.0	−0.47	0.47
Rectum	♂	6.9	6.7	6.6	6.0	5.9	5.8	5.6	−3.0	−3.37	−2.63
	♀	3.9	3.9	3.9	3.5	3.4	3.3	3.2	−3.1	−3.75	−2.45
Pancreas	♂	11.0	11.2	11.1	11.1	10.8	11.0	11.0	0.2	−0.14	0.54
	♀	6.6	6.7	6.7	6.6	6.8	6.7	6.8	0.3	−0.03	0.63
Lung	♂	55.0	57.6	60.2	61.9	63.6	64.8	66.7	2.6	2.20	3.00
	♀	10.2	11.1	12.2	13.4	14.5	15.5	16.8	7.1	6.60	7.60
Melanoma	♂	2.0	2.0	2.1	2.2	2.5	2.4	2.6	4.0	2.94	5.06
	♀	1.4	1.4	1.5	1.4	1.4	1.4	1.6	0.8	−0.84	2.44
Breast	♀	26.2	27.0	27.1	27.3	27.0	26.8	27.2	0.3	−0.09	0.69
Cervix	♀	5.5	5.2	5.1	4.4	4.4	4.0	3.9	−4.9	−5.56	−4.24
Corpus + uterus NOS[b]	♀	4.6	4.6	4.6	4.4	4.3	4.1	4.2	−1.7	−2.26	−1.14
Ovary	♀	8.9	9.0	9.0	8.6	8.8	8.8	8.9	−0.3	−0.79	0.19
Prostate gland	♂	19.0	19.4	20.0	20.5	20.4	20.3	21.0	1.2	0.77	1.63
Bladder	♂	7.1	7.5	7.2	7.4	7.5	7.5	7.5	0.6	0.05	1.15
	♀	2.1	2.3	2.2	2.1	2.1	2.0	2.0	−1.4	−2.53	−0.27
Kidney	♂	4.3	4.4	4.5	4.4	4.6	4.5	4.5	0.6	0.06	1.14
	♀	2.0	2.0	2.0	2.0	2.0	2.1	2.1	0.7	0.17	1.23
Leukemia	♂	9.4	9.2	9.4	9.1	9.0	9.1	9.2	−0.4	−0.82	0.02
	♀	5.7	5.8	5.7	5.3	5.3	5.2	5.2	−1.7	−2.24	−1.16

[a] 1970 U.S. population was used as standard.
[b] Not otherwise specified.

TABLE 5.—*Age-adjusted[a] cancer mortality rates per 100,000 population for selected sites by sex and year, average annual percent change, and 95% confidence interval for percent change, United States, 1969–71 and 1973–76: Blacks*

Site	Sex	Mortality rate per 100,000 population							Average annual percent change	95% confidence interval	
		1969	1970	1971	1973	1974	1975	1976			
All sites	♂	236.3	245.4	250.7	261.3	264.5	269.2	276.2	2.1	1.87	2.33
	♀	144.0	146.0	154.8	154.8	151.8	149.3	152.0	0.6	−0.21	1.41
Stomach	♂	19.7	20.0	19.1	17.4	17.9	17.3	16.6	−2.6	−3.32	−1.88
	♀	7.5	7.8	7.9	7.9	7.9	7.0	6.9	−1.3	−2.96	0.36
Colon excluding rectum	♂	16.0	16.7	16.6	16.9	18.1	18.7	19.7	2.7	1.88	3.52
	♀	15.5	16.4	17.1	17.0	16.4	16.8	18.1	1.3	0.19	2.41
Rectum	♂	5.6	5.7	5.8	5.4	5.8	5.5	5.1	−1.0	−2.27	0.27
	♀	4.4	4.0	4.3	3.9	3.6	3.6	3.3	−3.6	−4.87	−2.33
Pancreas	♂	13.5	12.9	13.8	13.5	12.8	14.0	13.7	0.3	−0.81	1.41
	♀	7.4	8.3	8.9	8.4	8.6	8.8	8.9	1.8	0.26	3.34
Lung	♂	63.0	66.0	68.7	76.2	79.4	80.5	82.9	4.1	3.61	4.59
	♀	10.4	11.6	13.0	13.8	14.5	15.2	16.2	5.9	4.80	7.00
Melanoma	♂	0.7	0.6	0.4	0.6	0.4	0.5	0.6	−2.2	−9.60	5.20
	♀	0.4	0.4	0.4	0.4	0.3	0.4	0.3	−3.3	−7.07	0.47
Breast	♀	24.9	24.1	26.1	26.7	27.1	25.3	25.7	0.7	−0.51	1.91
Cervix	♀	14.7	14.0	14.7	13.3	11.9	11.2	10.8	−4.5	−5.88	−3.12
Corpus + uterus NOS[b]	♀	7.9	7.9	8.3	8.2	7.2	6.7	6.9	−2.5	−4.36	−0.64
Ovary	♀	7.0	7.1	7.3	7.2	7.0	6.4	7.1	−0.6	−1.95	0.75
Prostate gland	♂	35.9	37.4	39.1	40.0	40.2	41.1	41.5	1.9	1.39	2.41
Bladder	♂	5.9	6.0	6.1	5.7	5.7	5.5	6.2	−0.4	−1.82	1.02
	♀	2.9	3.0	3.0	3.0	3.1	2.9	2.8	−0.4	−1.48	0.68
Kidney	♂	3.2	3.5	3.3	3.2	3.3	3.5	3.7	1.2	−0.34	2.74
	♀	1.6	1.5	1.6	1.5	1.5	1.6	1.7	0.6	−0.94	2.14
Leukemia	♂	6.6	7.4	7.1	7.8	7.1	7.2	7.3	0.8	−0.78	2.38
	♀	4.3	4.6	4.4	4.5	4.3	4.5	4.7	0.5	−0.53	1.53

