Marital Status and Cancer Incidence: Differences in the Black and White Populations

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ABSTRACT

A study of 59,070 cancers newly diagnosed during the years 1978 through 1982 among black and white males and females was conducted to assess variations in age-adjusted incidence rates across four marital categories, single, married, divorced, and widowed. Population data were obtained from the 1980 Census. Distinct patterns of cancer incidence by marital status were observed for black and white males and females. Single black males had the highest age-adjusted incidence rates for all 15 of the 15 sites analyzed among men. Similarly single black females' rates were highest for 14 of the 18 sites analyzed among women. Among white females, age-adjusted incidence rates were highest or second highest in widows for 16 of 18 sites analyzed. The variation in cancer incidence by marital status was not statistically significant for white men. In addition, there is a statistically significant concordance of cancer incidence by marital status across the four race-gender groups for three digestive tract sites. Clues to cancer etiology are suggested by this study, as well as potential directions for preventive health programs.

INTRODUCTION

It has been shown consistently that married people have lower cancer mortality rates than do people who are single, widowed, or divorced (1-3). Despite this widely reported finding, it would be incorrect to conclude that marriage somehow protects people from developing cancer. Many factors influence mortality which have no etiological significance for malignant disease. In fact, a study of cancer incidence across marital status groups did not find consistently lower rates among the married compared to those who were single, widowed, separated, or divorced (4). The relationship between marital status and incidence rates varied by anatomic site and gender as well as by race. In particular, the age-specific incidence rates for single black males were higher than those for black males in other marital status groups for most cancer sites. Marital status may be implicated in the etiology of cancer, but its role appears to be more complex and subtle than would be assumed from studies of cancer mortality.

The present descriptive study is designed to identify patterns of cancer incidence by marital status which may suggest etiological leads. The specific focus will be to identify racial and gender differences in marital status patterns of cancer incidence for selected anatomic sites. Attention also will be directed to methodological issues, such as misclassification bias, which must be understood in order to interpret these data correctly (5, 6). In addition to suggesting etiological leads, research in this area may help one to determine whether marital status can be utilized, in conjunction with age, race, and gender, for cancer surveillance in the community to identify population groups at elevated risk for particular types of cancer. This study analyzes age-adjusted cancer incidence data from the Metropolitan Detroit Cancer Surveillance System for four marital status categories, married, single, divorced, and widowed.

MATERIALS AND METHODS

The MDCSS, a participant in the National Cancer Institute's SEER program, has collected population-based data describing all cancer patients diagnosed in the Metropolitan Detroit area since 1969. The geographic area encompassed by the MDCSS includes Macomb, Oakland, and Wayne counties. The 1980 population for this area was 4,044,284 (7). Within this population, 887,087 or 21.9% are black. Of the population 35 years of age and older, 6.2% are reported as single, 68.1% are married, 13.9% are widowed, and 9.1% are divorced (7). Detailed data, collected for each newly diagnosed cancer patient in this area, include information on demographic factors, tumor characteristics, and treatment. The 1981 SEER Monograph presents a more thorough description of both the SEER program and the MDCSS (8).

The study population selected for this analysis includes all Metropolitan Detroit residents newly diagnosed with invasive cancers during the years 1978 through 1982. These years were selected to maximize the number of persons to be included in the analysis, while optimizing comparability of the study group with the 1980 Census data. Average annual cancer incidence rates were calculated per 100,000 black and white males and females in the marital status categories of single, married, widowed, and divorced. Persons reported as separated were excluded from the analysis because too few were available for these years for meaningful analysis. Patients under the age of 35 were excluded because very few cancers are diagnosed within that group.

Estimates of the percentage of net underecount of the 1980 Census show an increase in coverage of the total population in 1980 over 1970 (9). In 1980, black males were underenumerated by 7.5%, while black females were underenumerated by 2.1%. There was an excess in the count of white and other males by 0.5% and of white and other females by 1.7%. In 1970, black males were undercounted by 10.1%, black females by 5.3%, and white and other males by 2.1%, and white and other females by 0.9% (10). There is greater underenumeration of black males in the 1980 Census than of the other three race-sex groups, even with the improvement over 1970. Unfortunately estimates of population undercount have not been made by marital status. The differentials in census accuracy by race and gender may well be further exacerbated by variation in enumeration errors across marital status groups. Additionally rates based upon small numbers and those revealing small differences between blacks and whites, between males and females, or across marital status groups must be interpreted with particular caution.

