



FINAL PERFORMANCE REPORT

Cancer Mortality among Minority Workers

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TABLE OF CONTENTS

Abbreviations	3
Significant Findings	4
Abstract	6
Background	7
Specific Aims	14
Methods	15
Results	20
Discussion	146
Conclusions	150
References	152
Publications	159

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ABBREVIATIONS

PMR, proportionate mortality ratio; SRR, standardized mortality ratio; CI, confidence interval; PUMS, public-use micro sample.

SIGNIFICANT FINDINGS

The principal findings of this research can be divided into methodological and substantive categories. The principal substantive findings are:

1. When the experience of African-American, Latino, Native American and Asian workers was compared to that of whites or the entire workforce, most of the positive associations of cancer with occupation and industry were for cancers known to be related to race and ethnicity, but without strong, established links to workplace exposures. Associations of this type include stomach cancer in Asians, cancer of the gall bladder among Native Americans, and esophageal cancer among African Americans.
2. Internal analyses comparing minority workers in specific occupations and industries to all workers of the same race or ethnicity, revealed several established associations of cancer with the work environment. Associations observed include: bladder cancer and leukemia in the rubber industry among African-American men and Latino men, respectively; lung cancer in the construction industry and in stone, glass, clay, and concrete products manufacturing, among African-American women and Native-American men, respectively; lung and bladder-cancer among motor vehicle operators, in African-American women, and bladder cancer among several groups of metal workers potentially exposed to polycyclic aromatic hydrocarbons. Excess cancer of the pleura in several groups of African-American workers is also suggestive of widespread exposure to asbestos.

The primary methodological findings are:

1. In comparisons between different ethnic and racial groups, proportionate mortality ratios (PMRs) tended to give an impression of low cancer mortality among minority workers, while standardized mortality rate ratios (SRRs) more frequently suggested excess cancer mortality among minority workers. This tendency is likely to be a consequence of the dependence of the PMR on all-cause mortality rates, and indicates that PMRs may not be sensitive indicators of association in occupational studies that involve comparisons across race or ethnicity.
2. The cancers and work settings for which excess mortality was observed varied among the four minority groups, suggesting that the common practice of aggregating "non-white" workers is likely to obscure significant inter-group variation.
3. In internal analyses within a single race or ethnic group, associations of cancer with occupation or industry were often markedly different for women and men. This observation reinforces the need for sex-specific analyses, because of differences between men and women in their patterns of employment and mortality.
4. Analysis of multi-state, multi-year surveillance data bases is a useful approach for epidemiologic studies of workers whose numbers in any single workplace or community may not be sufficient for investigation with other methods. We were able to examine the experience of male and female

minority workers in many occupations and industries. Nevertheless, the study was still limited by small numbers in some groups, most notably for Native Americans and Asians. The data base currently omits several of the largest states, which also have large minority populations. The mortality data base could be improved by adding additional years of data and additional states; efforts should be made to add New York, California, Texas, and Florida to the list of states that provide death certificate occupational information to the National Center for Health Statistics.

5. It is feasible and useful to combine mortality data and census data to compute SRRs as measures of occupation-cancer associations. However, the ability to generate SRRs for populations defined by occupation and industry is currently limited by the methods used to collect occupational information in the US census. Computation of SRRs for elderly people who are no longer in the labor force is particularly difficult, because the census only requests information about recent work. This is a significant problem, because most cancer occurs at older ages. The usefulness of census occupational data for epidemiologic studies of chronic diseases could be improved significantly by adding questions about usual, lifetime occupation and industry to the census form.

ABSTRACT

A need for further epidemiological research on cancer among workers belonging to racial and ethnic minority groups is indicated by the extreme scarcity of the information currently available, coupled with the evidence that these workers' health experience is likely to be less favorable than that of the majority. Given that the fundamental features of cancer occurrence among minority workers have not been well delineated, basic epidemiological information derived from comprehensive, broadly representative data is necessary to define the problem, generate leads for further research, and initiate preventive efforts. This epidemiological study used mortality surveillance data from 21 states to address four questions about African-American, Latino, Asian, and Native-American workers: 1) How do the overall rates of cancer among minority workers compare with those of the US workforce as a whole? 2) Which occupational settings, if any, are associated with excess cancer occurrence among workers of each minority group, relative to the US workforce at large? 3) Which occupational settings, if any, are associated with excess cancer within specific minority groups? and 4) Is there evidence of previously-reported occupation-cancer associations among minority workers? The study population included residents of the 21 states who died at ages >20 in the years 1985-1992 and had information on the death certificate indicating an occupation other than retired, homemaker, student or volunteer. This information was used to classify usual occupation and industry. Race and ethnicity were classified using the race and national origin items from the death certificate. Excess cancer mortality was identified primarily through analyses using the proportionate mortality ratio (PMR). For workers under age 65, analyses were also conducted using the standardized mortality rate ratio (SRR) as an indicator of association.

All of the specific aims originally proposed for this research have been met. However, because of problems with the University's central computing system, the work proceeded more slowly than expected, and we remain behind schedule in publishing the research findings.

In total, 639,337 cancer deaths were observed among eligible workers in the study population. Analyses of these deaths indicated that, when compared to whites or to the entire workforce, African-American, Latino, Native American and Asian workers experienced excess mortality from cancers known to be related to race and ethnicity, but without strong, established links to workplace exposures. Associations of this type include stomach cancer in Asians, cancer of the gall bladder among Native Americans, and esophageal cancer among African Americans. Analyses using PMRs and SRRs tended to give different impressions of the magnitude of excess cancer among minority workers relative to whites, with SRRs more frequently suggesting an excess for African Americans, in particular. In internal analyses within single race or ethnic groups, evidence of several established associations of cancer with the work environment was noted. These associations include bladder cancer and leukemia in the rubber industry among African-American men and Latino men, respectively. The occupational groups experiencing excess cancer varied substantially by sex and race/ethnic group. In addition, the numbers of deaths from some cancers were small for Native Americans and Asians, in particular.

Although these routinely-collected data did not permit direct identification of occupational carcinogens or rigorous examination of detailed etiologic questions, the limitations are counterbalanced by several important considerations: mortality surveillance data provide virtually the only opportunity to examine the full spectrum of occupations and industries in which minority workers are employed; selection bias is minimized because essentially all deaths are registered; the problem of small numbers can be overcome by the use of multi-state mortality data to examine the experience of many numbers workers who may be dispersed at separate workplaces. Knowledge regarding occupationally-related cancer among minority workers is sufficiently incomplete that our findings based on existing surveillance data constitute a significant step forward.

BACKGROUND

Overview

Very little epidemiological information is available concerning the occurrence of cancer among workers who belong to racial or ethnic minorities of the United States population. Nevertheless, there is reason to believe that these minority workers may have higher exposures to occupational hazards in some settings, and that their risks of work-related cancer may be quantitatively and qualitatively different relative to non-minority workers'. With knowledge at such a preliminary stage, epidemiological studies based on mortality surveillance data could yield key epidemiological information potentially leading to public health action or further research. Appropriate mortality data exist for approximately 20 states, but have not previously been analyzed for this purpose.

A Note on Terminology

Like race and ethnicity themselves, the language used to identify national and racial groups is complex and fluid. At any given time, a group may be referred to by multiple names with greater degrees of acceptance for those inside and outside the group. We recognize that the naming of population groups can be problematic and contentious. The term, "minority," for example, though in common use, can be seen as ethnocentric and misleading because the groups that are usually classified as "minorities" in the United States collectively comprised the majority of the world's population, and are projected to be more than 50% of the US population in a few decades. For this report, we have used group names that are familiar to readers, reasonably concise, and generally acceptable according to contemporary consciousness. These choices, however, imply no judgement as to the accuracy, desirability, or merit of a given term. We recognize that some may prefer other language, but know of no terminology that will satisfy everyone.

Cancer among Minority Workers

Racial and ethnic minority groups comprise approximately 18 percent of the United States labor force, yet epidemiologic data concerning the health of minority workers are exceedingly sparse. The paucity of relevant information is reflected in the official surveillance data collected by the Bureau of Labor Statistics. This annual nationwide survey of occupational illness and injury only began providing information by race and ethnicity in 1992. Epidemiologic studies of specific industries and occupational groups similarly provide little information. Whether because of the statistical limitations of small numbers, logistical difficulties, or lack of interest in race- and ethnic group-specific results, minority workers are frequently omitted from occupational studies, or combined with white workers in race-adjusted analyses in which whites predominate. When data for minority workers are reported, they are frequently identified only with the difficult to interpret label "non-white." Indeed, standard software for the analysis of occupational cohort studies generally allows minority workers to be considered only in the aggregate (Steenland et al., 1990).

Data concerning cancer among minority workers are similarly sparse. Despite the extensive epidemiological literature devoted to occupational research on cancer, most studies have focussed on white men. Kipen et al (1991) reported finding only 31 articles providing information on cancer mortality among "non-white" workers, after searching 4 years of leading US journals of occupational health, epidemiology, and cancer research, as well as major on-line catalogs of the medical literature. A more recent survey of 1233 English language occupational epidemiologic cancer studies published 1971-1990 found that only 9% presented any data, although the number that included such workers was larger (Zahm et al., 1994). Information was found to be particularly lacking for US Latinos, Native-Americans, and Asian-Americans (Zahm et al, 1994). Our experience was similar in searching the

Medline and NIOSHTIC data bases to prepare the proposal for this project. Searches using a variety of subject headings and text strings (minority-groups, blacks, african-americans, hispanic-americans, latinos, asians, asian-americans, native-americans, indians and amerinds, combined with occupational-diseases, occupation, industry, and cancer) yielded 11 citations of which only 3 provided epidemiological data specifically for cancer among minorities in relation to occupation or workplace exposures. The relevant citations provided data for African-Americans but not other minority populations.

Despite the paucity of information concerning occupational cancer among specific racial and ethnic minority groups, there are compelling reasons to suspect that the far more extensive data available for white and racially mixed groups may not reflect the experience of minority workers. In the population at large, cancer incidence and mortality vary significantly by race and ethnic origin. African-Americans have high overall mortality from cancer relative to other groups in the United States, whereas Asians, Latinos, and Native Americans have relatively low overall cancer rates (US DHHS, 1986). Risks for specific cancers also vary considerably among groups. For example, the incidence of buccal cavity cancers is highest among Puerto Ricans, despite their relatively low overall cancer incidence, and proportional cancer mortality from prostate cancer is higher among Native Americans than in any group but African-Americans (US DHHS, 1986). Determinants of these differences are complex, and are likely to include cultural, social, genetic, and medical influences, in addition to occupational and environmental exposures. For African-Americans, the minority group with the most extensive data, differential cancer risk relative to whites has been attributed to social class, as well as to unidentified factors associated with race (Baquet et al., 1991).

The diversity of epidemiological patterns observed globally carries over to relationships between cancer and occupation. Different occupations have been reported to be associated with lung cancer, pancreatic cancer and leukemia among black men than among white men, for example (Pickle et al., 1980; Swanson et al., 1993; Loomis & Savitz, 1991). Indeed, given the diversity of the US population and the intricate interrelationships between race and ethnic origin on the one hand, and the history of migration, acculturation, and discrimination on the other, associations between cancer rates and a diverse array of sociodemographic attributes, including employment, are to be expected. A Department of Health and Human Resources study in the 1980s concluded that extrapolating the experience of non-minority workers to gauge the occupational cancer risks of minority groups would be "improper."

Within the workplace itself, tasks and exposures are determined in part by ethnic group membership. In the past, African-Americans in particular were openly selected for unpleasant, "dirty" jobs regarded as unsuitable for other workers (Baron, 1983). Some of these discriminatory practices have had documented adverse consequences for health. Cherniak's thorough study of silicosis at a West Virginia tunnel construction project in the 1930s where some 800 men died of acute silicosis provides stark evidence of the link between race and worker health; the majority of the exposed workers and probably three-fourths of the dead were African-American (Cherniak, 1986). There is also evidence that minority workers have been concentrated in jobs with high exposures to occupational carcinogens in more recent times (Davis et al., 1995). In one of the best-known examples, excess lung cancer in a large cohort of steel workers was almost entirely attributable to a 10-fold increase in lung cancer mortality among workers on the top side of the coke ovens, 80% of whom were African-American (Lloyd, 1971). Such examples remain relevant today, because cancer occurring now may be a result of exposures decades ago, and also because minority workers remain concentrated in the least desirable and sometimes most hazardous jobs (Davis et al., 1995). A review of recent occupational cohort studies that found a tendency for nonwhite workers to have higher cancer mortality than white workers (Kipen et al., 1991) highlights the need for continued concern.

Occupation may also be a more significant contributor to the total burden of cancer among minority

populations than among the majority. An analysis of combined data from several case-control studies in the United States suggested that the proportion of lung cancer due to occupation was up to twice as high among African-Americans than among whites (Vineis et al., 1988).

Finally, ethnic groups may differ in their susceptibility to occupational carcinogens. Differential susceptibility may be related to ethnicity through diet and other culturally-determined "lifestyle" factors. Susceptibility may be mediated by factors, such as tobacco use, that may enhance (or reduce) cancer risk in combination with occupational exposures. In rare instances, there is evidence of genetic influences in differences in susceptibility related to race or ethnicity (Young, 1993; Polednak, 1989).

Methodological Challenges

Sources of Data

Cancer surveillance data can play an important part in delineating epidemiological patterns of cancer among minority workers. The goals of surveillance for work-related disease include: 1) describing the occurrence of disease and determining its magnitude; 2) monitoring known hazards, and 3) identifying possible new hazards for remediation or further investigation. In addition, for the study of adverse effects among minority workers, the use of surveillance-type data from a population-based system has the important additional benefit of greatly enhanced efficiency. The analysis of such data is an appropriate method to provide the fundamental, descriptive epidemiological data that are now lacking for minority workers in the United States.

Surveillance data of this type are routinely used for occupational epidemiological studies in some European countries. In Britain, occupational information has been recorded on death certificates and in the population census for 150 years. The analysis of combined data from death registrations and the population census has thus been a productive tool for occupational epidemiology since William Farr developed the approach in the 1850s (Eyler, 1979). In some Nordic countries, national cancer registries and population data containing occupational information can be linked for still more informative studies of occupation and cancer (e.g., Vagero & Olin, 1983). Occupational analyses based on these British and Scandinavian data systems have been an important source of epidemiological insight.

Mortality and incidence surveillance data have been used for occupational epidemiologic studies to a much lesser extent in the United States. A nationwide occupational mortality study of men was conducted for deaths in 1950 (Guralnick, 1963) and occupational data from death registrations in some states, notably California and Washington, have been analyzed (Milham, 1983; Reidmiller et al, 1987). However, occupational information has not been routinely provided for death registrations on a nationwide basis. Within the last ten years, however, a joint effort of the National Institute for Occupational Safety and Health, the National Cancer Institute, and the National Center for Health Statistics has made death registration data including occupational information for 25 states available to the research community. These mortality data have now been used for several occupational epidemiological studies, including a number focussed on cancer (e.g., Blair et al, 1993; Hayes, 1993; Loomis & Savitz, 1990; 1991; Loomis, 1992). However, at the time the project was initiated, these new multi-state occupational mortality data had not yet been used for studies of minority workers.

Study Designs and Measures of Association

Several analytical methods have been used for surveillance of occupational cancer incidence and mortality. The preferred method is to form a cohort based on a census of the workforce and follow it by linking individual census records to mortality or incidence records. This method cannot be used in the United States, however, because individual census records are confidential and cannot be linked

with other records. All of the remaining methods require compromises.