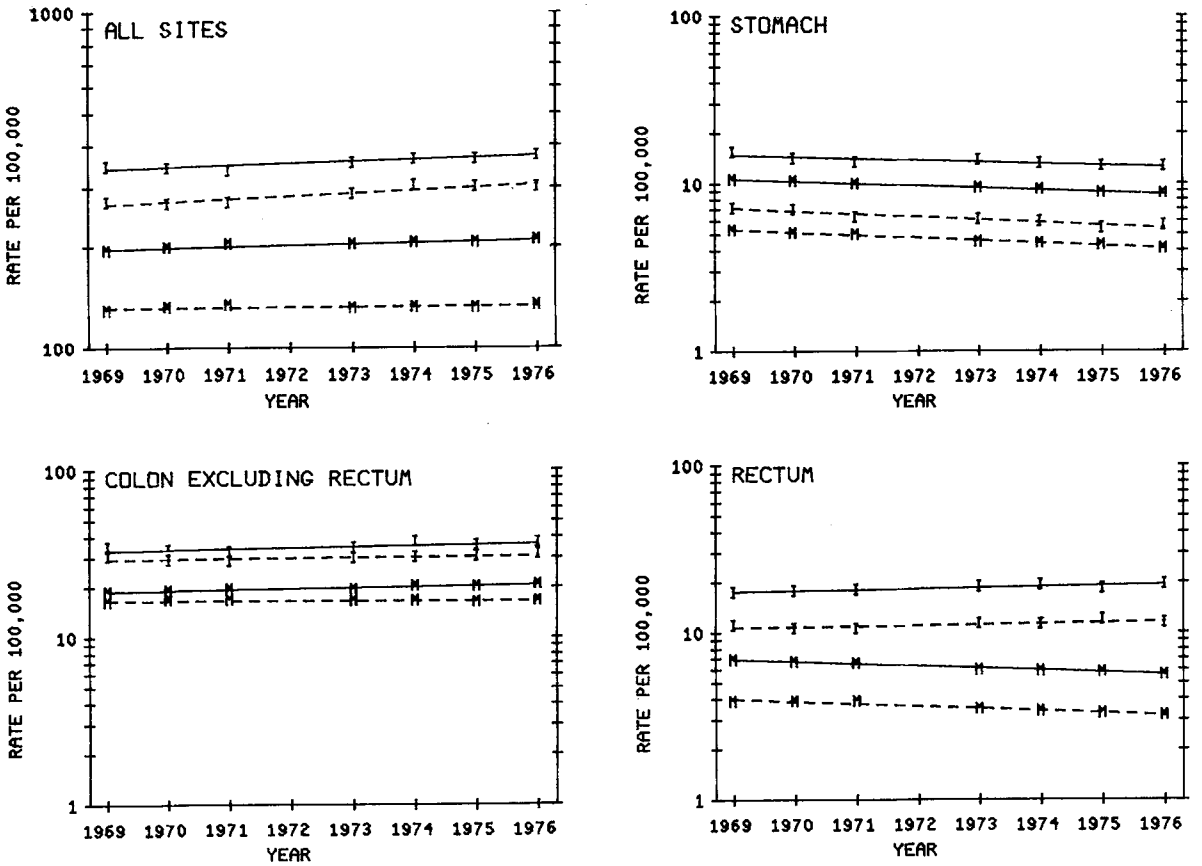
[a] 1970 U.S. population was used as standard.
[b] Not otherwise specified.

for all sites combined showed somewhat greater average annual percent increases than those for their white counterparts: 2.1% for males and 0.6% for females. It can be misleading to focus on the picture for all sites combined, however, because the trends in both incidence and mortality vary considerably from site to site. To show the direction and amount of trend at a glance, the trend lines on a log scale and the original rates are shown for each site in text-figures 2-5. As pointed out earlier, no trends are shown for blacks because the incidence rates for blacks were not comparable over time due to differences in the populations included in the TNCS and the SEER program. The mortality patterns for blacks for individual sites were quite similar to those for whites, with decreasing trends for cancers of the stomach, rectum, and cervix and the largest increase occurring for cancer of the lung among women (5.9%/yr). The trends among whites will be discussed briefly for the major sites.