The quality of information about marital status is probably similar for both the MDCSS data and the Census data, since both are obtained by self-report. However, Census data utilize the category "never married"...
in order to ensure a minimum expected value of 5. Then these
(W) was utilized to assess the agreement in the ranks of the 19 age-
status across these four groups. Kendall's coefficient of concordance
this relationship was the same for each of the four race-sex groups, then
was associated with site-specific cancer incidence and if the nature of
cancer incidence which transcends gender and race. If marital status
rank of its associated rate which is consistent for these cancers.
expected values implies a relationship between marital status and the
which had ranks 1 or 2 were combined, as were those with ranks 3 or
the 15 cancers among black and white males and 18 cancers among

differed by marital status (13). Age-adjusted incidence rates for each of

distribution of age-adjusted incidence rates for black and white males
and females. Additionally for many of the specific cancers, one or more
groups contained too few cases for meaningful analysis. Since
focusing upon age-adjusted incidence rates does not seem to distort
age-specific incidence patterns and because the number of cases for
each site is greater and allows inclusion of a larger number of anatomic
sites, this report is based solely on the age-adjusted incidence rates.

Age-adjusted incidence rates for 1978 through 1982 were calculated
for invasive cancers diagnosed among males for 15 topographic or
morphological categories and among females for 18 topographic or
morphological rubrics. Disease coding utilized the ICD-O classifications

As noted previously, this is a descriptive analysis designed to investi-
gate whether there is a relationship between cancer incidence and marital
status. The specific form of such a relationship, however, was not
postulated. Because of the statistical nature of age-adjusted rates, two
nonparametric procedures were used to assess possible relationships
between marital status and cancer incidence. Nonparametric tests avoid
the assumption that the age-adjusted incidence rates have a well-defined
parametric distribution (12). It also must be noted that the ranking
procedures used do not take into account the magnitude of the differ-
ces in age-adjusted incidence rates.

First, a one-sample x² goodness of fit test was utilized to evaluate
whether the distribution of ranks of the age-adjusted incidence rates
differed by marital status (13). Age-adjusted incidence rates for each of
the 15 cancers among black and white males and 18 cancers among
black and white females were assigned a rank of 1 (highest rate) through
4 (lowest rate) for each marital status category. The number of cancers
which had ranks 1 or 2 were combined, as were those with ranks 3 or
4, in order to ensure a minimum expected value of 5. Then these
 frequencies were compared to the number which would be expected if
there was no relationship between cancer incidence and marital status.
If there was no relationship between age-adjusted cancer incidence rates
and marital status across cancers, one would expect the same number
of cancers to have each pair of ranks, i.e., 7.5 for each group of males
and 9.0 for each group of females. Significant departure from these
expected values implies a relationship between marital status and the
rank of its associated rate which is consistent for these cancers.

Second, a statistic which measures the degree of agreement in the
rankings of age-adjusted incidence rates for 19 cancer groups was used
to assess whether there is a relationship between marital status and
cancer incidence which transcends gender and race. If marital status
was associated with site-specific cancer incidence and if the nature of
this relationship was the same for each of the four race-sex groups, then
one would expect to find similar rankings of incidence rates by marital
status across these four groups. Kendall's coefficient of concordance
(W) was utilized to assess the agreement in the ranks of the 19 age-
adjusted cancer incidence rates by marital status for black and white
males and females (13). Concordance of the ranks of age-adjusted

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RESULTS

Table 1 presents the 5-year frequencies and the average annual age-adjusted incidence rates for newly diagnosed invasive cancers by site, race, gender, and marital status for 15 cancers for males and 18 cancers for females among residents of Metropolitan Detroit during the years 1978–1982. Kendall’s W also is shown for each cancer site or type. The rank orders utilized in both the x² analysis and the Kendall’s W were derived from the age-adjusted rates presented in Table 1. Table 2 presents the results of the x² analysis.