Three methods can be used with current United States mortality data. The method most similar to following a true cohort involves computation of mortality rates using numerators from vital statistics records and denominators from a population census, but without individually-linked records. The mathematical computations and indicators of association used with this method are identical to those required when death and census records can be linked, but the population at risk is estimated rather than enumerated directly. Although this is the oldest of the methods discussed here and has had a distinguished history since its introduction by Farr 150 years ago (Eyler, 1979), it has seen little use in the United States.

In contrast, the two methods employed most frequently in this country use death data alone. With the first approach, usually called proportional mortality analysis, the proportion of all deaths due to a specific cause in one occupational group is compared to that in another group. The indirectly-standardized proportional mortality ratio (PMR) is the classical indicator of association in such analyses (Kupper et al., 1978). The PMR can be interpreted as an indicator of the structure of mortality, which contrasts the relative importance of a cause of death between populations (Kupper et al., 1978). However, the PMR is more often used as a convenient surrogate for the SMR for use when the population at risk cannot be enumerated. Although studies using such surrogate methods can be valuable, their interpretation is complicated by uncertainty about how their results correspond to those that might have been obtained with knowledge about the size of the population at risk.

Objections to the PMR as a surrogate for the SMR have been advanced on theoretical grounds: PMRs and standardized mortality rate ratios for the same group of deaths may not be equal because the magnitude of the PMR is dependent upon the requirement that the proportion of deaths from all causes must add to unity, as well as on the relative magnitude of the all-cause death rates in the compared populations (Decoufle et al., 1980; Miettinen & Wang, 1981; Rothman, 1986). In occupational studies which contrast workers to the general population, the overall death rates often differ because of the so-called "healthy worker effect" (Checkoway et al., 1989). The proportionate cancer mortality ratio (PCMR) has been proposed as an alternative to the usual PMR which may help address the latter problem in studies of cancer (Checkoway et al., 1989). Since cancer mortality is thought to be less affected by the health worker effect, the logic of this indicator is to compare the proportion of all cancer deaths (rather than deaths from all causes) due to a specific neoplasm in the occupations of interest.

The proportionate mortality ratio (PMR) has another theoretical disadvantage, as an indirectly adjusted measure of association analogous to the standardized mortality ratio (SMR) (Kupper et al., 1978). Although indirectly adjusted indicators are widely used in occupational mortality analysis, their structure results in a significant limitation. The weights in indirectly adjusted measures are obtained from the specific occupational group being assessed. Therefore, SMRs and PMRs for different occupational groups are differently weighted such that confounding by the adjustment factors is controlled within the SMR or PMR, but not between two or more such measures. As a result, a set of SMRs or PMRs for different groups of workers may not be mutually comparable. This lack of comparability among indirectly adjusted measures is detrimental to a goal of many occupational mortality analyses: the comparison of mortality in different occupational groups.

An alternative approach to occupational mortality studies using only death data is the mortality case-control study. This design is a variant of the proportional mortality method proposed to eliminate the requirement of addition to unity (Miettinen & Wang, 1981). With this approach, PMRs are replaced by odds ratios comparing the proportion of cases dying of a specific cause who worked in the occupation of interest to the proportion of a control group who worked in the same occupation; the controls can be

more limited array. However, the magnitude of the mortality odds ratio remains dependent on the rate of death from the control diseases in the occupation of interest relative to the referent occupations, so the results may still be different from those that would be obtained with true mortality rate ratios based on the population at risk. Divergence between mortality odds ratios and the corresponding rate ratio is likely if the occupations being compared belong to different social groups, because mortality from all causes combined and from many major causes of death varies markedly by social class (Finkelstein & Liss, 1987; Loomis, 1992). Adjustment for social class should therefore help to compensate for differences in all-cause (or all-cancer) death rates among the occupations being compared (Brisson et al, 1987; Loomis, 1992). In principle, this dependency might also be eliminated by restricting controls to people dying of causes unrelated to the occupation of interest (Miettinen & Wang, 1981). However, this approach is not widely used, because the causes of death unrelated to occupation are difficult to identify empirically (Pearce and Checkoway, 1988). In practice, deaths from all other causes (or, in cancer studies, all other cancers) are the usual controls in mortality case-control studies. Thus, these mortality case-control studies are equivalent to classical proportionate mortality studies analyzed with a different measure of association.

Recent studies of US multi-state occupational mortality data have used either proportional mortality or mortality case-control methods exclusively (e.g., Blair et al, 1993; Hayes, 1993; Loomis & Savitz, 1990; 1991; Loomis, 1992), and are therefore hampered to some extent by the liabilities of studies based solely on deaths. Analyses of occupational mortality rates have not been employed. However, the potential for using this method is nevertheless illustrated by an analysis of North Carolina occupational mortality from 1984 to 1986 (Surles et al., 1988).

Enumeration of Populations at Risk

While analysis of mortality rates has advantages relative to proportional mortality methods for occupational cancer studies, the population at risk must be enumerated or estimated before mortality rates can be calculated. In the United States, estimates of occupational populations that would be appropriate to use in conjunction with death certification data to calculate mortality rates have proven difficult to obtain. For occupational cancer studies, the ability to adjust rates for age and to examine males and females separately are minimum requirements, in addition to counts of workers by occupation and industry. Studies of minority workers additionally require information on race and/or ethnicity. None of this necessary information has been available from the principal sources of employment data, including the surveys conducted by the Bureau of Labor Statistics. Appropriate data are collected in the decennial Census of Population and in Current Population Surveys conducted annually by the Census Bureau. These census data are the best single source from which to enumerate working populations for the purposes of computing mortality rates. Nevertheless, some limitations remain. The decennial census provides no occupational information for people not in the labor force at the time of the survey, however, Current Population Survey data do identify the usual occupation in the last five years of those no longer in the labor force, in addition to indicating the current occupation of people still working. In contrast, death certification records indicate the usual occupation during life, but provide no information about when that occupation was held. This inability to directly match the usual occupation of decedents to the workforce to which they belonged is the principal limitation of analysis of occupational mortality rates using US data.

Without the ability to link deaths directly to the cohorts that produced them, occupational mortality rates are estimates based on a surrogate approximation of the size and structure of the occupational population at risk. The accuracy of these estimates depends on the assumption that the size of the population at risk is stable between the time of a worker's usual employment and the time of his or her death. Given the nature of the death and census data collected in the United States, the validity of this assumption is unlikely to be directly testable. However, the classic study of death data reporting

patterns indicated that the usual occupation as indicated on death certificates is often the last occupation (Buechley et al., 1956), so this assumption may not be overly restrictive.

Definition of Population Groups

Race is an important and contentious theme in American history, yet the meaning of the concept itself is difficult to define rigorously. In much research in the social sciences, medicine, and public health, the term race was historically used in a biological or genetic sense. However, the traditional definitions of the "races" are quite unscientific. In modern biology, a race is understood as a genetically, reproductively, and geographically distinct, interbreeding group below the species level (Baker, 1967). In contrast, most racial definitions used in health research are based on gross phenotypes, rather than modern biological concepts (Wilkinson & King, 1987). The major "races" have not in any way remained geographically or reproductively isolated over the course of human history. In the United States, racial mixing was common before the 20th Century (Williamson, 1984). Indeed, research from the 1940s onward has demonstrated that genetic variability between "races" is so much smaller than inter-individual variability within them that the traditional concept of race has virtually no biological meaning (Lewontin et al., 1984:116-127).

These difficulties with the biological definition of race were recognized as early as fifty years ago, and its use as a genetic marker in modern human populations has come under attack as a racist practice with no scientific justification and negative social consequences (e.g., Montagu, 1953). As a result, conflating race with biology is viewed in the social sciences a pitfall to be avoided (Young, 1994:21). Race is regarded as a potentially sensitive topic, and the pains are taken to define racial groups as social, rather than biological, entities, which may or may not share nationality and culture (Polednak, 1989). This definition is similar in concept to ethnicity, which indicates national origin or culture (Polednak, 1989).

The views of race which prevail in contemporary social science have not been adopted to as great an extent in medicine and public health. Despite their benevolent purposes, these disciplines have been cited for uncritical use of outmoded biological concepts of race and ambiguity resulting from failure to define the concept (Cooper and David, 1986; Wilkinson & King, 1987; Herman, 1996). Public health is most frequently concerned with environmental and social factors, rather than genetic ones, since the former are amenable to control. Consequently, an explicitly sociocultural concept of race may be especially appropriate in public health research.

Identification and Classification of Minority Groups

Even with a clear definition of the construct of interest, identifying "racial" and ethnic groups and their characteristics that are relevant to health is challenging. The classification of Latino populations illustrates the potential complexity of the problem. Latinos are unambiguously recognized in contemporary practice as an ethnic group, rather than a race. However, an array of indicators, including nationality, language, surname, and self-identification have been used separately or in combination to identify individuals of Latino origin, with potentially different implications for research and policy (Hayes-Bautista, 1983). Whether a given individual is classified as Latino may depend on factors including recency of migration to the United States, acculturation, the type of informant providing information, and national origin (Zimmerman et al., 1994; Aday et al., 1980). In addition, the Latino population is internally heterogeneous with regard to national origin, culture, social class, and health experience. Mortality from major causes of death, including cancer, can vary substantially between the three principal Hispanic groups in the US, persons born in Mexico, Puerto Rico, and Cuba (Rosenwaike, 1987). Health status, including cancer mortality, may also depend on acculturation (Savitz, 1986). Related problems attend the identification of other minority groups (Cooper & David,

1986; Young, 1994; US DHHS, 1986).

The challenges of meaningfully identifying population subgroups is amplified when access to individual records or the research subjects themselves is not possible. Currently, both self-identified race and national origin are requested for both death registration and Census reports. However, some definitions used in classifying these data reflect traditional value judgements with no defensible scientific or social basis. For example, the "one drop rule " once used to designate as "black" any person with one black ancestor (Williamson, 1984) was evident in algorithms used until 1989 to code race in US birth records: a child with one black parent was designated as black, regardless of the race of the other parent, unless it was Hawaiian (Cooper & David, 1986). Other definitions in current use are merely arbitrary without apparent value content: in death registration data, Chinese and Japanese are designated as separate races, whereas Italian and Mexican indicate only national origin. Neither census nor death registration data provide direct indicators of length of residence in the United States or acculturation, although both do indicate place of birth.

As a result of these features of current vital records and census data, there is no single scheme of classification that can adequately identify racial and ethnic groups or subgroups for public health research. However, a combination of indicators including so-called race, national origin, and place of birth would facilitate definition of groups reasonably consistent with contemporary concepts of race and ethnicity and, for some of the larger groups, subdivision by nationality and foreign vs. US birth.

SPECIFIC AIMS

The specific aims of this project were:

1. To estimate cancer mortality rates and proportional mortality among African-American, Asian, Latino, and Native American workers relative to the total workforce encompassing all races and ethnic groups;
2. To identify, for each minority group, occupations and industries with greater than expected mortality from cancer relative to non-minorities in the same occupation or industry;
3. To identify, for each minority group, occupations and industries with greater than expected mortality from cancer relative to all workers in the same minority group;
4. To look for evidence of established or suspected cancer-occupation associations among minority workers.

METHODS

Study Population

Detailed data from death certificates are available from the National Center for Health Statistics (NCHS). The NCHS provides standard death certificate items in electronic form, including a demographic description of the decedent, the place of death and place of residence, the usual occupation and industry, and the underlying cause of death (NCHS, 1987; 1988; 1989; 1990; 1992; 1993a; 1993b; 1994). These data are collected by the state and local vital statistics units and provided to the NCHS, which compiles the data and issues the information for public use. Occupational information is collected by funeral directors and is intended to reflect the decedent's usual (i.e., longest-held) occupation, and the industry in which that occupation was located (DHHS, 1988). Occupation and industry are coded by state offices of vital records, with oversight and quality control provided by NCHS, using the 1980 Census System for the Classification of Industries and Occupations (Census Bureau, 1982). Information about race, national origin, and place of birth are collected by funeral directors from next-of-kin and coded according to standard categories developed by the NCHS.

The study population was selected from death records provided to the NCHS by 21 states that provided information on both occupation and ethnic origin for at least one year between 1985 and 1992. The states and the number of years for which data were available for each are shown in Figure 1. Four other states (Alaska, Missouri, New Hampshire, Oklahoma,) provided occupational data during this period, but did not give information about ethnic origin in the same year. Persons eligible for the study were residents of the preceding 21 states age 19 years or older who died between 1985 and 1992, and whose usual occupation, according to the death certificate, was in the paid labor force. Status in the paid labor force was defined as having any occupation other than "retired," "homemaker," "student," "volunteer," or "unemployed/never worked/disabled" coded in the electronic death certificate record. To reduce the number of occupation and industry categories, we grouped three-digit Census occupation and industry codes (the most detailed coding level) using a scheme similar to those we have used in previous studies (Loomis & Savitz, 1991; Loomis, 1991), with adaptations to emphasize occupations and industries where minority workers are concentrated or where exposures to potential carcinogens may occur.

Race and ethnicity are complex constructs with cultural, historical, social, and biological dimensions. Ethnicity refers to national origin, while race, in its usual meaning, refers largely to phenotype. Because of the limited information available, race and ethnicity were classified for this study using simple, operational criteria, based on information from the death certificate (see table). For purposes of this study, we classified African-Americans, Native Americans, Latinos, and Asians as "minority" workers and whites as "non-minority" workers.

Definition of Study Groups

Group	Definition
African-American	Race="Black" or Origin="Other African" and Place of birth=US
Asian	Race="Chinese", "Japanese," "Hawaiian," "Filipino," or "Other Asian or Pacific Islander"
Latino	Origin="Mexican," "Puerto-Rican," "Cuban," "Central or South American", or "Other or Unknown Spanish" (1985-88) or Hispanic Origin indicated (1989 onward)
Native American	Race="American Indian" (includes Aleuts and Eskimos) or Origin="American Indian"
Non-Minority	All other eligible persons

Data Analysis

Associations of each cancer with decedents' usual occupation and industry were assessed primarily via analysis of proportionate mortality. Proportionate mortality ratios (PMRs) were used as a measure of association and comparison. Proportionate mortality ratios can be thought of as the ratio of the observed number of deaths from a specific cause to the number expected from that cause, based upon the structure of deaths in a referent population (Miettinen, 1972). Using the PMR, we initially compared the proportion dying from each individual cancer among minority worker groups to that expected if those groups' cause-specific mortality were the same as that of the entire labor force and to that of non-minority workers. Then, within each minority group, we compared occupation- and industry-specific proportionate mortality from each cancer to that expected if the occupation or industry had the same distribution of deaths as all workers of the same group. Deaths for men and women were analyzed separately because of their different patterns of employment and mortality, and all PMRs were directed adjusted for age, using the age-distribution of deaths among the total labor force. Ninety-five percent confidence intervals (CIs) for PMRs were computed using the equation given by Kleinbaum et al. (1981) for standardized risk ratios.

For workers under age 65, some analyses were repeated using the standardized mortality rate ratio (SRR) as the measure of association in place of the PMR. In contrast to the PMR, the SRR reflects the relative rate of mortality, rather than the relative ranking of a given cause of death. Analyses using SRRs were analogous to those using PMRs, proceeding in the same sequence, and employing the same strata. SRRs were also directly adjusted for age using the age-distribution of deaths among the total labor force, and ninety-five percent confidence intervals (CIs) for PMRs were computed using the equations of Kleinbaum et al. (1981).