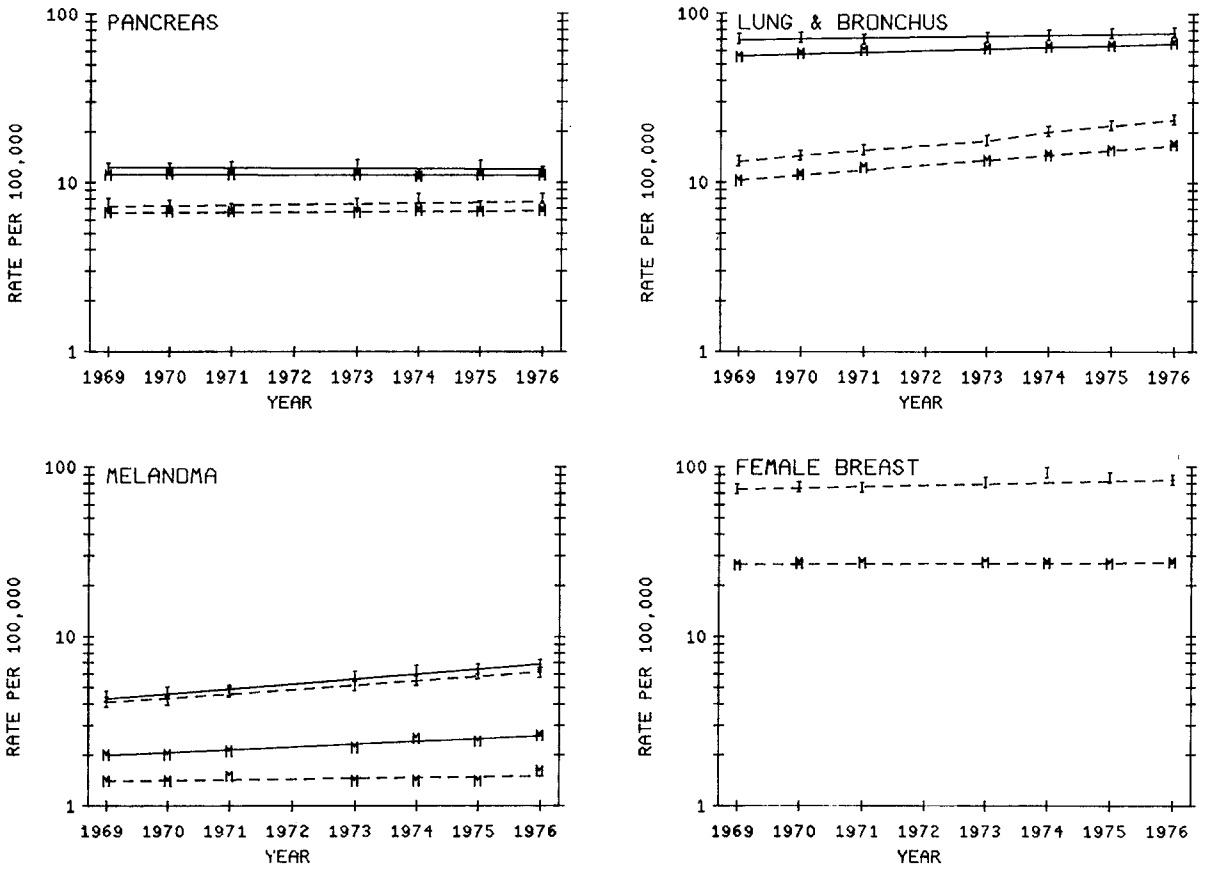
Cancer of the female breast.—Cancer of the breast among females is the most frequent of all cancers, representing one of every seven new cancers diagnosed. The incidence rate for this site among white females reached its peak in 1974 with a rate of 92.5 per 100,000 population after which it decreased to 83.5 in 1976. This peak was undoubtedly due in part to the increased awareness of breast cancer brought about by the publicity concerning the diagnosis and treatment of breast cancer. Even after the 1974 and 1975 rates were removed from the computation of the trend for the period 1969-76, the incidence rate increased by 1.8% per year. For the period covered by the earlier surveys, the trend was essentially level. The trend in breast cancer mortality was almost level for the period 1969-76 and represents essentially a continuation of the trends for the total United States since 1935.

Cancer of the lung.—Of all newly diagnosed cancer, lung cancer is the second most frequent site, accounting for almost 14% of the total. It is also the site with the greatest average annual increase in incidence over the period studied—an increase of 8.6% per year among females. In contrast, the lung cancer incidence rate among males increased by only 1.4% per year. Corresponding increases in mortality were 2.6% per year for males and 7.1% per year for females. When compared with trends from the earlier surveys, the incidence and mortality rates for males begin to show evidence of leveling off, whereas those for females show a continuation of their rapid increase.

Gastrointestinal cancers.—The colon is the third most frequent site of cancer, accounting for 10.2% of all cancers diagnosed in 1973-76. The incidence rate in-



TEXT-FIGURE 2.—Age-adjusted U.S. cancer incidence rates (TNCS 1969-71 and SEER 1973-76) and U.S. cancer mortality rates per 100,000 population and fitted trends, for each sex, cancers of all sites, stomach, colon excluding rectum, and rectum, 1969-76—whites. _____, Male trend, - - - - -, female trend; I, observed incidence rate; M, observed mortality rate.