The analysis of marital status across sites and within race-sex groups shows that the relationship between marital status and age-adjusted incidence rates varies by race and gender. The distributions of ranks of the age-adjusted cancer incidence rates were found to differ significantly (P < 0.05) from the expected distributions for black males and females and for white females. Only white males had a distribution of ranks for these cancers which did not differ statistically from that which would be expected if there were no relationship between the age-adjusted cancer incidence rates and marital status across cancer types. Among black females, more single and widowed women had higher age-adjusted incidence rates for the cancers analyzed than expected. Widowed white females had the highest or second highest incidence rate for 16 of the 18 cancers analyzed.

The most consistent finding is that single black men had the highest age-adjusted incidence rates for all 15 sites examined (Table 2). The probability that this would occur, assuming that each marital status group had an equal probability of having the highest rate for each cancer, is less than 1 in 1 billion. The magnitude of the differences between incidence rates among single black men compared to black men of other marital status was 1.2 or greater for 12 of the 15 sites analyzed. Rate ratios ranged from 1.2 to 2.0 in cancers of the urinary bladder to 1.6 to 4.4 times higher in cancers of the buccal cavity and pharynx, comparing single black men to divorced, widowed, and married black men. There were only four cases among single black males of cancers of the thyroid and other endocrine organs, even though their incidence rate was highest among black men. The two remaining cancers (rectum and rectosigmoid junction and leukemias) were 1.1 to 1.7 and 1.2 to 2.1 times higher in single black men, respectively.

Among black females, all cancers except those of the rectum and rectosigmoid junction, kidney and renal pelvis, thyroid and other endocrine organs, and non-Hodgkin’s lymphomas were highest among single black women (Table 1). The magnitude of the differences between incidence rates among single black women and black women of other marital status was greatest for cancers of the buccal cavity and pharynx, esophagus, pancreas, lung and bronchus, breast, uterine corpus, and ovary. For these cancers, incidence rates ranged from 1.2 to 1.4 times higher for breast cancer to 2.0 to 5.4 times higher for cancers of the buccal cavity and pharynx in single black women compared with widowed, married, or divorced black women. Although age-adjusted incidence rates were highest among black women in those who were single for cancers of the larynx and bladder, as well as for leukemias and multiple myeloma, there were only ten
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Table 1
Five-year frequencies and average annual age-adjusted cancer incidence rates among persons 35 and older by marital status, site, race, and gender: Metropolitan Detroit cases diagnosed in 1978-1982

<table>
<thead>
<tr>
<th>Marital Status</th>
<th>Black females</th>
<th>White females</th>
<th>Black males</th>
<th>White males</th>
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<tr>
<td></td>
<td>No.</td>
<td>Rate</td>
<td>No.</td>
<td>Rate</td>
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<td>12</td>
<td>31.2</td>
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<td>40</td>
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<td>11</td>
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<td>Stomach</td>
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<td>12</td>
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<td>9.1</td>
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<td>Married</td>
<td>47</td>
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<td>15.1</td>
<td>16</td>
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<tr>
<td>Widowed</td>
<td>86</td>
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<td></td>
<td>W = 0.700, P &lt; 0.05</td>
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<td>Colon</td>
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<td>1264</td>
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<td>94.9</td>
<td>1403</td>
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<td></td>
<td>W = 0.825, P &lt; 0.05</td>
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<td>Rectum and rectosigmoid junction</td>
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<td>35.3</td>
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<td>74</td>
<td>26.7</td>
<td>477</td>
<td>25.2</td>
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<tr>
<td>Divorced</td>
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<td>17.2</td>
<td>64</td>
<td>27.6</td>
</tr>
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<td>Widowed</td>
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<td>23.9</td>
<td>495</td>
<td>33.9</td>
</tr>
<tr>
<td></td>
<td>W = 0.625, P &lt; 0.05</td>
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<tr>
<td>Pancreas</td>
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<td></td>
</tr>
<tr>
<td>Single</td>
<td>14</td>
<td>38.1</td>
<td>28</td>
<td>13.4</td>
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<tr>
<td>Married</td>
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<td>317</td>
<td>17.6</td>
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<tr>
<td>Divorced</td>
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<td>19.0</td>
<td>48</td>
<td>20.4</td>
</tr>
<tr>
<td>Widowed</td>
<td>111</td>
<td>31.2</td>
<td>360</td>
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<tr>
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<td>Larynx</td>
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<td>7.5</td>
<td>5</td>
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<tr>
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<td>3.8</td>
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<td>9</td>
<td>4.0</td>
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<td>7.0</td>
<td>52</td>
<td>8.0</td>
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<tr>
<td></td>
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<td></td>
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<td>Lung and bronchus</td>
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<tr>
<td>Single</td>
<td>50</td>
<td>114.3</td>
<td>119</td>
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<tr>
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<td>240</td>
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<td>87</td>
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<td>253</td>
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</tr>
<tr>
<td></td>
<td>W = 0.450</td>
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or fewer cases among single black women for each of these sites. For the remaining three sites that were highest among single black females, their rates ranged from 1.1 to 2.0 times higher for stomach cancers to 1.1 to 1.8 times higher for colon cancers (Table 1). Additionally, widowed black women had the second highest rates for all but five of the cancers analyzed: rectum and rectosigmoid junction; breast; uterine corpus; urinary bladder; and non-Hodgkin’s lymphomas (Table 1).