SRRs were computed only for people aged <65 because census data files provide only information about employment in the month before the survey, rather than usual employment, as indicated on death certificates. We judged that, under age 65, most people would report an occupation that could be coded to match death certificates, but that after that age the number reporting any codable occupation

would decline markedly (note that “retired” is an acceptable—although uninformative--occupation code in the census, but not on death certificates). We used the last or current occupation reported in the census for people under age 65 as a surrogate for the usual occupation, as described above.



RESULTS

Summary of Progress

This section summarizes the overall technical progress and outcomes of this project. The following sections present the scientific results in relation to the project's specific aims, as described in the proposal.

All of the technical goals of this project have been accomplished. These goals included:

- 1) the development of software needed for analysis of occupational mortality data;
- 2) the creation of analysis files from 1985 to 1992 mortality records from 21 states;
- 3) the estimation of worker populations for the same states and time period, and
- 4) the conduct of statistical analyses to address the project's four specific aims.

The completed work pertinent to the preceding goals is summarized below.

Development of software for standardization of mortality measures was an important part of the project. Commercially-available software for proportionate mortality analysis produces only indirectly-adjusted PMRs, which may not be comparable across groups of workers which differ in age. As a result, we developed algorithms for direct standardization of proportionate mortality ratios and mortality rate ratios, translated them to SAS code and tested them during the first year of the project.

Progress on all other aspects of the project that involved the processing of electronic data was significantly delayed from the beginning of the project because of continuing problems with the University's computing environment. At the end of 1995, the University retired the IBM mainframe system that had been the principal environment for research computing and storage of data and replaced it with a new UNIX-based Convex system. As we reported in the interim progress report for this project, the beginning of work was delayed as a result of this changeover. Some of the large, archival data files that were needed as input to build the analysis files were lost or corrupted in the process and had to be recovered. Furthermore, when the new computer system was installed it failed to perform as expected. The throughput of data was extremely slow and the need to respond to the problems with this system consumed large amounts of programmer time. As a result of its poor performance the CONVEX computer system was itself replaced during the second year of the project. With the current system in place most of the previous operational problems have been resolved and most analytical tasks can be completed with reasonable efficiency. Nevertheless, the computing environment continues to be plagued with problems that have limited progress. As recently as November 1998, we had to repeat a series of analyses completed earlier in the year because of the discovery of a fault in one of the system's processors.

The impact of computing difficulties on this project was particularly acute because the research required the processing of very large data sets, which could not be easily transferred to a desktop computer. In addition, because of the large output of data generated by these analyses, organizing the information in a coherent form requires significant time and effort. Although all of the planned analyses have been completed, as a result of the computing difficulties we experienced in the first two years we remain behind schedule in organizing the data for presentation and developing manuscripts for publication.

As of this writing we have presented some results in an international conference and have three manuscripts in progress, but have not yet published results of the study in peer-reviewed scientific journals.

Scientific Findings

In total, 2,520,535 deaths were observed among eligible workers over age 20 in the states that reported information on occupation, industry, and ethnic origin to NCHS in the years 1985 to 1992. Of that number, 639,337 were cancer deaths that were selected for study.

Specific Aim 1: To estimate cancer mortality rates and proportional mortality among African-American, Asian, Latino, and Native American workers relative to the total workforce encompassing all races and ethnic groups.

Here we highlight the comparisons in which the exposed group included 5 or more deaths and the PMR or SRR and its 95% CI exceeded unity. Complete results for this aim are presented Tables 1.1 and 1.2.

The results of analyses using the PMR are presented in Table 1.1. Among females, there was no cancer for which the PMR was elevated for all four minority-racial/ethnic groups (African-Americans, Latinos, Asians, and Native Americans). Latino (PMR=2.14), Asian (PMR=3.90), and Native American (PMR=1.91) women experienced elevated stomach cancer mortality relative to all racial ethnic groups combined. The same three groups experienced elevated gallbladder cancer mortality (Latinos, PMR=2.90; Asians, PMR=2.60, and Native Americans PMR=3.14). African-American (PMR=1.11) and Latino (PMR=1.34) women experienced elevated cervical cancer mortality. No more than one of the four female-minority-racial/ethnic groups experienced elevated mortality from any of the 40 additional cancers we examined.

Much as among the women, three of the four male-minority-racial/ethnic groups (Blacks, PMR=1.20; Latinos, PMR=1.84; Asians, PMR=3.14) experienced elevated stomach cancer proportionate mortality. Latino (PMR=2.04) and Asian (PMR=11.72) men both experienced elevated liver cancer proportionate mortality. The PMRs of Latino (PMR=1.67) and Asian (PMR=2.92) men were also elevated for acute lymphocytic leukemia. However, just as for the women one or none of the male-minority-racial/ethnic groups experienced elevated proportionate mortality for the vast majority of the cancers we examined.

Both African-American men (PMR=1.85) and women (PMR=1.87) experienced elevated proportionate mortality from esophageal cancer. Likewise, African-American men (PMR=1.30) and African-American women (PMR=1.32) experienced similarly elevated multiple myeloma proportionate mortality. As noted above, Latinos and Asians of both sexes experienced elevated mortality from stomach cancer. In contrast, there were 18 cases where only one sex of a racial/ethnic minority group experienced elevated mortality for a particular cancer.

When compared to all female-racial/ethnic groups combined, African-American women experienced elevated SRRs at 23 sites (Table 1.2). These elevated SRRs contrast with elevated PMRs at only three sites. The three congruent sites- cervical (SRR=2.37), multiple myeloma (SRR=2.60), and esophageal (SRR=3.68) had the three most elevated SRRs.

The elevated SRRs were similar to the elevated PMRs for Asian and Latino women. Asian women experienced elevated mortality for stomach cancer (SRR=2.97), and liver cancer (SRR=4.75), while Latino women experienced elevated mortality for stomach cancer (SRR=1.59) and gallbladder cancer (SRR=1.98).

Native American women had elevated SRRs at nine cancer sites. The most elevated SRRs were for stomach cancer (SRR=4.06) and gallbladder cancer (SRR=5.73). These two sites were the only two sites to have elevated PMRs for Native American women.

When compared to all male-racial/ethnic groups combined, African-American men experienced elevated SRRs for seventy percent of the cancer sites we examined, including all of the most prevalent cancers. This contrasts with the few elevated PMRs for African-American men.

The elevated SRRs were similar to the elevated PMRs for Asian and Latino men. Latino (SRR=1.56) and Asian (SRR=1.71) men experienced elevated mortality for stomach cancer compared to all male-racial/ethnic groups combined. Liver cancer SRRs were elevated for Latino (SRR=1.69) and Asian (SRR=6.51) men, too.

Compared to all male-racial/ethnic groups combined, Native American men experienced elevated SRRs for six cancer sites- stomach (SRR=1.67), liver (SRR=2.54), rectum (SRR=2.58), other connective & and soft tissue (SRR=2.58), testicular (SRR=4.40), and chronic myeloid leukemia (SRR=3.80). None of these cancer sites had an elevated PMR for Native American men.

From a methodological perspective, it is also noteworthy that SRRs for non-cancer causes of death varied markedly among the four minority groups, ranging from 2-3 among African-Americans and Native Americans, to less than unity among Asians (Table 1.2). Among Latinos, the SRR for non-cancer causes was close to 1.0 (Table 1.2).

Table 1.1. Proportionate mortality ratios (PMRs) and 95% confidence intervals (CIs) comparing minority workers to the entire workforce. Ages 20-64, directly adjusted for age.

Group/Cause of Death	Deaths	PMR	95% CI	
African-American Men				
Non-cancer deaths	69634	1.03	1.03	1.04
MN-oral cavity, & pharynx	935	1.50	1.40	1.61
MN-esophagus	1323	1.85	1.74	1.97
MN-stomach	762	1.20	1.11	1.30
MN-small intestine	52	1.10	0.81	1.48
MN-colon	1210	0.76	0.72	0.81
MN-rectum	264	0.78	0.68	0.88
MN-liver and intrahepatic bile ducts	390	1.04	0.94	1.16
Gall bladder and extrahepatic bile ducts	61	0.77	0.59	1.00
MN-pancreas	789	0.84	0.78	0.90
MN-peritoneum & other/unspec digestive organs	49	0.75	0.56	1.02
MN-nasal cavity	32	1.01	0.70	1.48
MN-larynx	433	1.55	1.39	1.72
MN-trachea, bronchus and lung	7231	0.91	0.89	0.93
MN-pleura	7	0.27	0.12	0.58
MN-other parts of the respiratory system	23	0.73	0.47	1.13
MN-bone	51	0.66	0.49	0.89
MN-connective and other soft tissue	122	0.65	0.53	0.78
Malignant melanoma of the skin	30	0.06	0.04	0.08
Other malignant neoplasm of the skin	139	1.02	0.85	1.22
MN-breast	24	0.98	0.63	1.51
MN-prostate	1004	1.49	1.39	1.59
MN-testis	18	0.20	0.12	0.32
MN-penis & other male genital organs	15	0.81	0.47	1.39
MN-bladder	178	0.63	0.54	0.74
MN-kidney & other/unspec urinary organs	407	0.67	0.60	0.74
MN-brain	285	0.32	0.29	0.36
MN-thyroid gland	16	0.45	0.27	0.75
Lymphosarcoma & reticulosarcoma	58	0.45	0.35	0.60
Hodgkin's disease	89	0.48	0.39	0.60
Other lymphatic neoplasms	407	0.50	0.45	0.56
Multiple myeloma	389	1.30	1.16	1.45
Acute lymphocitic leukemia	30	0.39	0.26	0.56
Chronic lymphocitic leukemia	79	0.75	0.59	0.94
Acute myeloid leukemia	133	0.52	0.43	0.62
Chronic myeloid leukemia	107	0.81	0.66	1.00
Other leukemia	113	0.57	0.47	0.70
All Leukemias	462	0.61	0.55	0.67
All other specified malignant neoplasms	29	0.48	0.33	0.71
MN-ill-defined & unspecified	1493	1.01	0.95	1.06
Asian Men				
Non-cancer	1474	0.95	0.93	0.98
MN-oral cavity, & pharynx	24	1.48	0.99	2.24
MN-esophagus	15	0.96	0.58	1.61

Group/Cause of Death	Deaths	PMR	95% CI	
MN-stomach	47	3.14	2.34	4.20
MN-small intestine	3	2.63	0.82	8.44
MN-colon	39	1.17	0.85	1.60
MN-rectum	12	1.44	0.80	2.60
MN-liver and intrahepatic bile ducts	104	11.73	9.64	14.27
MN-gall bladder and extrahepatic bile ducts	3	1.72	0.54	5.48
MN-pancreas	27	1.24	0.85	1.82
MN-peritoneum & other/unspec digestive organs	2	1.71	0.43	6.83
MN-nasal cavity	2	2.12	0.53	8.53
MN-larynx	2	0.38	0.10	1.52
MN-trachea, bronchus and lung	124	0.68	0.57	0.81
MN-pleura	.	.	.	.
MN-other parts of the respiratory system	.	.	.	.
MN-bone	1	0.81	0.11	5.78
MN-connective and other soft tissue	6	1.35	0.59	3.10
Malignant melanoma of the skin	2	0.16	0.04	0.68
Other malignant neoplasm of the skin	1	0.40	0.06	2.84
MN-breast	1	2.24	0.31	16.00
MN-prostate	3	0.21	0.07	0.66
MN-testis	2	0.98	0.25	3.94
MN-penis & other male genital organs	.	.	.	.
MN-bladder	4	0.66	0.24	1.79
MN-kidney & other/unspec urinary organs	12	0.85	0.47	1.51
MN-brain	15	0.70	0.42	1.18
MN-thyroid gland	.	.	.	.
Lymphosarcoma & reticulosarcoma	2	0.79	0.19	3.28
Hodgkin's disease	2	0.46	0.12	1.86
Other lymphatic neoplasms	26	1.51	1.02	2.24
Multiple myeloma	6	0.91	0.40	2.05
Acute lymphocytic leukemia	6	2.92	1.30	6.53
Chronic lymphocytic leukemia	.	.	.	.
Acute myeloid leukemia	11	1.90	1.03	3.50
Chronic myeloid leukemia	9	3.03	1.54	5.96
Other leukemia	7	1.29	0.60	2.76
All Leukemias	33	1.72	1.21	2.44
All other specified malignant neoplasms	4	2.43	0.91	6.49
MN-ill defined & unspecified	32	0.89	0.62	1.26
Latino Men				
Non-Cancer	12434	1.09	1.08	1.10
MN-oral cavity, & pharynx	72	0.89	0.70	1.13
MN-esophagus	42	0.45	0.33	0.61
MN-stomach	161	1.84	1.57	2.17
MN-small intestine	5	0.86	0.35	2.09
MN-colon	176	0.83	0.71	0.97
MN-rectum	50	1.22	0.92	1.62
MN-liver and intrahepatic bile ducts	101	2.04	1.67	2.50
MN-gall bladder and extrahepatic bile ducts	10	0.97	0.52	1.83
MN-pancreas	116	0.88	0.73	1.06
MN-peritoneum & other/unspec digestive organs	8	0.87	0.42	1.83

Group/Cause of Death	Deaths	PMR	95% CI	
MN-nasal cavity	5	1.05	0.41	2.70
MN-larynx	31	0.89	0.62	1.27
MN-trachea, bronchus and lung	511	0.49	0.45	0.53
MN-pleura	1	0.26	0.04	1.86
MN-other parts of the respiratory system	3	0.47	0.12	1.81
MN-bone	6	0.49	0.20	1.19
MN-connective and other soft tissue	27	0.81	0.53	1.23
Malignant melanoma of the skin	27	0.27	0.18	0.41
Other malignant neoplasm of the skin	23	1.10	0.71	1.72
MN-breast	2	0.74	0.18	3.00
MN-prostate	77	0.89	0.71	1.11
MN-testis	19	1.08	0.65	1.81
MN-penis & other male genital organs	3	0.86	0.27	2.77
MN-bladder	20	0.56	0.36	0.88
MN-kidney & other/unspec urinary organs	86	1.08	0.87	1.35
MN-brain	92	0.72	0.58	0.90
MN-thyroid gland	3	0.70	0.23	2.20
Lymphosarcoma & reticulosarcoma	16	0.68	0.39	1.17
Hodgkin's disease	25	0.90	0.58	1.41
Other lymphatic neoplasms	122	0.98	0.81	1.19
Multiple myeloma	32	0.81	0.56	1.15
Acute lymphocitic leukemia	24	1.67	1.06	2.63
Chronic lymphocitic leukemia	7	0.49	0.23	1.05
Acute myeloid leukemia	25	0.59	0.38	0.90
Chronic myeloid leukemia	28	1.31	0.87	1.97
Other leukemia	33	1.03	0.71	1.50
All Leukemias	117	0.91	0.74	1.11
All other specified malignant neoplasms	8	0.77	0.35	1.67
MN-ill-defined & unspecified	180	0.88	0.75	1.02
Native American Men				
Non-cancer	3185	1.16	1.14	1.17
MN-oral cavity, & pharynx	13	0.57	0.32	1.01
MN-esophagus	17	0.76	0.47	1.23
MN-stomach	16	0.61	0.36	1.03
MN-small intestine	1	0.77	0.11	5.51
MN-colon	26	0.47	0.31	0.69
MN-rectum	13	1.12	0.64	1.97
MN-liver and intrahepatic bile ducts	14	1.26	0.74	2.14
MN-gall bladder and extrahepatic bile ducts	3	1.17	0.37	3.71
MN-pancreas	15	0.50	0.30	0.84
MN-peritoneum & other/unspec digestive organs	.	.	.	.
MN-nasal cavity	.	.	.	.
MN-larynx	3	0.38	0.12	1.18
MN-trachea, bronchus and lung	141	0.54	0.46	0.63
MN-pleura	.	.	.	.
MN-other parts of the respiratory system	2	2.39	0.59	9.62
MN-bone	1	0.16	0.02	1.16
MN-connective and other soft tissue	7	0.85	0.37	1.96
Malignant melanoma of the skin	3	0.20	0.07	0.63

Group/Cause of Death	Deaths	PMR	95% CI	
Other malignant neoplasm of the skin	1	0.27	0.04	1.89
MN-breast	.	.	.	.
MN-prostate	14	0.62	0.36	1.05
MN-testis	5	0.97	0.39	2.40
MN-penis & other male genital organs	1	1.83	0.26	13.11
MN-bladder	2	0.24	0.06	0.97
MN-kidney & other/unspec urinary organs	17	0.87	0.53	1.41
MN-brain	18	0.51	0.31	0.85
MN-thyroid gland	.	.	.	.
Lymphosarcoma & reticulosarcoma	.	.	.	.
Hodgkin's disease	1	0.12	0.02	0.82
Other lymphatic neoplasms	11	0.36	0.19	0.68
Multiple myeloma	8	0.76	0.37	1.57
Acute lymphocitic leukemia	1	0.17	0.02	1.18
Chronic lymphocitic leukemia	.	.	.	.
Acute myeloid leukemia	4	0.27	0.10	0.76
Chronic myeloid leukemia	7	1.44	0.64	3.25
Other leukemia	4	0.40	0.13	1.23
All Leukemias	16	0.45	0.26	0.77
All other specified malignant neoplasms	2	0.87	0.22	3.50
Ill-defined & unspecified mn	31	0.61	0.43	0.87

Table 1.1 continued.