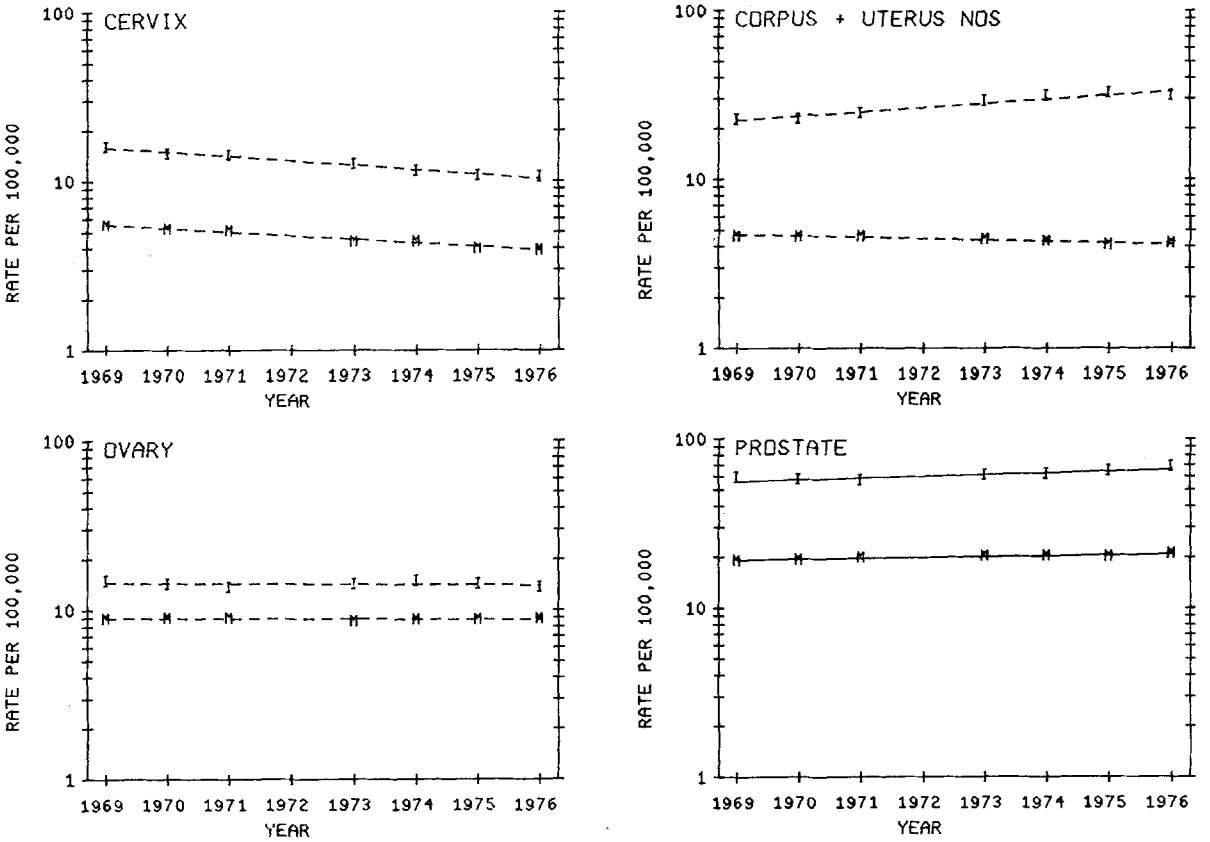


TEXT-FIGURE 3.—Age-adjusted U.S. cancer incidence rates (TNCS 1969-71 and SEER 1973-76) and U.S. cancer mortality rates per 100,000 population and fitted trends, for each sex, cancer of the pancreas, cancer of the lung and bronchus, melanoma, and cancer of the female breast, 1969-76—whites. _____, Male trend; - - - - -, female trend; I, observed incidence rate; M, observed mortality rate.

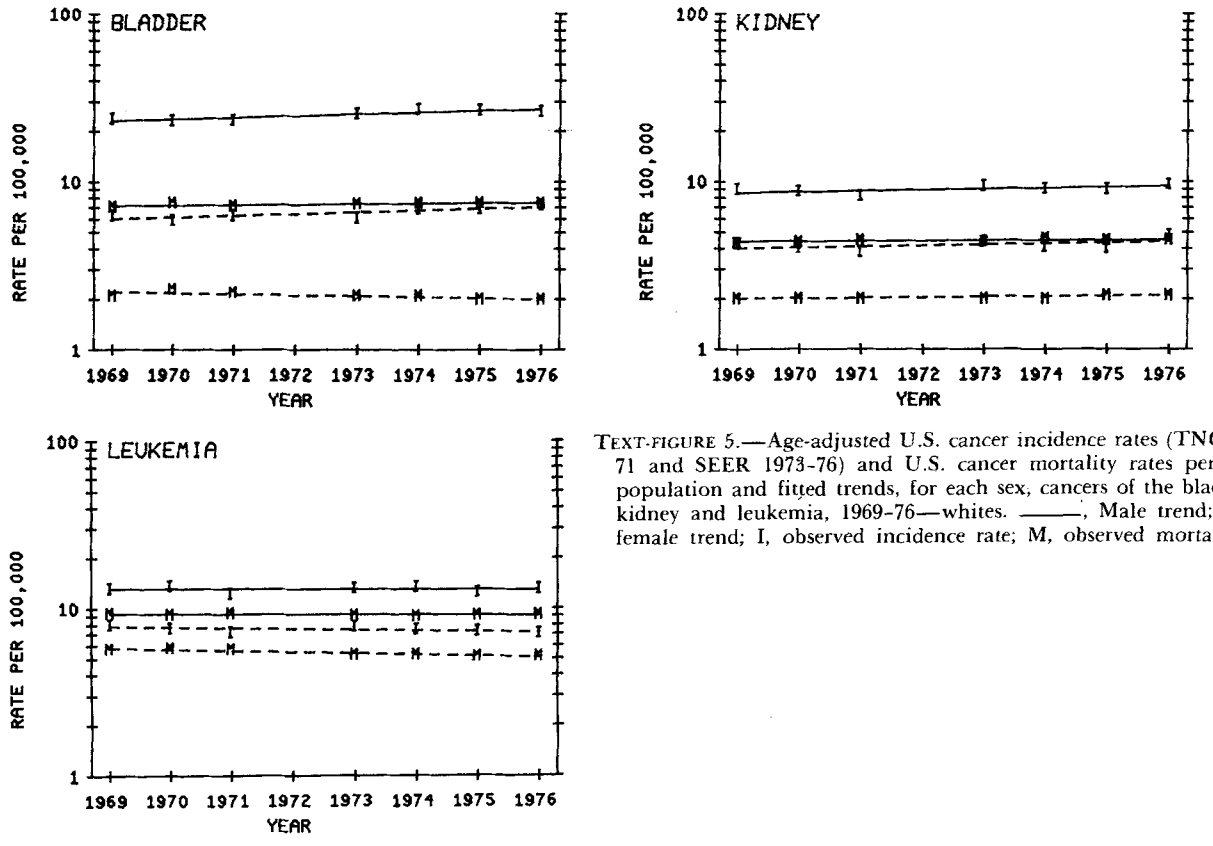
creased 1.5% per year among males and only 0.7% per year for females. The increase in mortality rates for males paralleled that for incidence, but for females mortality remained essentially unchanged. The trend data from the earlier surveys are not directly comparable because data for the small intestine were included with those for the large intestine but represented a very small proportion of the total. Departures from earlier trends are seen in an increase in incidence among females, an increase in male mortality following a level trend, and a leveling of female mortality following a decreasing trend. Cancer of the rectum showed an increasing trend in incidence of just over 1% per year for each sex, but mortality for each sex decreased by over 3% per year. This may reflect, to some extent, an improvement in survival rates for rectal cancer that appeared in the late 1960's and early 1970's (*6*). The increasing incidence rates represent an apparent reversal of the trends presented by Devesa and Silverman (*5*). For stomach cancer, both incidence and mortality decreased for each sex. Not only is this decrease comparable to the earlier decreases noted from the national surveys, but also this pattern is consistent with a decline in stomach cancer incidence in other parts of the world (*7*). In contrast, in cancers of the pancreas very little change was noted for either incidence or mortality.