Widowed white females had the highest or second highest age-adjusted incidence rates for all but two of the site groups analyzed. Their rates were larger than those of the other three marital status groups for cancers of the buccal cavity and pharynx, stomach, colon, pancreas, larynx, uterine cervix, kidney and renal pelvis, and multiple myeloma. The only two sites for which widowed white women did not have the highest or second highest age-adjusted incidence rates were cancers of the breast and urinary bladder (Table 1). Among the cancers for which widowed white females had the highest incidence, this differential was greatest in cancers of the buccal cavity and pharynx, larynx, kidney and renal pelvis, and multiple myeloma. Rate ratios of widowed white females compared to white females of other marital status were at least 1.3 for these cancers, ranging to 3.6. Four of the eight cancers for which widowed white women had the second highest incidence had rate ratios of at least 1.2 (cancers of the rectum and rectosigmoid junction, lung and bronchus, thyroid and other endocrine system, and leukemias). Small numbers of cases were not a problem among white women. For the remaining eight sites for which white female rates were highest or second highest among widowed women, the rate differential ranged from 1.0 to 1.7 in uterine cervix cancers to 1.1 to 2.0 in stomach cancers (Table 1). Although divorced white women had the lowest age-adjusted incidence rates for nine of the site groups analyzed, they had the highest rates for esophageal cancers and cancers of the lung and bronchus (Table 1).

The lowest age-adjusted incidence rates across the cancer sites analyzed did not occur predominantly among the married in any of the race-gender groups. Married persons had lower incidence rates than did any of the other marital status groups, except for only two sites among white females, for four cancer sites among black females, for five sites among white males, and for three sites among black males (Table 2). Furthermore married persons had the highest or second highest age-adjusted incidence rates for seven sites each among black or white females and for eight sites each among black or white males. For all four race-gender groups, the lowest incidence of cancers occurred most frequently among divorced persons: for 12 of the cancers among black females; 9 among white females; 11 among black males; and 8 among white males.

Kendall’s coefficient of concordance (W) was calculated to compare site-specific patterns of cancer incidence by marital status across the four race and gender groups. For the gastrointestinal sites of stomach, colon, and rectum and rectosigmoid junction, the test indicated similar ranks of age-adjusted incidence rates by marital status for black and white males and females (Table 1). This result is attributable primarily to high incidence rates among single and widowed persons and low rates among divorced persons. Single or widowed individuals had the highest age-adjusted incidence rates across all four race-
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gender groups for stomach cancers, among all but white males for colon cancers, and among all but black females for cancers of the rectum and rectosigmoid junction. High rates among single persons predominated, with single persons having the highest incidence of cancers of the rectum and rectosigmoid junction across all groups except black females and among both black males and females for cancers of the stomach and colon. Rates were lowest among divorced persons across all four race-sex groups for cancers of the stomach and colon, as well as among all groups except white females for cancers of the rectum and rectosigmoid junction.