Group/Cause of Death	Deaths	PMR	95% CI	
African-American Women				
Non-cancer	26885	1.19	1.19	1.20
MN-oral cavity, & pharynx	171	1.06	0.90	1.26
MN-esophagus	235	1.87	1.61	2.17
MN-stomach	267	1.08	0.95	1.24
MN-small intestine	22	0.77	0.49	1.21
MN-colon	914	0.83	0.78	0.89
MN-rectum	126	0.79	0.65	0.95
MN-liver and intrahepatic bile ducts	129	0.82	0.68	0.99
MN-gall bladder and extrahepatic bile ducts	57	0.67	0.51	0.88
MN-pancreas	493	0.91	0.83	1.00
MN-peritoneum & other/unspec digestive organs	24	0.57	0.37	0.87
MN-nasal cavity	10	0.60	0.31	1.17
MN-larynx	59	1.22	0.92	1.62
MN-trachea, bronchus and lung	2149	0.65	0.62	0.67
MN-pleura	2	0.42	0.10	1.75
MN-other parts of the respiratory system	16	1.06	0.61	1.82
MN-bone	23	0.70	0.45	1.09
MN-connective and other soft tissue	133	0.87	0.72	1.04
Malignant melanoma of the skin	20	0.07	0.05	0.11
Other malignant neoplasm of the skin	18	0.78	0.48	1.29
MN-breast	3019	0.72	0.69	0.75
MN-cervix uteri	651	1.11	1.02	1.21
MN-uterine corpus	115	0.85	0.70	1.03
MN-ovary and uterine adnexa	440	0.45	0.41	0.50
MN-other/unsp parts of uterus & other female genital organs	202	1.07	0.92	1.25
MN-bladder	77	1.01	0.79	1.29
MN-kidney & other/unspec urinary organs	172	0.68	0.58	0.80
MN-brain	145	0.29	0.24	0.34
MN-thyroid gland	18	0.68	0.41	1.11
Lymphosarcoma & reticulosarcoma	21	0.32	0.21	0.50
Hodgkin's disease	46	0.59	0.44	0.81
Other lymphatic neoplasms	184	0.47	0.40	0.55
Multiple myeloma	259	1.32	1.15	1.51
Acute lymphocitic leukemia	19	0.38	0.24	0.61
Chronic lymphocitic leukemia	35	1.03	0.72	1.49
Acute myeloid leukemia	96	0.52	0.42	0.64
Chronic myeloid leukemia	72	0.83	0.65	1.07
Other leukemia	72	0.59	0.46	0.75
All Leukemias	294	0.62	0.54	0.70
All other specified malignant neoplasms	33	0.80	0.55	1.16
MN-ill-defined & unspecified	726	0.85	0.79	0.92
Asian Women				
Non-cancer	538	0.97	0.91	1.03
MN-oral cavity, & pharynx	5	1.43	0.56	3.64
MN-esophagus	1	0.46	0.07	3.27

Group/Cause of Death	Deaths	PMR	95% CI	
MN-stomach	25	3.90	2.57	5.92
MN-small intestine	.	.	.	.
MN-colon	32	1.37	0.96	1.95
MN-rectum	1	0.20	0.03	1.45
MN-liver and intrahepatic bile ducts	23	6.55	4.25	10.09
MN-gall bladder and extrahepatic bile ducts	5	2.60	1.03	6.55
MN-pancreas	14	1.20	0.70	2.07
MN-peritoneum & other/unspec digestive organs	1	0.57	0.08	4.06
MN-nasal cavity	.	.	.	.
MN-larynx	.	.	.	.
MN-trachea, bronchus and lung	58	0.80	0.62	1.03
MN-pleura	1	6.04	0.82	44.26
MN-other parts of the respiratory system	1	4.01	0.56	28.74
MN-bone	2	2.88	0.67	12.30
MN-connective and other soft tissue	7	1.61	0.74	3.52
Malignant melanoma of the skin	.	.	.	.
Other malignant neoplasm of the skin	.	.	.	.
MN-breast	88	0.87	0.70	1.07
MN-cervix uteri	22	1.31	0.85	2.02
MN-uterine corpus	.	.	.	.
MN-ovary and uterine adnexa	22	0.88	0.57	1.37
MN-other/unsp parts of uterus & other female genital organs	2	0.30	0.07	1.22
MN-bladder	2	1.49	0.37	5.95
MN-kidney & other/unspec urinary organs	8	1.42	0.68	2.97
MN-brain	12	0.80	0.45	1.43
MN-thyroid gland	3	5.57	1.72	18.06
Lymphosarcoma & reticulosarcoma	.	.	.	.
Hodgkin's disease	.	.	.	.
Other lymphatic neoplasms	8	0.80	0.39	1.66
Multiple myeloma	2	0.46	0.11	1.94
Acute lymphocitic leukemia	3	1.89	0.60	5.92
Chronic lymphocitic leukemia	.	.	.	.
Acute myeloid leukemia	7	1.38	0.64	2.99
Chronic myeloid leukemia	3	1.30	0.42	4.04
Other leukemia	3	0.68	0.22	2.12
All Leukemias	16	1.13	0.69	1.87
All other specified malignant neoplasms	1	0.93	0.13	6.61
MN-ill-defined & unspecified	26	1.31	0.88	1.95
Latino Women				
Non-cancer	2228	1.07	1.04	1.10
MN-oral cavity, & pharynx	8	0.56	0.27	1.16
MN-esophagus	8	0.83	0.41	1.70
MN-stomach	45	2.14	1.58	2.91
MN-small intestine	6	2.25	0.95	5.35
MN-colon	86	0.97	0.78	1.20
MN-rectum	8	0.66	0.32	1.34
MN-liver and intrahepatic bile ducts	16	1.31	0.78	2.18
MN-gall bladder and extrahepatic bile ducts	20	2.90	1.83	4.59
MN-pancreas	53	1.21	0.92	1.60

Group/Cause of Death	Deaths	PMR	95% CI	
MN-peritoneum & other/unspec digestive organs	4	1.21	0.44	3.33
MN-nasal cavity	1	1.04	0.15	7.49
MN-larynx	2	0.42	0.10	1.68
MN-trachea, bronchus and lung	140	0.56	0.47	0.66
MN-pleura	1	2.95	0.40	21.70
MN-other parts of the respiratory system	.	.	.	.
MN-bone	3	0.93	0.27	3.21
MN-connective and other soft tissue	8	0.63	0.31	1.30
Malignant melanoma of the skin	10	0.40	0.21	0.78
MN-other malignant neoplasm of the skin	1	0.69	0.10	4.96
MN-breast	330	0.93	0.84	1.03
MN-cervix uteri	73	1.34	1.05	1.70
MN-uterine corpus	2	0.14	0.04	0.57
MN-ovary and uterine adnexa	81	1.02	0.82	1.28
MN-other/unsp parts of uterus & other female genital organs	18	1.17	0.73	1.90
MN-bladder	6	0.91	0.39	2.11
MN-kidney & other/unspec urinary organs	26	1.36	0.92	2.03
MN-brain	26	0.62	0.42	0.93
MN-thyroid gland	4	1.34	0.49	3.63
Lymphosarcoma & reticulosarcoma	8	1.34	0.64	2.83
Hodgkin's disease	7	0.97	0.44	2.16
Other lymphatic neoplasms	31	0.95	0.66	1.38
Multiple myeloma	18	1.26	0.79	2.03
Acute lymphocitic leukemia	7	1.63	0.75	3.56
Chronic lymphocitic leukemia	2	0.73	0.18	3.04
Acute myeloid leukemia	17	0.94	0.57	1.54
Chronic myeloid leukemia	9	1.37	0.70	2.71
Other leukemia	10	0.87	0.45	1.69
All Leukemias	45	1.05	0.77	1.43
All other specified malignant neoplasms	5	1.07	0.43	2.62
MN-ill-defined & unspecified	59	0.85	0.65	1.10
Native American Women				
Non-cancer	838	1.22	0.39	2.11
MN-oral cavity, & pharynx	6	1.34	0.58	3.08
MN-esophagus	2	0.70	0.18	2.80
MN-stomach	13	1.91	1.09	3.36
MN-small intestine	1	1.60	0.22	11.38
MN-colon	21	0.74	0.48	1.14
MN-rectum	5	1.08	0.43	2.69
MN-liver and intrahepatic bile ducts	2	0.59	0.15	2.35
MN-gall bladder and extrahepatic bile ducts	7	3.14	1.49	6.64
MN-pancreas	11	0.81	0.45	1.47
MN-peritoneum & other/unspec digestive organs	3	2.66	0.85	8.38
MN-nasal cavity	1	1.33	0.19	9.55
MN-larynx	.	.	.	.
MN-trachea, bronchus and lung	52	0.61	0.47	0.79
MN-pleura	.	.	.	.
MN-other parts of the respiratory system	1	1.56	0.22	11.16
MN-bone	1	1.41	0.20	10.08

Group/Cause of Death	Deaths	PMR	95% CI	
MN-connective and other soft tissue	5	0.98	0.39	2.47
Malignant melanoma of the skin	2	0.17	0.04	0.68
Other malignant neoplasm of the skin	.	.	.	.
MN-breast	53	0.44	0.34	0.58
MN-cervix uteri	27	1.41	0.95	2.08
MN-uterine corpus	2	0.55	0.14	2.24
MN-ovary and uterine adnexa	16	0.64	0.39	1.05
MN-other/unsp parts of uterus & other female genital organs	2	0.29	0.07	1.22
MN-bladder	1	0.43	0.06	3.07
MN-kidney & other/unspec urinary organs	6	0.92	0.41	2.09
MN-brain	5	0.40	0.16	0.97
MN-thyroid gland	1	1.27	0.18	9.07
lymphosarcoma & reticulosarcoma	.	.	.	.
Hodgkin's disease	.	.	.	.
MN-other lymphatic neoplasms	5	0.45	0.18	1.10
Multiple myeloma	8	1.42	0.71	2.87
Acute lymphocitic leukemia	1	0.49	0.07	3.47
Chronic lymphocitic leukemia	.	.	.	.
Acute myeloid leukemia	7	1.15	0.52	2.53
Chronic myeloid leukemia	4	1.78	0.64	4.93
Other leukemia	3	0.83	0.26	2.73
All Leukemias	15	1.02	0.60	1.74
All other specified malignant neoplasms	.	.	.	.
MN-ill-defined & unspecified	20	0.85	0.54	1.33

Table 1.2. Standardized mortality rate ratios (SRRs) and 95% confidence intervals (CIs) comparing minority workers to the entire workforce. Ages 20-64, directly adjusted for age.

Group/Cause of Death	Deaths	SRR	95% CI	
African-American Men				
Non-Cancer deaths	69634	2.38	2.36	2.40
MN-oral cavity, & pharynx	935	3.29	3.07	3.54
MN-esophagus	1323	3.96	3.72	4.20
MN-stomach	762	2.60	2.40	2.81
MN-small intestine	52	2.41	1.79	3.23
MN-colon	1210	1.64	1.55	1.74
MN-rectum	264	1.70	1.50	1.93
MN-liver and intrahepatic bile ducts	390	2.27	2.04	2.53
MN-gall bladder and extrahepatic bile ducts	61	1.64	1.25	2.13
MN-pancreas	789	1.77	1.65	1.91
MN-peritoneum & other/unspec digestive organs	49	1.66	1.23	2.23
MN-nasal cavity	32	2.18	1.50	3.17
MN-larynx	433	3.35	3.01	3.72
MN-trachea, bronchus and lung	7231	1.92	1.87	1.97
MN-pleura	7	0.61	0.29	1.31
MN-other parts of the respiratory system	23	1.60	1.04	2.47
MN-bone	51	1.54	1.15	2.06
MN-connective and other soft tissue	122	1.47	1.22	1.77
Malignant melanoma of the skin	30	0.12	0.08	0.17
Other malignant neoplasm of the skin	139	2.22	1.85	2.65
MN-breast	24	2.16	1.40	3.32
MN-prostate	1004	3.00	2.80	3.21
MN-testis	18	0.50	0.31	0.79
MN-penis & other male genital organs	15	1.69	0.99	2.88
MN-bladder	178	1.33	1.14	1.55
MN-kidney & other/unspec urinary organs	407	1.47	1.33	1.63
MN-brain	285	0.74	0.65	0.83
MN-thyroid gland	16	0.92	0.56	1.53
Lymphosarcoma & reticulosarcoma	58	1.08	0.83	1.41
Hodgkin's disease	89	1.18	0.95	1.46
Other lymphatic neoplasms	407	1.15	1.04	1.27
Multiple myeloma	389	2.74	2.46	3.06
Acute lymphocitic leukemia	30	0.91	0.63	1.32
Chronic lymphocitic leukemia	79	1.57	1.24	1.97
Acute myeloid leukemia	133	1.18	0.99	1.41
Chronic myeloid leukemia	107	1.86	1.52	2.28
Other leukemia	113	1.27	1.05	1.54
All Leukemias	462	1.35	1.23	1.49
All other specified malignant neoplasms	29	1.09	0.75	1.60
MN-ill-defined & unspecified	1493	2.18	2.06	2.30
Asian Men				
Non-Cancer deaths	1474	0.60	0.57	0.63
MN-oral cavity, & pharynx	24	0.86	0.57	1.30
MN-esophagus	15	0.49	0.30	0.82
MN-stomach	47	1.71	1.27	2.28