Cancer of female genital organs.—The incidence of and mortality from cancer of the specific female genital organs have shown vastly different trends. Both the incidence of and mortality from cervical cancer decreased sharply, by 6 and 5% per year, respectively. This is a continuation of the decreases noted since the early 1950's by Devesa and Silverman (*5*). The incidence of cancer of the uterine corpus increased almost 6% per year from 1969 to 1976. However, the rate reached a peak of 32.4 in 1975 after which it declined to 31.2 in 1976. This observation is in contrast with no change in rates among white females between 1947 and 1969-71. The rising trend has been reported by other investigators (*8, 9*) and was thought to be accounted for in part by the large increase in postmenopausal estrogen sales in the late 1960's and early 1970's (*9*). However, mortality rates for cancer of the uterine corpus have continued to decrease. Both the incidence of and mortality from cancer of the ovary have shown only a slight decrease (0.4 and 0.3%, respectively).

Prostate cancer.—The prostate gland is the fourth most frequent site of cancer, accounting for 8% of all cancers. Over the period 1969-76 the incidence rate



TEXT-FIGURE 4.—Age-adjusted U.S. cancer incidence rates (TNCS 1969-71 and SEER 1973-76) and U.S. cancer mortality rates per 100,000 population and fitted trends, for each sex, cancers of the cervix, corpus + uterus (not otherwise specified), ovary, and prostate gland, 1969-76—whites. ———, Male trend; - - - - -, female trend; I, observed incidence rate; M, observed mortality rate.



TEXT-FIGURE 5.—Age-adjusted U.S. cancer incidence rates (TNCS 1969-71 and SEER 1973-76) and U.S. cancer mortality rates per 100,000 population and fitted trends, for each sex, cancers of the bladder and kidney and leukemia, 1969-76—whites. ———, Male trend; - - - - -, female trend; I, observed incidence rate; M, observed mortality rate.

increased 2.3% per year. The mortality rate also increased, but at a less rapid rate—1.2% per year. These changes are consistent with the earlier trends.

Melanoma.—The incidence rates for melanoma are low, less than 7 per 100,000, but have increased 6% per year among both males and females. However, mortality rates have increased 4% per year for males but less than 1% per year for females. These increases in both incidence and mortality rates appear to be continuations of those that had been occurring for at least the last 40 years (*5*). There is evidence that occurrence of both melanoma and nonmelanoma skin cancer is related to exposure to short-wavelength UV radiation (*10*). It is possible, therefore, that at least part of this rapid increase in incidence is due to increased exposure of the population to UV radiation.

Cancers of other sites.—For cancers of other sites for which data are presented in this paper, the patterns of incidence and mortality vary considerably. The incidence rates for bladder cancer increased over 2% per year for both males and females, but mortality rates showed only a slight increase for males and a decrease of over 1% per year for females. Incidence for cancer of the kidney increased over 1% per year for each sex, but mortality increased less than 1% per year. Leukemia showed very slight decreases in both incidence and mortality for males and greater decreases (1% for incidence and 1.7% for mortality) for females. These changes are essentially consistent with those from the earlier surveys except that the decreasing incidence among males represents a change in direction.

DISCUSSION

This analysis has focused more on the methodology of and problems in the analysis of trends over the period of time covered by two nonrandom samples of the U.S. population than on the trends themselves. The reason for this is that we considered it important to establish a background against which trends in cancer incidence can continue to be assessed as data from the SEER program accumulate in the years to come. It would have been possible to use the four areas common to the TNCS and SEER as a basis for the assessment of trends in cancer incidence over the time period studied. As later data become available from the SEER program, however, there is a great advantage in investigators' being able to use the entire SEER population because of the greater stability in the rates that will result.

The incidence rates for whites for some of the sites appear to be at one level for 1969-71 and at another level for 1973-76. This observation raises the question as to whether this phenomenon may be due to geographic differences in the composition of the TNCS and SEER. Examples of these patterns can be seen for cancer of the female breast, cancer of the uterine corpus, and cancer of the bladder among males. The effect of geographic differences between the TNCS and SEER can be eliminated if rates for the areas common to the two surveys are used. These rates are presented for the white population in table 6. When these rates are compared with those in table 3 for the sites mentioned above, they reveal virtually identical patterns. The values for the average annual percent change in table 6 are strikingly similar to those in table 3.