DISCUSSION

The results presented above must be interpreted in the context of both the strengths and limitations of the data and of the statistical procedures utilized. Testing for statistical significance of Kendall’s W for 19 sites yields a problem in multiple comparisons in that some of the significant findings may be due to chance alone. There is greater than a 50:50 chance of rejecting the null hypothesis of no concordance by chance alone in at least one of these tests. Additionally the nonparametric procedures utilize only the rank orders of the rates for analysis. Thus some detail from the full data set is lost in the statistical testing. However, these rank order summaries do provide a useful method of making comparisons of cancer incidence by marital status across site groups and across race-gender categories. It is important to remember that the statistical tests were performed essentially as a guide or screen for sifting through this large set of descriptive data. Finally the results obtained from Metropolitan Detroit data may reflect, to some degree, regional peculiarities. Therefore analyses of cancer incidence by race, gender, and marital status from national SEER data and from other geographic areas would be useful.

Misclassification bias and enumeration error in both the cancer case data and the Census data must be considered in any analysis of incidence rates. The potential problems associated with race, gender, and age variations may be exacerbated when calculating these rates by marital status as well. This problem has been discussed in previous studies as a possible explanation for marital status variation in cancer incidence and mortality (1–4), and it also has been considered in greater detail as a methodological issue (5, 6). Only blacks are estimated to have been underenumerated in the 1980 Census, black males by 7.5% and black females by 2.1% (10). Even in the unlikely probability that as much as one-half of the underenumeration occurred among singles, this still would not account for all the excess cancer incidence observed among single black females or males. Furthermore the estimated net undercount for black males varies considerably by age. For the age groups included in this study, the largest estimated net undercount occurred in the two youngest age groups (35–44 years and 45–54 years), at 16.1 and 15.1%, respectively. Black males in the age groups 55–64 years are estimated to have been undercounted in the 1980 Census by 6.2%, those 65–74 years old were overenumerated by 4.3%, and those 75 years old and older undercounted by 0.5% (10). For all but three sites, the proportion of cases in the two younger age groups ranged from 8.0 to 44.4%, with an average of about 23%. For cancers of the buccal cavity and pharynx, 50.0% of the cases were in the 35–44- and 45–54-year age groups, as were 75.0% of the thyroid and other endocrine organ cancers and 55.6% of the leukemias. The magnitude of the age-specific rate ratios for these younger age groups for single black males compared to black males of other marital status diagnosed with cancers of the buccal cavity and pharynx ranged from 1.4 to 3.4 and for leukemias from 2.4 to 4.5. Thus even if all the net undercount in these two age groups occurred in single black men, a very unlikely event, the excess age-specific rates would not be eradicated. Except for cancers of the thyroid and other endocrine organs, the majority of cases were observed in age groups 55–64 years and older. Thus the high age-adjusted incidence rates among single black men do not appear to be explained by underenumeration of the population.

If higher incidence rates are primarily a result of methodological artifact due to misclassification, then misclassification error resulting in overenumeration of the numerator or underenumeration of the denominator is responsible. In addition, small numbers of cases may produce rates that are highly variable. As shown in the results, small numbers were not a problem for cancer incidence rates that were higher among widowed white females. Small numbers were a problem with the cancer incidence rate for thyroid and other endocrine organs among single black males and for the high cancer incidence rates of larynx, bladder, multiple myeloma, and leukemias among single black women. These rates must be interpreted with particular caution; additional evidence is required from studies with larger numbers of cases. While misclassification bias could account for some high or low rates, it is not likely to be responsible for a large proportion of the variation observed by marital status. In the first place, marital status data were available for 97.1% of the cancer case records and 98.8% of the census records, and both data sets are derived from self-reports. Second, as noted previously, although the cancer case record data utilize the category "single" and the census data utilize the category "never married," we have found from interview data that 92% of those reported as "single" on the hospital record stated they were "never married" in the interview. Finally it is highly unlikely that age-adjusted incidence rates based on large numbers of cases which are 50 to 100% higher than the other rates could occur solely as a result of misclassification.