Group/Cause of Death	Deaths	SRR	95% CI	
MN-small intestine	3	1.42	0.45	4.48
MN-colon	39	0.60	0.44	0.83
MN-rectum	12	0.97	0.54	1.73
MN-liver and intrahepatic bile ducts	104	6.51	5.33	7.95
MN-gall bladder and extrahepatic bile ducts	3	0.87	0.28	2.74
MN-pancreas	27	0.65	0.44	0.95
MN-peritoneum & other/unspec digestive organs	2	0.83	0.21	3.32
MN-nasal cavity	2	1.21	0.30	4.86
MN-larynx	2	0.19	0.05	0.75
MN-trachea, bronchus and lung	124	0.36	0.30	0.43
MN-pleura	.	.	.	.
MN-other parts of the respiratory system	.	.	.	.
MN-bone	1	0.38	0.05	2.70
MN-connective and other soft tissue	6	0.89	0.39	2.04
Malignant melanoma of the skin	2	0.08	0.02	0.34
Other malignant neoplasm of the skin	1	0.19	0.03	1.38
MN-breast	1	1.09	0.15	7.80
MN-prostate	3	0.11	0.03	0.33
MN-testis	2	0.53	0.13	2.11
MN-penis & other male genital organs	.	.	.	.
MN-bladder	4	0.34	0.13	0.90
MN-kidney & other/unspec urinary organs	12	0.45	0.25	0.80
MN-brain	15	0.44	0.26	0.74
MN-thyroid gland	.	.	.	.
Lymphosarcoma & reticulosarcoma	2	0.40	0.10	1.63
Hodgkin's disease	2	0.26	0.06	1.04
Other lymphatic neoplasms	26	0.85	0.57	1.26
Multiple myeloma	6	0.46	0.21	1.04
Acute lymphocytic leukemia	6	2.09	0.90	4.85
Chronic lymphocytic leukemia	.	.	.	.
Acute myeloid leukemia	11	1.14	0.62	2.09
Chronic myeloid leukemia	9	1.73	0.88	3.39
Other leukemia	7	0.98	0.46	2.11
All Leukemias	33	1.11	0.78	1.58
All other specified malignant neoplasms	4	1.36	0.51	3.66
MN-ill-defined & unspecified	32	0.47	0.33	0.67
Latino Men				
Non-Cancer deaths	12434	1.16	1.14	1.18
MN-oral cavity, & pharynx	72	0.73	0.58	0.92
MN-esophagus	42	0.36	0.26	0.49
MN-stomach	161	1.56	1.34	1.83
MN-small intestine	5	0.67	0.28	1.62
MN-colon	176	0.68	0.59	0.79
MN-rectum	50	0.94	0.71	1.24
MN-liver and intrahepatic bile ducts	101	1.69	1.39	2.07
MN-gall bladder and extrahepatic bile ducts	10	0.77	0.41	1.43
MN-pancreas	116	0.74	0.62	0.89
MN-peritoneum & other/unspec digestive organs	8	0.76	0.38	1.54
MN-nasal cavity	5	0.93	0.38	2.28
MN-larynx	31	0.69	0.49	0.99

Group/Cause of Death	Deaths	SRR	95% CI	
MN-trachea, bronchus and lung	511	0.39	0.35	0.42
MN-pleura	1	0.25	0.03	1.77
MN-other parts of the respiratory system	3	0.52	0.17	1.65
MN-bone	6	0.52	0.23	1.16
MN-connective and other soft tissue	27	0.89	0.60	1.30
Malignant melanoma of the skin	27	0.29	0.20	0.42
Other malignant neoplasm of the skin	23	1.01	0.66	1.53
MN-breast	2	0.53	0.13	2.14
MN-prostate	77	0.65	0.52	0.82
MN-testis	19	1.42	0.89	2.25
MN-penis & other male genital organs	3	0.93	0.29	2.91
MN-bladder	20	0.43	0.28	0.67
MN-kidney & other/unspec urinary organs	86	0.89	0.72	1.10
MN-brain	92	0.67	0.55	0.83
MN-thyroid gland	3	0.50	0.16	1.56
Lymphosarcoma & reticulosarcoma	16	0.80	0.49	1.32
Hodgkin's disease	25	0.93	0.63	1.39
Other lymphatic neoplasms	122	0.96	0.80	1.15
Multiple myeloma	32	0.65	0.46	0.92
Acute lymphocitic leukemia	24	1.97	1.30	2.98
Chronic lymphocitic leukemia	7	0.39	0.19	0.83
Acute myeloid leukemia	25	0.62	0.42	0.92
Chronic myeloid leukemia	28	1.38	0.94	2.01
Other leukemia	33	1.03	0.73	1.46
All Leukemias	117	0.95	0.79	1.14
All other specified malignant neoplasms	8	0.81	0.40	1.63
MN-ill-defined & unspecified	180	0.74	0.64	0.86
Native American Men				
Non-Cancer deaths	3185	3.38	3.27	3.50
MN-oral cavity, & pharynx	13	1.39	0.81	2.40
MN-esophagus	17	1.57	0.98	2.53
MN-stomach	16	1.67	1.02	2.73
MN-small intestine	1	1.46	0.21	10.41
MN-colon	26	1.10	0.75	1.61
MN-rectum	13	2.58	1.49	4.45
MN-liver and intrahepatic bile ducts	14	2.54	1.50	4.29
MN-gall bladder and extrahepatic bile ducts	3	2.46	0.79	7.66
MN-pancreas	15	1.03	0.62	1.72
MN-peritoneum & other/unspec digestive organs	.	.	.	.
MN-nasal cavity	.	.	.	.
MN-larynx	3	0.72	0.23	2.25
MN-trachea, bronchus and lung	141	1.15	0.97	1.35
MN-pleura	.	.	.	.
MN-other parts of the respiratory system	2	4.43	1.10	17.85
MN-bone	1	0.88	0.12	6.24
MN-connective and other soft tissue	7	2.58	1.23	5.44
Malignant melanoma of the skin	3	0.38	0.12	1.17
Other malignant neoplasm of the skin	1	0.50	0.07	3.57
MN-breast	.	.	.	.
MN-prostate	14	1.26	0.75	2.13

Group/Cause of Death	Deaths	SRR	95% CI	
MN-testis	5	4.40	1.82	10.65
MN-penis & other male genital organs	1	3.48	0.49	24.87
MN-bladder	2	0.46	0.12	1.85
MN-kidney & other/unspec urinary organs	17	1.93	1.20	3.11
MN-brain	18	1.45	0.91	2.31
MN-thyroid gland	.	.	.	.
Lymphosarcoma & reticulosarcoma	.	.	.	.
Hodgkin's disease	1	0.45	0.06	3.23
Other lymphatic neoplasms	11	0.99	0.55	1.79
Multiple myeloma	8	1.71	0.85	3.42
Acute lymphocitic leukemia	1	0.89	0.13	6.33
Chronic lymphocitic leukemia	.	.	.	.
Acute myeloid leukemia	4	1.08	0.40	2.88
Chronic myeloid leukemia	7	3.80	1.80	8.01
Other leukemia	4	1.37	0.51	3.67
All Leukemias	16	1.42	0.87	2.33
All other specified malignant neoplasms	2	2.29	0.57	9.18
MN-ill-defined & unspecified	31	1.38	0.97	1.97

Table 1.2 continued.

Group/Cause of Death	Deaths	SRR	95% CI	
African-American Women				
Non-Cancer deaths	26885	2.50	2.46	2.53
MN-oral cavity, & pharynx	171	2.15	1.82	2.54
MN-esophagus	235	3.68	3.17	4.28
MN-stomach	267	2.17	1.90	2.48
MN-small intestine	22	1.56	0.99	2.44
MN-colon	914	1.67	1.56	1.79
MN-rectum	126	1.59	1.32	1.92
MN-liver and intrahepatic bile ducts	129	1.68	1.39	2.03
MN-gall bladder and extrahepatic bile ducts	57	1.29	0.98	1.70
MN-pancreas	493	1.79	1.62	1.97
MN-peritoneum & other/unspec digestive organs	24	1.14	0.74	1.73
MN-nasal cavity	10	1.27	0.65	2.45
MN-larynx	59	2.45	1.84	3.25
MN-trachea, bronchus and lung	2149	1.28	1.22	1.33
MN-pleura	2	0.79	0.19	3.31
MN-other parts of the respiratory system	16	2.22	1.29	3.82
MN-bone	23	1.50	0.96	2.32
MN-connective and other soft tissue	133	1.81	1.51	2.18
Malignant melanoma of the skin	20	0.15	0.10	0.24
Other malignant neoplasm of the skin	18	1.59	0.97	2.61
MN-breast	3019	1.50	1.44	1.56
MN-cervix uteri	651	2.37	2.18	2.59
MN-uterine corpus	115	1.63	1.34	1.98
MN-ovary and uterine adnexa	440	0.91	0.83	1.00
MN-other/unsp parts of uterus & other female genital organs	202	2.16	1.86	2.52
MN-bladder	77	1.97	1.54	2.51
MN-kidney & other/unspec urinary organs	172	1.38	1.18	1.62
MN-brain	145	0.60	0.51	0.71
MN-thyroid gland	18	1.35	0.82	2.20
Lymphosarcoma & reticulosarcoma	21	0.66	0.42	1.02
Hodgkin's disease	46	1.32	0.97	1.80
Other lymphatic neoplasms	184	0.96	0.82	1.12
Multiple myeloma	259	2.60	2.27	2.98
Acute lymphocytic leukemia	19	0.82	0.51	1.31
Chronic lymphocytic leukemia	35	2.00	1.39	2.87
Acute myeloid leukemia	96	1.08	0.87	1.33
Chronic myeloid leukemia	72	1.77	1.38	2.27
Other leukemia	72	1.21	0.95	1.55
All Leukemias	294	1.28	1.13	1.45
All other specified malignant neoplasms	33	1.69	1.17	2.44
MN-ill-defined & unspecified	726	1.71	1.58	1.85
Asian Women				
Non-Cancer deaths	538	0.82	0.75	0.89
MN-oral cavity, & pharynx	5	1.04	0.42	2.58
MN-esophagus	1	0.31	0.04	2.22

Group/Cause of Death	Deaths	SRR	95% CI	
MN-stomach	25	2.97	1.97	4.49
MN-small intestine	.	.	.	.
MN-colon	32	1.02	0.72	1.46
MN-rectum	1	0.15	0.02	1.06
MN-liver and intrahepatic bile ducts	23	4.75	3.09	7.30
MN-gall bladder and extrahepatic bile ducts	5	1.84	0.74	4.57
MN-pancreas	14	0.85	0.49	1.46
MN-peritoneum & other/unspec digestive organs	1	0.52	0.07	3.70
MN-nasal cavity	.	.	.	.
MN-larynx	.	.	.	.
MN-trachea, bronchus and lung	58	0.57	0.44	0.75
MN-pleura	1	4.44	0.60	32.68
MN-other parts of the respiratory system	1	2.84	0.39	20.41
MN-bone	2	2.11	0.50	8.93
MN-connective and other soft tissue	7	1.49	0.68	3.25
Malignant melanoma of the skin	.	.	.	.
Other malignant neoplasm of the skin	.	.	.	.
MN-breast	88	0.64	0.51	0.79
MN-cervix uteri	22	1.09	0.70	1.68
MN-uterine corpus	.	.	.	.
MN-ovary and uterine adnexa	22	0.69	0.45	1.07
MN-other/unsp parts of uterus & other female genital organs	2	0.24	0.06	0.98
MN-bladder	2	1.01	0.25	4.05
MN-kidney & other/unspec urinary organs	8	1.03	0.50	2.11
MN-brain	12	0.66	0.37	1.18
MN-thyroid gland	3	3.85	1.19	12.46
Lymphosarcoma & reticulosarcoma	.	.	.	.
Hodgkin's disease	.	.	.	.
Other lymphatic neoplasms	8	0.68	0.33	1.40
Multiple myeloma	2	0.32	0.08	1.33
Acute lymphocitic leukemia	3	1.55	0.50	4.85
Chronic lymphocitic leukemia	.	.	.	.
Acute myeloid leukemia	7	1.14	0.53	2.47
Chronic myeloid leukemia	3	1.37	0.42	4.41
Other leukemia	3	0.58	0.19	1.80
All Leukemias	16	0.98	0.59	1.64
All other specified malignant neoplasms	1	1.12	0.16	7.97
MN-ill-defined & unspecified	26	0.97	0.65	1.45
Latino Women				
Non-Cancer deaths	2228	0.90	0.86	0.94
MN-oral cavity, & pharynx	8	0.43	0.21	0.87
MN-esophagus	8	0.56	0.28	1.12
MN-stomach	45	1.59	1.18	2.14
MN-small intestine	6	1.84	0.81	4.17
MN-colon	86	0.69	0.55	0.85
MN-rectum	8	0.45	0.22	0.90
MN-liver and intrahepatic bile ducts	16	0.93	0.57	1.53
MN-gall bladder and extrahepatic bile ducts	20	1.98	1.26	3.10
MN-pancreas	53	0.84	0.64	1.10

Group/Cause of Death	Deaths	SRR	95% CI	
MN-peritoneum & other/unspec digestive organs	4	0.83	0.31	2.24
MN-nasal cavity	1	0.65	0.09	4.67
MN-larynx	2	0.33	0.08	1.32
MN-trachea, bronchus and lung	140	0.37	0.31	0.44
MN-pleura	1	1.83	0.25	13.47
MN-other parts of the respiratory system	.	.	.	.
MN-bone	3	0.86	0.27	2.71
MN-connective and other soft tissue	8	0.48	0.24	0.96
Malignant melanoma of the skin	10	0.33	0.17	0.61
Other malignant neoplasm of the skin	1	0.43	0.06	3.05
MN-breast	330	0.71	0.63	0.79
MN-cervix uteri	73	1.13	0.90	1.43
MN-uterine corpus	2	0.11	0.03	0.44
MN-ovary and uterine adnexa	81	0.73	0.59	0.91
MN-other/unsp parts of uterus & other female genital organs	18	0.84	0.53	1.35
MN-bladder	6	0.66	0.29	1.49
MN-kidney & other/unspec urinary organs	26	0.94	0.63	1.39
MN-brain	26	0.47	0.32	0.70
MN-thyroid gland	4	1.17	0.43	3.15
Lymphosarcoma & reticulosarcoma	8	1.10	0.54	2.23
Hodgkin's disease	7	0.89	0.42	1.89
Other lymphatic neoplasms	31	0.71	0.50	1.02
Multiple myeloma	18	0.82	0.51	1.31
Acute lymphocitic leukemia	7	1.33	0.63	2.84
Chronic lymphocitic leukemia	2	0.49	0.12	2.00
Acute myeloid leukemia	17	0.80	0.50	1.30
Chronic myeloid leukemia	9	0.99	0.51	1.92
Other leukemias	10	0.73	0.39	1.36
All Leukemias	45	0.84	0.63	1.14
All other specified malignant neoplasms	5	1.05	0.43	2.56
MN-ill-defined & unspecified	59	0.61	0.47	0.79
Native American Women				
Non-Cancer deaths	838	3.07	2.86	3.29
MN-oral cavity, & pharynx	6	2.94	1.31	6.62
MN-esophagus	2	1.30	0.32	5.19
MN-stomach	13	4.06	2.34	7.05
MN-small intestine	1	2.99	0.42	21.40
MN-colon	21	1.43	0.93	2.20
MN-rectum	5	2.29	0.94	5.56
MN-liver and intrahepatic bile ducts	2	1.11	0.28	4.44
MN-gall bladder and extrahepatic bile ducts	7	5.73	2.69	12.19
MN-pancreas	11	1.53	0.84	2.78
MN-peritoneum & other/unspec digestive organs	3	4.84	1.53	15.34
MN-nasal cavity	1	6.04	0.84	43.44
MN-larynx	.	.	.	.
MN-trachea, bronchus and lung	52	1.15	0.87	1.51
MN-pleura	.	.	.	.
MN-other parts of the respiratory system	1	4.64	0.65	33.40
MN-bone	1	2.77	0.39	19.80

Group/Cause of Death	Deaths	SRR	95% CI	
MN-connective and other soft tissue	5	2.55	1.05	6.20
Malignant melanoma of the skin	2	0.51	0.13	2.04
Other malignant neoplasm of the skin	.	.	.	.
MN-breast	53	0.96	0.73	1.26
MN-cervix uteri	27	3.56	2.43	5.22
MN-uterine corpus	2	1.00	0.25	4.09
MN-ovary and uterine adnexa	16	1.31	0.80	2.15
MN-other/unsp parts of uterus & other female genital organs	2	0.81	0.20	3.33
MN-bladder	1	0.76	0.11	5.44
MN-kidney & other/unspec urinary organs	6	1.79	0.79	4.02
MN-brain	5	0.80	0.33	1.93
MN-thyroid gland	1	2.26	0.32	16.16
Lymphosarcoma & reticulosarcoma	.	.	.	.
Hodgkin's disease	.	.	.	.
Other lymphatic neoplasms	5	0.88	0.36	2.14
Multiple myeloma	8	2.67	1.32	5.39
Acute lymphocitic leukemia	1	1.49	0.21	10.60
Chronic lymphocitic leukemia	.	.	.	.
Acute myeloid leukemia	7	3.24	1.53	6.85
Chronic myeloid leukemia	4	4.02	1.49	10.86
Other leukemia	3	2.01	0.64	6.33
All Leukemias	15	2.63	1.57	4.39
All other specified malignant neoplasms	.	.	.	.
MN-ill-defined & unspecified	20	1.76	1.13	2.75

Specific Aim 2: To identify, for each minority group, occupations and industries with greater than expected mortality from cancer relative to non-minorities in the same occupation or industry.