During the above analyses we concluded that the data for blacks were not comparable both over the years within the SEER program (1973-76) and between SEER and TNCS. Thus inasmuch as the composition of SEER did not become complete until 1976, it may be necessary to begin future trend analyses of cancer incidence among blacks at that point. In the meantime, the SEER and TNCS data will be used to obtain only an approximate picture of changes in incidence among blacks since the late 1960's. The reader will have to be reminded continually that such data cannot be interpreted with the same degree of assurance as were the corresponding data for whites. To avoid confusion we have not presented a table showing the changes in the incidence rates for blacks. Some of the changes are sufficiently striking, however, that even with a certain amount of noncomparability from year to year the trends are likely to hold. For example, the incidence of cancer of the cervix among black women decreased by 5% per year between 1969 and 1976. The incidence of cancer of the lung increased by 10% per year among black women, the greatest change in incidence among any of the site-sex groups. However, the incidence of cancer of the stomach among blacks did not show the same decreasing trend evident among whites. This finding is due to an increasing pattern during 1969-71 and a decreasing pattern during 1973-76, undoubtedly a result of the noncomparability between the black populations in the two surveys.

One of the advantages that the TNCS had over the earlier national cancer surveys was the fact that it covered a 3-year period, which produced incidence rates that, when averaged over that period, had a greater stability than those based on only 1 year. A similar comment could be made about the data from the SEER program when the incidence data for all 4 years are combined to produce average annual incidence rates. Inasmuch as the focus of this analysis is to assess trends over the period 1969-76, however, rates for individual years were used. Therefore, the reader interested in the size of a particular rate should interpret it with caution because the numbers of cases for some of the individual sites become rather small for single years.

Inasmuch as the populations of both SEER and the TNCS represent approximately 10% of the total U.S. population, the question continually arises as to whether the incidence rates for each of these surveys are representative of those for the United States. Because there are no total U.S. incidence rates, there is no direct answer to this question. Inasmuch as mortality rates pertain to the total United States, however, they can be compared for specific sites of cancer for each of these

TABLE 6.—*Age-adjusted[a] cancer incidence rates per 100,000 population for selected sites by sex, four common areas[b] by year, 1969–1976: Whites*

Site	Sex	Incidence rate per 100,000 population							Average annual percent change	95% confidence interval	
		1969	1970	1971	1973	1974	1975	1976			
All sites	♂	349.7	347.4	335.4	357.4	364.8	363.0	376.4	1.2	0.48	1.92
	♀	279.8	275.4	279.2	292.5	307.8	307.3	303.4	1.7	1.04	2.36
Stomach	♂	15.4	15.0	13.5	13.6	12.6	12.0	13.2	−2.8	−4.38	−1.22
	♀	7.4	6.9	6.7	5.7	5.7	5.7	5.3	−4.5	−5.50	−3.50
Colon excluding rectum	♂	35.3	34.2	33.5	33.9	38.4	35.5	37.9	1.3	−0.14	2.74
	♀	30.4	30.6	30.2	29.9	29.5	31.8	32.3	0.6	−0.36	1.56
Rectum	♂	18.9	18.3	18.5	19.2	19.5	18.2	20.0	0.7	−0.34	1.74
	♀	11.5	10.9	10.9	11.1	11.0	11.6	11.8	0.6	−0.36	1.56
Pancreas	♂	11.5	12.4	12.5	12.5	11.3	12.5	11.9	0.0	−1.48	1.48
	♀	7.2	7.5	6.8	7.4	7.7	7.6	7.5	0.9	−0.28	2.08
Lung	♂	71.5	71.5	69.4	75.9	77.1	78.7	80.4	2.0	1.28	2.72
	♀	13.9	14.8	16.4	18.5	20.3	22.2	23.4	7.9	7.48	8.32
Melanoma	♂	4.2	4.3	4.3	5.6	5.8	6.2	6.1	6.7	5.02	8.38
	♀	3.9	3.8	4.8	4.9	5.3	5.8	5.9	6.5	4.74	8.26
Breast[c]	♀	77.6	79.0	76.7	82.3	95.3	86.8	83.9	1.2	0.44	1.96
Cervix	♀	16.1	14.0	14.2	13.7	12.1	11.2	11.3	−4.7	−6.14	−3.26
Corpus + uterus NOS[d]	♀	24.2	25.0	27.7	31.3	32.5	34.2	32.7	5.2	3.86	6.54
Ovary	♀	15.1	14.5	14.0	15.0	15.4	15.8	13.7	0.1	−1.66	1.86
Prostate gland	♂	57.8	57.6	54.8	60.6	61.1	62.4	66.9	2.1	0.98	3.22
Bladder	♂	24.5	23.2	23.9	25.2	26.6	26.1	26.2	1.7	0.78	2.62
	♀	6.5	5.8	6.5	5.6	7.0	7.0	7.0	1.9	−0.80	4.60
Kidney	♂	8.8	9.2	8.2	9.3	9.1	8.7	9.4	0.6	−0.92	2.12
	♀	4.3	4.1	3.6	4.5	4.3	3.5	4.9	0.9	−3.12	4.92
Leukemia	♂	13.2	14.5	12.3	13.1	13.9	12.7	13.8	0.0	−1.94	1.94
	♀	7.8	7.0	7.1	7.7	7.7	7.7	7.0	0.0	−1.72	1.72

[a] 1970 U.S. population was used as standard.
[b] The four areas common to the TNCS and the SEER Program are: San Francisco–Oakland, Detroit, Atlanta, and Iowa.
[c] 1974 and 1975 were not included in the computation of trend for breast cancer.
[d] Not otherwise specified.

two population samples with those for the total United States. If the rates for the TNCS areas and the SEER areas are approximately equivalent to those for the United States, one might infer that the incidence rates for each of these samples are good estimates of U.S. incidence rates. Mortality rates are a complex function of incidence and survival. Therefore, if we assume that incidence rates for these large population samples are equivalent to those for the United States, given equivalent mortality rates, we are also assuming that survival patterns for these samples are the same as those for the United States.