For sites which did not have concordant incidence patterns by marital status, it was observed that single black males and females had significant excesses of age-adjusted cancer incidence for most sites when compared with married, divorced, and widowed blacks. To establish sites for which further etiological research may prove productive, guidelines such as the magnitude of increase in rates and frequency in the population are useful measures. For example, it may be that the sites showing at least a 50% excess incidence based on ten cases or more for single blacks share a common etiology. These include cancers of the buccal cavity and pharynx and of the lung and bronchus for single black males and females; cancers of the esophagus for single black females; and laryngeal and pancreatic cancers among single black males. Because cancers at these sites have been shown in previous research to be associated with cigarette smoking and, to varying degrees, with excess alcohol consumption (14–17), these findings may reflect a greater excess of smoking and drinking among single blacks than occurs among married, divorced, or widowed blacks. While this is a reasonable assumption, a systematic examination of the preva-
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ience of cigarette smoking and alcohol consumption among black males by marital status has yet to be conducted. There is some evidence, however, at least with regard to drinking practices, which suggests that single men in general are more likely than men in other marital status groups to be heavier consumers of alcoholic beverages (18, 19). The evidence for cigarette smoking is more equivocal, showing little difference between married and single men (20). Other sites with high incidence among single black men also suggest a smoking and alcohol use etiology; these include cancers of the esophagus, urinary bladder, and kidney and other urinary organs (21, 22). Incidence rates of breast, ovary, and uterine corpus cancers also were higher in single black women than among married, divorced, or widowed black women. Perhaps this differential is accounted for by variation in levels of endogenous hormones, such as estrogen and progesterone, that vary with anovulation and nulliparity, two conditions more likely to occur among single women (23, 24).

Because of the diversity of sites for which the cancer incidence of widowed white females exceeds that of married, single, and divorced white females, another possibility is suggested. Perhaps these data reflect host responses to psychosocial stress associated with being a widow. Such responses could function as promoters in the development of malignant disease (25, 26). Additionally it may be that widowed white women are at greater risk for losing social supports or for reductions in socioeconomic status compared to white women who are single, married, or divorced or compared to black widows. The 1971–1972 NCHS Health Interview Survey reports that 72.0% of widowed persons have a family income under $7000, compared to 59.7% of divorced persons, 41.2% of never married persons, and 29.5% of married persons (27). In addition, a higher proportion of widowed persons with a family income under $7000 were found to have limited activity due to chronic conditions than persons in other marital status groups with a family income under $7000. Unfortunately results of this survey are not presented by both race and gender. There is presently little research comparing widowhood and the bereavement process between black and white women (25).

As Cox and MacKay (28) pointed out in their review of psychosocial factors and cancer etiology, specific variables such as marital status, socioeconomic status, stress, and social support interact with each other as a host environment complex. Perhaps widowed white women and single blacks are more likely to be characterized by a combination of reduced socioeconomic status and loss of social support and thus to experience psychosocial stress. These factors could exacerbate the effects of known carcinogens, such as cigarette smoking and excess alcohol consumption. It is more likely that these factors would act synergistically to produce a promoter effect in the process of malignant transformation of cells and in growth of malignant cells than it is that individual factors would explain the high incidence rates of certain cancers.

Concordant marital status patterns of cancer incidence across the four race-gender groups observed for the three digestive tract sites of colon, stomach, and rectum and rectosigmoid junction may be indicative of shared risk factors among single and widowed persons that are less common among married and divorced persons. One avenue of further investigation that may be appropriate in analytical studies of these sites is to determine whether dietary habits and stress contribute to this pattern of higher cancer incidence rates. Since studies of the role of diet in the occurrence of these diseases suggest that different components of diet seem to contribute to their respective etiologies, perhaps stress plays a promoter function, acting synergistically with various components of the diet to increase cancer incidence among single and widowed persons. The low rates for these cancers observed among divorced persons are more perplexing. In future studies, it would be interesting to determine whether patterns of dietary habits and stress are different in single and widowed persons, in contrast to divorced and married persons, and whether such factors are associated with relatively higher or lower incidence of these cancers.