For convenience in summarizing results for racial and ethnic groups within industries or occupations, we have selected those groups with greater than 2 deaths and a PMR or SRR greater than 2.0. Groups for which the PMR or SRR estimate is particularly precise or the risk estimated is substantially elevated are discussed in further detail. Complete results for this aim are presented in the Appendix.

Proportionate Mortality

Industries

Industry-specific PMRs are given in Table 2.1. Compared to non-minority men in the same industry, African-American men in 15 industries experienced elevated esophageal cancer PMRs. Esophageal cancer mortality was most elevated for African-American men in lumber, wood products & furniture manufacturing (PMR=3.69), but in the construction industry, African-American men (PMR=2.88) experienced the greatest impact of elevated esophageal cancer mortality as 199 more African-American men than expected died of the cancer. African-American men in five industries experienced elevated laryngeal cancer proportionate mortality. Laryngeal cancer proportionate mortality was most elevated for African-American men (PMR=3.50) in finance, insurance and real estate. African-American men in three industries experienced elevated prostate cancer proportionate mortality. Prostate cancer proportionate mortality was most elevated for African-American men (PMR=3.39) in stone, clay, glass and concrete products manufacturing. African-American men in the military (PMR=11.23) experienced extremely elevated thyroid cancer proportionate mortality. Elevated proportionate mortality from multiple myeloma was experienced by African-American men in six industries. African-American men in the mining industry (PMR=3.75) experienced the greatest excess mortality from this cancer.

Compared to non-minority men, Asian men in 13 industries experienced substantially elevated liver cancer proportionate mortality. In retail trade, the elevated liver cancer mortality among Asian men (PMR=14.62) had a large impact as 22 more Asian men died of the cancer than expected. Asian men in eight industries experienced elevated stomach cancer proportionate mortality. In wholesale trade, Asian men (PMR=7.76) experienced the highest elevation in stomach cancer mortality. Other cancer sites at which Asian men in specific industries experienced notably elevated proportionate mortality were: colon cancer in finance, insurance & real estate (PMR=3.52); acute lymphocytic leukemia in retail trade (PMR=7.82); acute myeloid leukemia in professional & related services (PMR=4.61), and all leukemia's in professional & related services (PMR=2.82).

When compared to non-minority men, Latino men in many industries experienced elevated proportionate mortality from stomach and liver cancer. Latino men (PMR=7.04) in lumber, wood products and furniture manufacturing experienced the greatest excess, while Latino men in public

administration (PMR=4.74) experienced 12 more deaths than expected from this cancer. Latino men in the metal industries (PMR=9.32) experienced particularly elevated proportionate mortality from testicular cancer, while Latino men in the military (PMR=9.97) experienced nearly a tenfold elevation in acute lymphocytic leukemia proportionate mortality. Native American men in construction (PMR=3.05) experienced elevated liver cancer proportionate mortality.

Compared to non-minority women in the same industry, African-American women in seven industries experienced elevated proportionate mortality from esophageal cancer. African-American women in food and tobacco manufacturing (PMR=7.90) experienced the greatest excess. African-American women in three industries experienced elevated stomach cancer proportionate mortality, with the African-American women in wholesale trade (PMR=5.57) experiencing the greatest elevation. In four industries, African-American women experienced elevated multiple myeloma proportionate mortality. The greatest impact was in textile and apparel manufacturing (PMR=3.47); 16 more African-American women died than expected.

Compared to non-minority women, Asian women in professional and related services and those in retail trade experienced elevated proportionate mortality from stomach and liver cancer. For both liver cancer (PMR=7.70) and stomach cancer (PMR=5.86), the elevated mortality was highest for Asian women in professional and related services. Asian women in retail trade (PMR=5.05) also experienced elevated oral cavity and pharyngeal cancer proportionate mortality.

Latino women experienced elevated proportionate mortality from cancer at numerous sites and in a broad array of industries when compared to non-minority women. Six of the most notable elevations were: stomach cancer in personal services (PMR=2.73); gallbladder cancer in retail trade (PMR=7.07); pancreatic cancer in other manufacturing (PMR=3.92); breast cancer in rubber and miscellaneous plastic manufacturing (PMR=3.05); kidney cancer in finance, insurance and real estate (PMR=6.30), and chronic myeloid leukemia in public administration (PMR=8.93). Given the small number of Native American female deaths in our study, we detected few industry groups with elevated cancer proportionate mortality compared to non-minority women. The most notable group we did detect was personal services in which stomach cancer was elevated (PMR=5.03).

Occupations

Table 2.2 presents PMRs by occupation. Compared to non-minority men in the same occupation, African-American men in eleven occupations had elevated PMRs for esophageal cancer. African-American men in farming, agriculture & forestry (PMR=3.21) experienced one of the greatest elevations in esophageal cancer proportionate mortality. African-American male machine operators and tenders (PMR=2.25) experienced 50 more prostate cancer deaths than expected. African-American males in five additional occupations experienced elevated prostate cancer proportionate mortality, but the greatest impact was felt by the machine operators and tenders. African-American men in five occupations experienced elevated multiple myeloma proportionate mortality with the greatest impact- 26 excess deaths- being found among motor vehicle operators (PMR=2.08). African-American male machine operators and tenders (PMR=2.19) also experienced elevated proportionate mortality for laryngeal cancer as 23 more African-American

male machine operators died of the cancer than expected. African-American male inspectors, testers, samplers and weighers (PMR=4.09) experienced elevated liver cancer proportionate mortality, and African-American men in the military (PMR=5.11) experienced elevated thyroid cancer proportionate mortality.

Asian men in five occupations experienced elevated proportionate mortality from stomach cancer compared to non-minorities in the same occupation. Asian male machine operators and tenders (PMR=8.19) experienced the greatest stomach cancer mortality elevation. Asian male fabricators, assemblers, and hand workers (PMR=28.66) experienced extremely elevated liver cancer proportionate mortality, and Asian men in ten other occupations also experienced elevated liver cancer proportionate mortality. Oral cavity and pharyngeal cancer was elevated among Asian male technicians and related support workers (PMR=6.34).

Compared to non-minorities, Latino men in eight occupations experienced elevated stomach cancer proportionate mortality. Latino male machine operators and tenders (PMR=3.26) experienced the greatest impact; 14 more of these men died of the cancer than expected. Latino men in service occupations (PMR=3.76) experienced elevated liver cancer proportionate mortality as did Latino men in six additional occupations. Latino men in the military experienced elevated proportionate mortality for both all leukemias (PMR=2.03) and for acute lymphocytic leukemia (PMR=9.71).

Native American males in the construction trades experienced elevated liver cancer proportionate mortality (PMR=3.42) and elevated rectal cancer proportionate mortality (PMR=3.68) compared to non-minorities in the same occupation.

African-American women in five occupations had elevated PMRs for esophageal cancer compared to non-minority women in the same occupation. African-American women machine operators and tenders (PMR=3.40) experienced the greatest elevation in proportionate esophageal cancer mortality. African-American women in four occupations experienced elevated proportionate mortality for multiple myeloma. Once again, the greatest impact was among African-American women machine operators and tenders (PMR=2.71); 21 more of these women died of the cancer than expected. African-American women inspectors, testers, samplers and weighers (PMR=6.66) experienced highly elevated proportionate mortality for rectal cancer, but it was based on only 5 cases.

Asian women in five occupations experienced elevated stomach cancer proportionate mortality compared to non-minority women in the same occupation. Asian female precision production workers (PMR=8.61) experienced the greatest elevation in stomach cancer proportionate mortality. Asian women fabricators, assemblers, and hand workers (PMR=22.46) experienced the greatest elevation in liver cancer proportionate mortality, but Asian women in two other occupations- professional specialists (PMR=8.42) and services (PMR=8.22) also experienced highly elevated proportionate mortality for this cancer.

Compared to non-minority women in the same occupation, Latino women in three occupations experienced elevated proportionate stomach cancer mortality. The greatest impact was

experienced among Latino women in service occupations (PMR=3.08) where 12 more Latino women died of stomach cancer than expected. Latino women in service occupations (PMR=3.22) also experienced elevated proportionate mortality from gallbladder cancer. Latino women professional specialists experienced elevated proportionate mortality from all leukemias (PMR=2.25) and from chronic myeloid leukemia (PMR=3.44).

Native American females in the service occupations experienced elevated proportionate mortality for both gall bladder cancer (PMR=4.83) and stomach cancer (PMR=2.55). Native American women executives, administrators and managers (PMR=11.81) experienced extremely elevated stomach cancer proportionate mortality. Multiple myeloma was elevated among Native American female administrative support and clerical workers (PMR=5.72).

Mortality Rates

Industries

Industry-specific SRRs are given in Table 2.3. Compared to non-minorities, the eight minority-racial/ethnic-sex groups experienced elevated SRRs at the same cancer site in the industry groups noted in the review of the elevated PMRs. However, in the SRR analysis numerous additional cancer sites and industry groups experienced elevated mortality. The increase in elevated groups was most evident for Blacks and Native Americans and least evident for Asians.

African-American men experienced elevated SRRs in at least one industry at 36 of the 40 cancer sites we examined. At 19 of these cancer sites, African-American men in agriculture, forestry, and fisheries experienced elevated mortality. Latino men experienced elevated SRRs in at least one industry at 28 of the 40 cancer sites we examined. Native American men also experienced elevated SRRs in at least one industry at numerous cancer sites, but the elevated SRRs were based on fewer than ten cases with two exceptions. Native American men in lumber, wood products and furniture manufacturing (SRR=18.90) and Native American men in agriculture, forestry, and fisheries (SRR=7.30) experienced elevated trachea, bronchus, and lung cancer mortality.

African-American women experienced elevated SRRs in at least one industry at 35 of the 42 cancer sites we examined. At 17 of these cancer sites, African-American women in agriculture, forestry, and fisheries experienced elevated mortality. Few of the elevated SRRs among Asian, Latino, and Native American women were based on more than 10 cases and fewer still did not have a matched elevated PMR.

Occupations

Table 2.4 presents SRRs by occupation. As with industries, minority workers generally experienced elevated SRRs at the same cancer sites in the same occupational groups as noted in the analysis using PMRs, but numerous additional cancer-occupation associations were also observed. Again, the additional elevated groups were most evident among Blacks and Native Americans and least evident among Asians.

African-American men experienced elevated SRRs in at least one occupation at 37 of the 40 cancer sites we examined (Table 1.2). Latino men experienced elevated SRRs in at least one occupation at 25 of the 40 cancer sites we examined. Native American men also experienced elevated SRRs in at least one occupation at numerous cancer sites, but the elevated SRRs were based on fewer than ten cases except for elevated trachea, bronchus, and lung cancer mortality in four occupations- farming, agriculture, and forestry (PMR=8.92), mechanics and repairers (PMR=3.75), precision production workers (PMR=3.68), and services (PMR=2.22).

African-American women experienced elevated SRRs in at least one industry at 33 of the 42 cancer sites we examined. Few of the elevated SRRs among Asian, Latino, and Native American women were based on more than 10 cases and fewer still lacked a corresponding elevated PMR.

For breast cancer mortality compared to non-minority women two interesting patterns emerged. First, Native American (PMR=48.22) and African-American (PMR=6.15) women in farming, agriculture and forestry experienced elevated mortality. Second, Native American (PMR=4.60), Asian (PMR=3.16), and Latino (PMR=2.16) women executives, administrators, and managers all had elevated mortality. Cervical cancer mortality was also elevated for Latino (PMR=4.49) and Asian (PMR=7.96) women compared to non-minority women.

Table 2.1. Proportionate mortality ratios (PMRs) and 95% confidence intervals (CIs) for minority workers by industry, relative to white workers in the same industry. Ages 20-64, PMRs directly adjusted for age. Selected results with PMR > 2.0 and >2 deaths.

Group/Cancer Site	Industry	Deaths	PMR	95% CI
African-American Men MN-oral cavity, & pharynx	Leather mfg	3	2.86	0.79 10.27
	Agriculture, forestry, and fisheries	80	2.61	1.96 3.48
	Rubber & misc plastics mfg	8	2.41	1.08 5.39
	Personal Services	42	2.26	1.47 3.48
	Other manufacturing	25	2.05	1.31 3.21
	Lumber, wood products, furniture mfg	59	3.69	2.50 5.45
	Petroleum & coal products mfg	6	3.22	1.25 8.30
	Chemical & allied product mfg	29	3.10	1.98 4.86
	Construction	305	2.88	2.49 3.33
	Agriculture, forestry, and fisheries	94	2.86	2.19 3.73
MN-esophagus	Entertainment & recreation services	21	2.69	1.56 4.62
	Personal Services	55	2.49	1.70 3.65
	Military	32	2.47	1.64 3.71
	Textile & apparel mfg	40	2.31	1.58 3.39
	Business & repair services	63	2.27	1.69 3.05
	Stone,clay,glass,concrete products mfg	19	2.23	1.28 3.89
	Food & tobacco mfg	40	2.22	1.49 3.29
	Wholesale trade	22	2.11	1.33 3.35
	Finance, insurance, & real estate	20	2.05	1.27 3.32
	Retail trade	73	2.05	1.58 2.66
MN-stomach	Mining	5	2.72	1.09 6.80
	Rubber & misc plastics mfg	8	2.09	0.94 4.65
	Military	3	4.13	0.98 17.35
MN-small intestine	Lumber, wood products, furniture mfg	3	3.39	0.56 20.32
	Public administration	8	2.73	1.17 6.33
	Printing & publishing	4	2.35	0.81 6.79
MN-liver and intrahepatic bile ducts	Rubber & misc plastics mfg	5	2.22	0.82 5.98
	Personal Services	3	2.07	0.41 10.35
MN-gall bladder and extrahepatic bile ducts	Other manufacturing	4	3.12	0.91 10.68
MN-nasal cavity				

MN-larynx	Finance, insurance, & real estate	8	3.50	1.57	7.78
	Other manufacturing	15	3.12	1.71	5.68
	Personal Services	17	2.39	1.22	4.69
	Agriculture, forestry, and fisheries	30	2.08	1.34	3.24
	Metal Industries	24	2.04	1.27	3.30
MN-other malignant neoplasm of the skin	Paper & allied products mfg	4	3.57	1.07	11.90
	Metal Industries	12	2.84	1.37	5.88
	Other manufacturing	5	2.76	0.99	7.67
MN-breast	Food & tobacco mfg	3	3.25	0.73	14.50
	Machinery & transportation equipment mfg	4	2.88	0.90	9.28
	Construction	6	2.02	0.74	5.53
MN-prostate	Stone,clay,glass,concrete products mfg	20	3.39	1.93	5.97
	Wholesale trade	24	2.38	1.54	3.69
	Paper & allied products mfg	9	2.15	1.04	4.46
MN-penis & other male genital organs	Personal Services	4	4.37	0.80	24.04
MN-thyroid gland	Military	13	1.23	1.88	67.22
Lymphosarcoma & reticulosarcoma	Lumber, wood products, furniture mfg	3	2.19	0.49	9.88
Multiple myeloma	Mining	4	3.75	1.33	10.59
	Printing & publishing	4	2.61	0.90	7.59
	Rubber & misc plastics mfg	4	2.50	0.80	7.82
	Textile & apparel mfg	16	2.23	1.22	4.10
	Military	12	2.15	1.11	4.15
	Chemical & allied product mfg	9	2.02	0.95	4.29
All other specified malignant neoplasms	Other manufacturing	3	2.26	0.61	8.39

Table 2.1. continued.