To obtain some idea as to the comparability in mortality among the TNCS areas, the SEER areas, and the total United States, tables 7 and 8 present these comparisons for the periods 1969–71 and 1973–76 for specific sites of cancer for whites and blacks, respectively. Among whites the three sets of mortality rates agree quite closely, with the TNCS area rates for males being slightly higher for each of the two periods but for females the SEER area rates for all sites combined being the highest for the period 1973–76. Among the individual sites, however, there is considerable variation in terms of which of the three sets of rates is highest for a given time period. Among blacks the rates for the SEER areas, the TNCS areas, and the total United States appear to be sufficiently noncomparable that it is difficult to conclude that either SEER or the TNCS provides a good representation of U.S. cancer mortality. The rates are noncomparable in two ways: 1) The level of the mortality rates among blacks for either the TNCS areas or the SEER areas for a given time period differs from that of the corresponding U.S. mortality rates and 2) the changes in rates between 1969–71 and 1973–76 for the TNCS areas and the SEER areas do not agree with those for the United States. The mortality rate for the SEER areas in 1969–71 for all sites combined was 257.2 per 100,000 black males compared with 244.2 for the total United States. For the period 1973–76 the SEER rate was 288.0 compared with only 267.9 for the United States. In terms of change in rates between the two periods, however, the SEER rates increased by 10% compared with 12% for the United States. Perhaps the most striking difference between the SEER areas and the United States in the level of the rates is seen for lung cancer among black males with a SEER area rate of 91.8 in 1973–76 compared with only 79.8 for the total United States. In terms of percent change, however, the two are quite similar: 22.6% versus 21.1%. For cancer of the prostate gland, the SEER rate for 1973–76 was 40.2 compared with 40.7 for the United States, but the corresponding changes in the rates between the two periods were 15.2% for SEER and 8.5% for the United States. Similarly, other sites have substantial differences in level or change or both. Thus one might conclude that for blacks cancer mortality for

TABLE 7.—*Age-adjusted[a] cancer mortality rates per 100,000 population for the total United States, TNCS and SEER areas, for selected sites, by sex, 1969–71 and 1973–76: Whites*

Site	Sex	Mortality rates per 100,000 population					
		1969–71			1973–76		
		United States	TNCS	SEER	United States	TNCS	SEER
All sites	♂	199.5	203.0	201.3	206.8	210.4	209.6
	♀	131.9	131.9	131.7	132.3	133.3	136.1
Stomach	♂	10.3	10.7	11.4	9.0	9.2	9.9
	♀	5.1	5.2	5.5	4.3	4.3	4.6
Colon excluding rectum	♂	19.1	19.3	18.9	20.1	20.5	21.3
	♀	16.5	16.2	16.2	16.5	15.9	16.7
Rectum	♂	6.7	6.6	6.8	5.8	5.5	5.9
	♀	3.9	3.7	3.8	3.4	3.1	3.4
Pancreas	♂	11.1	10.9	10.7	11.0	11.2	11.5
	♀	6.7	6.7	6.6	6.7	6.9	7.3
Lung	♂	57.6	57.6	56.9	64.3	64.4	62.0
	♀	11.2	11.5	11.4	15.0	15.4	15.5
Melanoma	♂	2.0	2.0	1.8	2.4	2.2	2.2
	♀	1.4	1.6	1.4	1.5	1.4	1.4
Breast	♀	26.8	27.2	27.4	27.0	27.8	28.3
Cervix	♀	5.3	4.7	4.4	4.2	3.9	3.6
Corpus + uterus NOS[b]	♀	4.6	4.3	4.4	4.2	4.1	4.2
Ovary	♀	9.0	9.0	9.1	8.8	9.0	9.2
Prostate gland	♂	19.5	20.6	20.6	20.6	22.1	21.9
Bladder	♂	7.3	7.3	7.4	7.5	7.5	8.0
	♀	2.2	2.0	1.9	2.0	2.0	2.1
Kidney	♂	4.4	4.4	4.5	4.5	4.4	4.4
	♀	2.0	2.1	2.1	2.0	2.0	2.0
Leukemia	♂	9.3	9.8	9.3	9.1	9.3	9.3
	♀	5.7	5.8	5.5	5.3	5.3	5.2

[a] 1970 U.S. population used as standard.
[b] Not otherwise specified.

TABLE 8.—*Age-adjusted[a] cancer mortality rates per 100,000 population for the total United States, TNCS and SEER areas, for selected sites, by sex, 1969–71 and 1973–76: Blacks*