The only other study of marital status patterns in cancer incidence was conducted by Ernster et al. (4). Direct comparison of results of these two investigations is complicated by two primary differences. The study of Ernster et al. utilized age-specific cancer incidence rates, while this study includes age-adjusted rates; also the cases included in the study of Ernster et al. were between the ages of 35 and 64 years, while the Metropolitan Detroit study includes cases 35 years of age and older. Time and geographic area also may affect results of the two studies, since the present study includes 1978–1982 cases from Metropolitan Detroit, while Ernster et al. included a 10% sample of the United States population, with cases diagnosed in 1969–1971. The most striking similarity between the two studies is the consistent finding of higher cancer incidence among single black men. In neither study does it appear that these excess rates can be explained entirely by population underenumeration. Another similarity between the two studies is the lack of concordance in marital status patterns between blacks and whites, with the exception of the three digestive tract sites for which the Metropolitan Detroit study did find concordant marital status patterns. There also are some important differences in the findings of these two studies. The consistent pattern of high incidence among single black females was not observed in the Ernster study; the Metropolitan Detroit data are the first to show this result. Furthermore Ernster et al. showed different male and female patterns for both blacks and whites, while the Metropolitan Detroit data reveal similar patterns among blacks, who have higher rates among single persons for both males and females. Ernster et al. also report that patterns among black and white females were similar, yet in the Metropolitan Detroit data widowed white females had the highest rates, while single black females most often experienced the highest cancer incidence. The tendency toward higher rates among widowed white females was observed for a few cancer sites in the study of Ernster et al. but did not present the more consistent pattern observed in the Metropolitan Detroit data.

Finally as Ernster et al. (4) observed, there appears to be no protective effect of marriage for cancer incidence. The lack of consistently lower cancer incidence rates among married persons is in distinct contrast to studies of cancer mortality by marital status (1–3). This may indicate that marriage influences survivorship among cancer patients but plays no role in the etiology of cancer.

While it is important to understand the limitations of any study, it is equally important that one should not ignore data that provide useful leads for analytical investigations. The statistical methods utilized in this study help screen the data for potential etiological clues. While the results neither define completely high risk marital
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status groups nor perfectly exclude those which may be at low risk, they do provide some important and convincing leads for further research. They also suggest that, while variation in cancer incidence by marital status is influenced to some degree by statistical artifact, it is not due primarily to misclassification bias or enumeration error.

In conclusion, these findings give striking evidence that the relationship between cancer incidence and marital status varies by site, race, and gender. This study confirms earlier work which showed no protective effect of marriage with respect to cancer incidence, in distinct contrast to studies showing lower cancer mortality rates among the married. With regard to widowed white females, it is important to assess the reasons for their elevated risk compared to white females who are single, married, or divorced. In addition to investigating behavioral differences, there may be heuristic value in studying the implications of reduced resistance to the occurrence of cancer resulting from changes in social relationships due to the loss of a spouse. Single black females and males seem to be at elevated risk for many cancers. The findings regarding single black men are confirmatory, supporting previous research in this area (4), while the results for single black women are new observations from the Detroit data, which require additional evidence from further studies, particularly for those sites with a small number of cases among single black women. It is essential to investigate the reasons for this apparent excess risk in greater detail through case-control studies. It would be particularly useful to compare the life-styles of single blacks with single whites, adjusting for socioeconomic status. Since many of the sites for which single blacks have the greatest excess of cancer incidence are known to be associated with excess cigarette smoking and alcohol use, these risk factors should be a central focus of such studies. Research in this area would have important implications for designing more effective preventive health programs for blacks. For example, there may be particular benefit from development of programs for smoking cessation and prevention, as well as for the prevention of alcohol abuse, specifically for single black men and women.

It also is important to keep in mind that marital status may be more than simply an indirect measure of the prevalence of some other well-known risk factor. The advantage of investigating cancer risk by marital status is that it may help to identify other, previously unknown, risk factors or perhaps specify the additive or multiplicative effects of several risk factors in combination. Other behavioral and environmental risk factors such as dietary habits and occupational history should be explored as well. Finally the concordant patterns of cancer incidence for the three digestive tract sites suggest that investigation of marital status, dietary habits, and stress may lead to further understanding of the etiologies of these diseases.

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Marital Status and Cancer Incidence: Differences in the Black and White Populations

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