Group/Cancer Site	Industry	Deaths	PMR	95% CI
Asian Men				
MN-esophagus	Machinery & transportation equipment mfg	3	3.41	1.09
MN-stomach	Wholesale trade	3	7.76	2.56
	Other manufacturing	3	5.43	1.56
	Business & repair services	4	4.75	1.83
	Transportation, communication & utilities	3	4.00	1.28
	Public administration	3	3.88	1.26
	Personal Services	3	3.84	1.11
	Retail trade	8	3.13	1.53
	Professional & related services	6	2.12	0.95
	Finance, insurance, & real estate	5	3.52	1.52
	Agriculture, forestry, and fisheries	4	2.66	1.03
	Retail trade	3	2.52	0.81
	Lumber, wood products, furniture mfg	3	47.68	2.64
	Textile & apparel mfg	5	30.52	2.21
	Other manufacturing	7	26.82	2.55
	Personal Services	10	22.93	1.61
	Business & repair services	5	22.42	9.41
	Wholesale trade	5	18.25	7.55
	Retail trade	24	14.62	9.51
	Construction	4	13.86	5.04
	Transportation, communication & utilities	5	10.60	4.30
	Professional & related services	15	10.10	5.93
	Military	3	9.09	2.94
	Public administration	3	8.03	2.59
	Machinery & transportation equipment mfg	4	6.64	2.28
	Machinery & transportation equipment mfg	3	2.00	0.62
	Personal Services	3	4.32	1.24
	Business & repair services	3	3.77	1.17
	Retail trade	4	7.82	2.82
	Professional & related services	7	4.40	1.97
	Professional & related services	3	2.79	0.85
	Public administration	3	3.57	1.23
MN-pancreas				
MN-kidney & other/unspec urinary organs				
Other lymphatic neoplasms				
Acute lymphocytic leukemia				
Acute myeloid leukemia				
Other leukemias				
All Leukemias				

Group/Cancer Site	Industry	Deaths	PMR	95% CI
MN-ill-defined & unspecified	Professional & related services	12	2.71	1.48 4.96
	Food & tobacco mfg	3	4.71	1.42 15.67
	Personal Services	5	2.37	0.92 6.05

Table 2.1 continued.

Group/Cancer Site	Industry	Deaths	PMR	95% CI
Latino Men				
MN-oral cavity, & pharynx	Other manufacturing	5	2.83	1.10 7.32
	Food & tobacco mfg	4	2.22	0.82 6.00
MN-stomach	Lumber, wood products, furniture mfg	6	7.04	2.95 16.78
	Stone, clay, glass, concrete products mfg	3	5.95	1.77 19.98
	Entertainment & recreation services	3	4.41	1.37 14.15
	Other manufacturing	9	3.84	1.89 7.79
	Chemical & allied product mfg	3	3.37	1.03 11.03
	Machinery & transportation equipment mfg	12	3.16	1.79 5.58
	Wholesale trade	4	2.77	1.00 7.68
	Metal Industries	11	2.47	1.35 4.52
	Business & repair services	11	2.36	1.23 4.53
	Transportation, communication & utilities	18	2.27	1.41 3.65
MN-liver and intrahepatic bile ducts	Entertainment & recreation services	3	6.24	1.84 21.22
	Public administration	15	4.74	2.77 8.13
	Business & repair services	11	4.14	2.09 8.19
	Military	4	4.08	1.49 11.12
	Finance, insurance, & real estate	3	3.29	1.03 10.46
	Machinery & transportation equipment mfg	6	3.24	1.42 7.43
	Professional & related services	12	3.15	1.76 5.64
	Agriculture, forestry, and fisheries	6	2.04	0.87 4.80
MN-gall bladder and extrahepatic bile ducts	Transportation, communication & utilities	3	2.97	0.93 9.54
MN-pancreas	Wholesale trade	6	2.44	1.10 5.42
MN-larynx	Personal Services	3	3.33	0.89 12.52
	Public administration	5	2.86	1.15 7.10
	Metal Industries	3	2.03	0.64 6.48
MN-connective and other soft tissue	Food & tobacco mfg	4	3.83	1.21 12.11
MN-other malignant neoplasm of the skin	Agriculture, forestry, and fisheries	4	2.70	0.94 7.71
MN-prostate	Entertainment & recreation services	3	4.07	1.27 13.03
MN-testis	Metal Industries	3	9.32	2.40 36.14
MN-bladder	Metal Industries	3	2.03	0.64 6.43
MN-brain	Entertainment & recreation services	4	2.20	0.64 7.51
Other lymphatic neoplasms	Mining	5	2.66	1.05 6.74

Group/Cancer Site	Industry	Deaths	PMR	95% CI
Acute lymphocytic leukemia	Military	3	9.97	2.50 39.84
	Agriculture, forestry, and fisheries	4	3.86	1.18 12.61
	Public administration	3	3.59	1.04 12.38
	Transportation, communication & utilities	3	2.34	0.70 7.80
Chronic myeloid leukemia	Public administration	4	3.32	1.17 9.44
	Machinery & transportation equipment mfg	3	2.94	0.94 9.24
All Leukemias	Chemical & allied product mfg	5	3.29	1.27 8.52
	Wholesale trade	4	2.17	0.81 5.80
	Military	6	2.07	0.89 4.81
All other specified malignant neoplasms	Military	4	2.15	0.67 6.87
	Construction			
Native American Men				
MN-esophagus	Professional & related services	4	3.11	1.19 8.14
MN-colon	Food & tobacco mfg	3	3.02	1.01 9.06
MN-rectum	Construction	5	2.03	0.75 5.46
MN-liver and intrahepatic bile ducts	Construction	7	3.05	1.42 6.55
MN-prostate	Lumber, wood products, furniture mfg	3	2.91	0.94 8.97
MN-other lymphatic neoplasms	Retail trade	3	2.16	0.61 7.63
MN-multiple myeloma	Professional & related services	3	3.24	1.04 10.13
MN-chronic myeloid leukemia	Construction	3	3.71	0.98 14.09
MN-ill-defined & unspecified	Machinery & transportation equipment mfg	4	2.01	0.78 5.17

Table 2.1 continued.

Group/Cancer Site	Industry	Deaths	PMR	95% CI
African-American Women				
MN-oral cavity, & pharynx	Stone,clay,glass,concrete products mfg	3	13.76	2.30 82.19
	Agriculture, forestry, and fisheries	8	2.80	0.85 9.25
MN-esophagus	Food & tobacco mfg	9	7.90	2.14 29.24
	Business & repair services	11	6.96	2.55 19.00
	Agriculture, forestry, and fisheries	7	4.60	0.96 22.06
	Textile & apparel mfg	17	4.33	2.17 8.62
	Personal Services	78	3.08	1.99 4.76
	Retail trade	24	2.67	1.67 4.28
	Other manufacturing	6	2.01	0.75 5.39
MN-stomach	Wholesale trade	4	5.57	1.74 17.82
	Entertainment & recreation services	4	3.39	0.99 11.60
	Other manufacturing	8	2.50	1.08 5.81
MN-rectum	Chemical & allied product mfg	3	7.33	1.18 45.57
MN-larynx	Public administration	4	2.13	0.65 6.93
MN-other parts of the respiratory system	Personal Services	3	3.73	0.38 36.69
	Finance, insurance, & real estate	3	3.21	0.74 14.01
	Retail trade	4	2.71	0.82 8.92
MN-connective and other soft tissue	Machinery & transportation equipment mfg	8	3.17	1.34 7.50
MN-uterine corpus	Agriculture, forestry, and fisheries	4	2.69	0.49 14.62
MN-other/unsp parts of uterus & other female genital organs	Metal Industries	3	4.19	0.96 18.35
MN-bladder	Other manufacturing	3	3.41	0.83 14.05
MN-kidney & other/unspec urinary organs	Entertainment & recreation services	3	5.66	1.22 26.18
Lymphosarcoma & reticulosarcoma	Finance, insurance, & real estate	4	2.05	0.57 7.41
Other lymphatic neoplasms	Paper & allied products mfg	3	2.36	0.63 8.93
Multiple myeloma	Other manufacturing	7	4.42	1.64 11.93
	Textile & apparel mfg	22	3.47	1.97 6.12
	Metal Industries	4	2.64	0.81 8.61
	Public administration	17	2.15	1.20 3.86
Chronic lymphocitic leukemia	Public administration	3	2.61	0.65 10.43
All Leukemias	Stone,clay,glass,concrete products mfg	5	2.47	0.85 7.13
All other specified malignant neoplasms	Public administration	4	9.57	1.74 52.78

Group/Cancer Site	Industry	Deaths	PMR	95% CI
Asian Women				
MN-oral cavity, & pharynx	Retail trade	4	5.05	1.86 13.67
MN-stomach	Textile & apparel mfg	3	6.86	1.90 24.74
	Professional & related services	7	5.92	2.75 12.73
	Retail trade	5	4.61	1.91 11.13
MN-colon	Textile & apparel mfg	3	2.03	0.63 6.49
	Machinery & transportation equipment mfg	5	2.03	0.84 4.86
MN-liver and intrahepatic bile ducts	Professional & related services	6	7.73	3.36 17.77
	Personal Services	3	6.72	2.04 22.10
	Retail trade	3	4.26	1.33 13.64
MN-kidney & other/unspec urinary organs	Professional & related services	5	2.74	1.07 7.04
MN-brain	Public administration	3	3.84	1.34 11.05
MN-ill-defined & unspecified	Public administration	3	3.48	1.23 9.81
	Other manufacturing	3	2.75	0.96 7.88
Latino Women				
MN-oral cavity, & pharynx	Public administration	3	2.83	0.88 9.14
MN-stomach	Transportation, communication & utilities	3	3.17	1.00 10.12
	Personal Services	8	2.73	1.31 5.70
	Retail trade	6	2.18	0.96 4.96
MN-small intestine	Professional & related services	13	2.15	1.22 3.79
MN-gall bladder and extrahepatic bile ducts	Professional & related services	3	4.02	1.22 13.21
	Retail trade	6	7.07	3.04 16.47
MN-pancreas	Personal Services	3	3.12	0.90 10.84
	Other manufacturing	5	3.92	1.59 9.67
MN-breast	Textile & apparel mfg	4	3.12	1.18 8.25
	Rubber & misc plastics mfg	3	3.06	2.26 4.14
MN-cervix uteri	Stone,clay,glass,concrete products mfg	3	2.53	0.91 7.07
MN-ovary and uterine adnexa	Textile & apparel mfg	4	2.09	0.79 5.56
MN-other/unsp parts of uterus & other female genital organs	Other manufacturing	6	2.20	0.99 4.90
MN-kidney & other/unspec urinary organs	Personal Services	4	2.24	0.81 6.20
Lymphosarcoma & reticulosarcoma	Finance, insurance, & real estate	4	6.30	2.13 18.66
Other lymphatic neoplasms	Retail trade	3	2.36	0.63 8.81
	Machinery & transportation equipment mfg	3	3.82	1.15 12.71

Group/Cancer Site	Industry	Deaths	PMR	95% CI
Multiple myeloma	Personal Services	4	2.78	0.98 7.88
Chronic myeloid leukemia	Public administration	3	8.93	2.55 31.28
Native American Women				
MN-oral cavity, & pharynx	Professional & related services	3	2.37	0.75 7.56
MN-stomach	Personal Services	5	5.03	2.05 12.37
MN-connective and other soft tissue	Public administration	3	4.13	1.25 13.62
MN-cervix uteri	Textile & apparel mfg	4	2.31	0.95 5.62
	Personal Services	6	2.27	1.02 5.04
	Retail trade	4	2.18	0.80 5.89
All Leukemias	Personal Services	4	2.12	0.76 5.89
MN-ill-defined & unspecified	Other manufacturing	3	2.39	0.72 7.88

Table 2.2. Proportionate mortality ratios (PMRs) and 95% confidence intervals (CIs) for minority workers by industry, relative to white workers in the same industry. Ages 20-64, PMRs directly adjusted for age. Selected results with PMR > 2.0 and >2 deaths.