Site	Sex	Mortality rates per 100,000 population					
		1969–71			1973–76		
		United States	TNCS	SEER	United States	TNCS	SEER
All sites	♂	244.2	254.4	257.2	267.9	277.2	288.0
	♀	148.3	151.4	152.7	152.0	152.9	159.4
Stomach	♂	19.6	17.1	19.1	17.3	16.2	17.8
	♀	7.7	7.8	8.5	7.4	6.7	7.7
Colon excluding rectum	♂	16.4	20.2	20.5	18.4	19.9	20.4
	♀	16.3	17.8	17.8	17.1	17.6	16.8
Rectum	♂	5.7	5.8	6.1	5.4	5.3	6.3
	♀	4.2	4.5	4.4	3.6	3.3	4.1
Pancreas	♂	13.4	13.8	13.8	13.5	15.0	15.9
	♀	8.2	7.9	7.8	8.7	9.6	10.7
Lung	♂	65.9	71.9	74.9	79.8	86.5	91.8
	♀	11.7	11.3	13.3	15.0	15.2	16.8
Melanoma	♂	0.6	0.4	0.6	0.5	0.5	0.5
	♀	0.4	0.5	0.5	0.3	0.5	0.5
Breast	♀	25.0	27.5	27.3	26.2	27.2	27.2
Cervix	♀	14.5	12.1	12.1	11.8	11.6	10.6
Corpus + uterus NOS[b]	♀	8.1	7.7	7.0	7.3	6.3	6.3
Ovary	♀	7.1	7.0	6.8	6.9	6.7	7.1
Prostate gland	♂	37.5	39.8	34.9	40.7	41.4	40.2
Bladder	♂	6.0	5.5	6.4	5.8	5.6	5.0
	♀	2.9	2.4	2.8	3.0	3.4	3.5
Kidney	♂	3.3	3.4	3.2	3.4	3.8	4.0
	♀	1.6	1.8	1.9	1.6	2.0	1.9
Leukemia	♂	7.0	7.4	6.5	7.3	7.4	8.0
	♀	4.4	5.0	4.5	4.5	4.6	4.8

[a] 1970 U.S. population was used as standard.
[b] Not otherwise specified.

either SEER or the TNCS does not provide a good representation of cancer mortality for the total United States.

One should keep in mind two additional problems when analyzing changes in cancer incidence rates from one year to the next. The first problem concerns revisions in the number of cancer cases included in the numerators of the incidence rates and the second, revisions of the population estimates used as denominators. Every year each of the 11 SEER project directors submits to the National Cancer Institute not only data on all new cases but also an update of the complete file from 1973 onward. This update includes new cases for earlier years, not previously identified, and removal of some cases for a given year that were discovered to have been diagnosed earlier. The SEER incidence data used for the current analysis are those submitted in December 1978 for the years 1973–76. These data differ from those for the numbers of new cases reported in December 1977 for the same time period and published in (*11*). As a result of the later submission of data, there was a net increase in the number of new cases for each year. The percentage increases were as follows: 1973=+0.4%, 1974=+1.5%, 1975=+2.1%, and 1976=+2.5%. Therefore, the incidence rates included in this paper do not agree with the corresponding rates in that previous report.

Population estimates used as denominators for the computation of incidence rates are not readily available from the Bureau of the Census. The Bureau has been projecting population estimates by age, sex, and race for each county in the United States for each individual year from 1971 onward. At the time this analysis was prepared, these projections had been completed only through 1975. The population estimates used as denominators for the 1976 rates were obtained by use of straight-line projections of the estimates for 1973 through 1975. When the projection procedure is completed by the Census Bureau for 1976, there will be some differences in the estimates of the populations for SEER areas from those used in this analysis. Therefore, in later analyses there will undoubtedly be still further changes in incidence rates as the revised population estimates become available for 1976. Following the 1980 census, the Census Bureau will be making further revisions of its 1971–79 estimates through an interpolation between 1970 and 1980. These revised estimates may be used as denominators for revised cancer incidence and mortality rates, particularly those used for trend analyses. Until the 1980 census data are available, however, it is not possible to predict with any precision what these revisions will be. It is unlikely that the revisions will be large enough to effect a change in the conclusions drawn from this trend analysis.

As contrasted with the earlier surveys, the SEER program is a continuous reporting system. It is to be expected, therefore, that minor changes will be made in information previously reported. It is unlikely, however, that such changes will result in alterations in the conclusions drawn from analyses such as these. It should be possible, therefore, to update these trend analyses shortly after the data are reported to detect important changes as early as possible.

REFERENCES

(*1*) National Center for Health Statistics. Vital statistics of the United States 1975. Vol II. Mortality. Washington, D.C.: U.S. Govt Print Off, 1979. (PHS publication No. 79-1114).

(*2*) DORN HF. Illness from cancer in the United States. Public Health Rep 1944;59:33-48, 65-77, 97-115.

(*3*) DORN HF, CUTLER SJ. Morbidity from cancer in the United States. Public Health Monogr 1959;56:1-207.

(*4*) CUTLER SJ, YOUNG JL JR, eds. Third National Cancer Survey: Incidence data. Natl Cancer Inst Monogr 1975;41:1-454.

(*5*) DEVESA SS, SILVERMAN DT. Cancer incidence and mortality trends in the United States: 1935-74. J Natl Cancer Inst 1978; 60:545-571.

(*6*) AXTELL LM, ASIRE AJ, MYERS MH, eds. Cancer patient survival report No. 5. Washington, D.C.: U.S. Govt Print Off, 1976. [DHEW publication No. (NIH)77-992].

(*7*) STUKONIS MK. Cancer incidence cumulative rates. IARC Internal Technical Report No. 78/002. Lyon, France: IARC, 1978.

(*8*) WEISS NS, SZEKELY DR, AUSTIN DF. Increasing incidence of endometrial cancer in the United States. N Engl J Med 1976; 294:1259-1262.

(*9*) GREENWALD P, CAPUTO TA, WOLFGANG PE. Endometrial cancer after menopausal use of estrogens. Obstet Gynecol 1977;50: 239-243.

(*10*) FEARS TR, SCOTTO J, SCHNEIDERMAN MA. Skin cancer, melanoma and sunlight. Am J Public Health 1976;66:461-464.

(*11*) YOUNG JL JR, ASIRE AJ, POLLACK ES. Cancer incidence and mortality in the United States, 1973-1976. Bethesda, Md.: National Institutes of Health, 1978. [DHEW publication No. (NIH)78-1837].