Group/Cancer Site	Occupation	Deaths	PMR	95% CI	
African-American Men	Fishing & hunting	4	10.92	2.01	
	Freight, stock, and materials handlers	42	2.32	1.43	
	Farming, Agriculture, & Forestry	91	2.18	1.66	
	Services	158	2.01	1.64	
	Freight, stock, and materials handlers	44	3.67	2.12	
	Farming, Agriculture, & Forestry	126	3.21	2.51	
	Laborers	317	3.04	2.54	
	Helpers	8	2.72	0.72	
	Military	31	2.54	1.67	
	Fabricators, assemblers & hand workers	23	2.51	1.55	
MN-esophagus	Oth transportation & material moving occs	43	2.46	1.71	
	Construction trades	136	2.41	1.98	
	Services	195	2.30	1.91	
	Inspectors, testers, samplers, & weighers	6	2.22	0.91	
	Mechanics & repairers	46	2.18	1.58	
	Extractive occupations	4	5.16	1.81	
	Freight, stock, and materials handlers	29	2.17	1.24	
	Freight, stock, and materials handlers	4	5.05	0.56	
	Military	3	4.20	1.00	
	Technicians and related support workers	3	3.27	0.85	
MN-rectum	Mechanics & repairers	3	2.35	0.64	
	Inspectors, testers, samplers, & weighers	4	2.85	0.92	
	Inspectors, testers, samplers, & weighers	6	4.09	1.53	
	Fabricators, assemblers & hand workers	4	3.05	0.87	
	Sales	4	2.45	0.86	
	Laborers	8	2.78	0.90	
	Precision production workers	4	2.59	0.83	
	Machine operators & tenders	42	2.19	1.50	
	Precision production workers	21	2.12	1.32	
	Services	61	2.07	1.48	
MN-liver and intrahepatic bile ducts	Freight, stock, and materials handlers	16	2.04	0.96	
	MN-nasal cavity	Fishing & hunting	4	10.92	2.01
		Freight, stock, and materials handlers	42	2.32	1.43
		Farming, Agriculture, & Forestry	91	2.18	1.66
		Services	158	2.01	1.64
		Freight, stock, and materials handlers	44	3.67	2.12
		Farming, Agriculture, & Forestry	126	3.21	2.51
		Laborers	317	3.04	2.54
		Helpers	8	2.72	0.72
		Military	31	2.54	1.67
Fabricators, assemblers & hand workers		23	2.51	1.55	
MN-larynx	Oth transportation & material moving occs	43	2.46	1.71	
	Construction trades	136	2.41	1.98	
	Services	195	2.30	1.91	
	Inspectors, testers, samplers, & weighers	6	2.22	0.91	
	Mechanics & repairers	46	2.18	1.58	
	Extractive occupations	4	5.16	1.81	
	Freight, stock, and materials handlers	29	2.17	1.24	
	Freight, stock, and materials handlers	4	5.05	0.56	
	Military	3	4.20	1.00	
	Technicians and related support workers	3	3.27	0.85	
MN-gall bladder and extrahepatic bile ducts	Mechanics & repairers	3	2.35	0.64	
	Inspectors, testers, samplers, & weighers	4	2.85	0.92	
	Inspectors, testers, samplers, & weighers	6	4.09	1.53	
	Fabricators, assemblers & hand workers	4	3.05	0.87	
	Sales	4	2.45	0.86	
	Laborers	8	2.78	0.90	
	Precision production workers	4	2.59	0.83	
	Machine operators & tenders	42	2.19	1.50	
	Precision production workers	21	2.12	1.32	
	Services	61	2.07	1.48	

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
MN-pleura	Sales	3	7.93	1.97
MN-other parts of the respiratory system	Laborers	7	3.15	0.91
MN-bone	Freight, stock, and materials handlers	4	2.33	0.49
MN-other malignant neoplasm of the skin	Freight, stock, and materials handlers	4	5.60	0.62
	Fabricators, assemblers & hand workers	6	3.06	1.09
MN-prostate	Other handlers & cleaners	12	6.17	2.00
	Freight, stock, and materials handlers	30	2.45	1.40
	Helpers	4	2.31	0.42
	Machine operators & tenders	89	2.25	1.75
	Inspectors, testers, samplers, & weighers	5	2.24	0.86
	Motor Vehicle Operators	88	2.14	1.66
MN-thyroid gland	Military	3	5.11	1.13
Lymphosarcoma & reticulosarcoma	Fabricators, assemblers & hand workers	4	2.14	0.65
Multiple myeloma	Other handlers & cleaners	5	3.44	0.82
	Military	12	2.19	1.13
	Machine operators & tenders	40	2.12	1.44
	Motor Vehicle Operators	50	2.08	1.48
	Fabricators, assemblers & hand workers	7	2.05	0.88

Table 2.2 continued.

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
Asian Men				
MN-oral cavity, & pharynx	Technicians and related support workers	3	6.34	1.99
	Professional specialists	5	2.29	0.93
	Services	5	2.13	0.88
MN-stomach	Machine operators & tenders	7	8.19	3.89
	Precision production workers	3	4.06	1.32
	Services	8	3.95	0.96
	Sales	4	2.90	1.06
	Executives, administrators, managers	7	2.21	1.04
MN-colon	Farming, Agriculture, & Forestry	5	3.65	1.54
MN-rectum	Executives, administrators, managers	3	2.68	0.87
MN-liver and intrahepatic bile ducts	Fabricators, assemblers & hand workers	7	28.66	13.27
	Machine operators & tenders	9	23.81	12.61
	Services	22	18.13	11.62
	Technicians and related support workers	4	15.24	4.66
	Construction trades	3	14.44	4.59
	Sales	11	12.53	6.81
	Military	4	12.08	4.56
	Farming, Agriculture, & Forestry	3	11.15	3.62
	Precision production workers	5	10.25	4.14
	Professional specialists	16	9.92	5.85
	Executives, administrators, managers	13	8.24	4.69
	Machine operators & tenders	3	3.65	1.20
	Freight, stock, and materials handlers	3	2.48	1.00
	Sales	5	2.20	0.89
MN-pancreas	Professional specialists	6	2.78	1.20
MN-trachea, bronchus and lung	Professional specialists	3	4.19	1.26
MN-other lymphatic neoplasms	Executives, administrators, managers	3	3.05	0.93
Acute myeloid leukemia	Professional specialists	12	2.14	1.17
Chronic myeloid leukemia	Professional specialists	3	4.49	1.42
Other leukemias	Laborers			
All Leukemias				
MN-ill-defined & unspecified				

Table 2.2 continued.

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
Latino Men				
MN-oral cavity, & pharynx	Freight, stock, and materials handlers	4	3.21	1.14 9.10
MN-stomach	Inspectors, testers, samplers, & weighers	3	8.90	2.77 28.64
	Motor Vehicle Operators	13	4.24	2.39 7.50
	Machine operators & tenders	20	3.26	2.05 5.18
	Fabricators, assemblers & hand workers	5	3.16	1.22 8.18
	Executives, administrators, managers	16	2.62	1.58 4.33
	Mechanics & repairers	9	2.39	1.22 4.68
	Oth transportation & material moving occs	5	2.31	0.95 5.64
	Freight, stock, and materials handlers	3	2.27	0.61 8.35
MN-rectum	Administrative support & clerical	4	2.42	0.89 6.53
	Motor Vehicle Operators	4	2.13	0.77 5.88
MN-liver and intrahepatic bile ducts	Military	4	4.02	1.47 10.98
	Motor Vehicle Operators	7	3.93	1.78 8.68
	Services	23	3.76	2.40 5.88
	Laborers	21	3.68	2.30 5.88
	Mechanics & repairers	6	2.65	1.11 6.30
	Administrative support & clerical	4	2.40	0.88 6.53
	Farming, Agriculture, & Forestry	6	2.08	0.89 4.88
MN-larynx	Mechanics & repairers	5	2.97	1.20 7.32
MN-connective and other soft tissue	Technicians and related support workers	5	7.22	2.67 19.53
	Motor Vehicle Operators	3	2.32	0.71 7.61
	Farming, Agriculture, & Forestry	4	2.37	0.84 6.72
MN-other malignant neoplasm of the skin	Executives, administrators, managers	13	2.01	1.18 3.44
MN-prostate	Precision production workers	3	2.54	0.76 8.47
MN-testis	Sales	9	2.02	1.05 3.90
MN-kidney & other/unspec urinary organs	Motor Vehicle Operators	12	2.43	1.31 4.50
Other lymphatic neoplasms	Military	3	9.71	2.42 38.93
Acute lymphocitic leukemia	Laborers	5	5.11	1.66 15.71
	Farming, Agriculture, & Forestry	3	3.30	0.94 11.53
	Machine operators & tenders	4	2.42	0.84 6.97
	Services	5	2.90	1.07 7.83
MN-chronic myeloid leukemia	Sales	3	2.66	0.74 9.49
	Executives, administrators, managers	3	2.37	0.73 7.73

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
MN-other leukemia	Mechanics & repairers	4	2.04	0.65 6.38
All Leukemias	Extractive occupations	3	2.59	0.79 8.45
	Military	6	2.03	0.87 4.73
All other specified malignant neoplasms	Construction trades	3	2.93	0.75 11.41
MN-ill-defined & unspecified	Inspectors, testers, samplers, & weighers	4	4.24	1.64 10.96
Native American Men				
MN-rectum	Construction trades	5	3.68	1.38 9.80
MN-liver and intrahepatic bile ducts	Construction trades	4	3.42	1.25 9.35
MN-prostate	Mechanics & repairers	3	2.62	0.78 8.75

Table 2.2 continued.

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
African-American Women				
MN-oral cavity, & pharynx	Farming, Agriculture, & Forestry	7	7.43	0.92 60.01
MN-esophagus	Machine operators & tenders	29	3.40	1.96 5.89
	Laborers	13	3.22	1.46 7.12
	Sales	8	2.99	1.33 6.71
	Services	116	2.64	1.97 3.54
	Executives, administrators, managers	9	2.12	1.04 4.32
MN-stomach	Inspectors, testers, samplers, & weighers	4	2.24	0.67 7.54
	Fabricators, assemblers & hand workers	6	2.10	0.80 5.51
MN-rectum	Inspectors, testers, samplers, & weighers	5	6.66	1.77 25.15
	Technicians and related support workers	5	2.51	0.79 7.95
MN-liver and intrahepatic bile ducts	Inspectors, testers, samplers, & weighers	3	2.94	0.69 12.53
MN-pancreas	Freight, stock, and materials handlers	5	2.34	0.88 6.23
MN-other parts of the respiratory system	Sales	3	7.47	1.50 37.33
MN-connective and other soft tissue	Inspectors, testers, samplers, & weighers	4	2.45	0.73 8.26
MN-uterine corpus	Farming, Agriculture, & Forestry	4	3.98	0.45 35.43
MN-other/unsp parts of uterus & other female genital organs	Farming, Agriculture, & Forestry	6	3.01	0.61 14.90
MN-multiple myeloma	Fabricators, assemblers & hand workers	9	2.89	1.22 6.88
	Inspectors, testers, samplers, & weighers	7	3.04	1.15 8.03
	Motor Vehicle Operators	3	2.81	0.64 12.28
	Machine operators & tenders	33	2.71	1.70 4.32
	Executives, administrators, managers	16	2.05	1.20 3.50
Chronic lymphocytic leukemia	Executives, administrators, managers	3	2.46	0.68 8.88
	Administrative support & clerical	6	2.39	0.95 6.00
Chronic myeloid leukemia	Laborers	4	2.31	0.58 9.28
All other specified malignant neoplasms	Executives, administrators, managers	3	2.04	0.56 7.40
MN-ill-defined & unspecified	Freight, stock, and materials handlers	8	2.39	1.09 5.25
Asian Women				
MN-stomach	Precision production workers	3	8.61	2.56 28.95
	Professional specialists	3	6.25	2.03 19.26
	Machine operators & tenders	5	5.98	2.42 14.75
	Administrative support & clerical	4	5.42	1.88 15.64

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
MN-colon	Services	6	4.85	2.15 10.93
	Precision production workers	3	2.70	0.88 8.34
	Fabricators, assemblers & hand workers	3	2.37	0.83 6.75
	Administrative support & clerical	5	2.09	0.90 4.87
	Professional specialists	7	2.08	0.97 4.47
MN-liver and intrahepatic bile ducts	Fabricators, assemblers & hand workers	3	22.46	7.30 69.10
	Professional specialists	5	8.42	3.06 23.17
	Services	6	8.22	3.63 18.58
MN-pancreas	Executives, administrators, managers	3	2.18	0.67 7.13
MN-cervix uteri	Executives, administrators, managers	4	2.65	0.92 7.66
Acute myeloid leukemia	Services	3	3.45	1.09 10.89
Latino Women				
MN-stomach	Sales	6	4.06	1.75 9.42
	Services	18	3.08	1.88 5.04
MN-liver and intrahepatic bile ducts	Executives, administrators, managers	3	2.17	0.63 7.47
	Machine operators & tenders	3	3.16	0.96 10.41
MN-gall bladder and extrahepatic bile ducts	Services	6	3.22	1.37 7.56
	Administrative support & clerical	4	2.96	1.05 8.38
MN-breast	Motor Vehicle Operators	6	2.38	1.13 5.04
MN-other/unsp parts of uterus & other female genital organs	Executives, administrators, managers	5	3.56	1.34 9.46
MN-kidney & other/unspec urinary organs	Machine operators & tenders	3	2.03	0.62 6.57
	Executives, administrators, managers	4	2.98	1.02 8.67
MN-lymphosarcoma & reticulosarcoma	Sales	3	2.42	0.78 7.45
	Administrative support & clerical	3	2.08	0.55 7.88
Other lymphatic neoplasms	Technicians and related support workers	3	2.12	0.68 6.63
	Machine operators & tenders	3	2.99	0.91 9.85
MN-multiple myeloma	Services	7	2.34	1.09 5.05
	Professional specialists	3	3.44	1.06 11.15
MN-chronic myeloid leukemia	Professional specialists	3	2.47	0.75 8.10
MN-other leukemia	Professional specialists	12	2.25	1.26 4.04
All Leukemias				
Native American Women				
MN-gall bladder and extrahepatic bile ducts	Executives, administrators, managers	4	11.81	4.12 33.85
	Services	5	2.55	1.04 6.21
	Services	3	4.83	1.52 15.41

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
MN-connective and other soft tissue	Administrative support & clerical	3	3.15	0.93 10.65
MN-cervix uteri	Machine operators & tenders	5	2.32	1.02 5.31
Multiple myeloma	Administrative support & clerical	4	5.72	2.03 16.07
Acute myeloid leukemia	Services	4	2.37	0.83 6.75
MN-ill-defined & unspecified	Professional specialists	6	2.10	0.95 4.64

Table 2.3. Standardized mortality rate ratios (SRRs) and 95% confidence intervals (CIs) for minority workers by industry, relative to white workers in the same industry. Ages 20-64, SRRs directly adjusted for age. Selected results with SRR > 2.0 and >2 deaths.

Group/cancer site	Industry	Deaths	SRR	95% CI
African-American Men MN-oral cavity, & pharynx	Leather mfg	3	27.58	0.11 111.53
	Agriculture, forestry, and fisheries	80	17.54	4.56 23.67
	Personal Services	42	10.41	4.03 16.28
	Rubber & misc plastics mfg	8	7.91	1.01 17.70
	Finance, insurance, & real estate	19	7.72	2.46 12.68
	Printing & publishing	5	6.40	0.78 16.30
	Paper & allied products mfg	5	6.13	0.82 16.65
	Construction	206	5.90	34.89 6.95
	Business & repair services	55	5.80	9.49 7.88
	Retail trade	71	5.74	12.36 7.46
	Food & tobacco mfg	33	5.64	5.85 8.62
	Entertainment & recreation services	11	5.36	2.05 10.57
	Lumber, wood products, furniture mfg	33	5.15	6.41 7.86
	Other manufacturing	25	5.10	4.90 7.95
	Wholesale trade	11	4.94	2.22 9.35
	Chemical & allied product mfg	7	4.43	1.58 10.07
	Stone,clay,glass,concrete products mfg	7	4.25	1.65 9.74
	Public administration	43	4.20	10.25 5.93
	Metal Industries	36	3.91	9.22 5.77
	Transportation, communication & utilities	118	3.88	30.41 4.79
Professional & related services	53	3.80	13.96 5.15	
Textile & apparel mfg	22	3.65	6.03 5.96	
Machinery & transportation equipment mfg	28	2.38	11.76 3.53	
MN-esophagus	Agriculture, forestry, and fisheries	94	18.71	5.03 24.74
	Lumber, wood products, furniture mfg	59	13.04	4.52 19.37
	Personal Services	55	11.45	4.80 17.05
	Stone,clay,glass,concrete products mfg	19	11.12	1.71 19.57
	Chemical & allied product mfg	29	10.51	2.76 16.51
	Entertainment & recreation services	21	9.83	2.14 16.77
	Construction	305	9.25	32.98 10.69
	Wholesale trade	22	8.02	2.74 12.81

Group/cancer site	Industry	Deaths	SRR	95% CI
MN-stomach	Finance, insurance, & real estate	20	7.80	2.57 12.61
	Petroleum & coal products mfg	6	7.47	0.80 22.75
	Food & tobacco mfg	40	6.71	5.96 9.99
	Business & repair services	63	6.67	9.44 8.94
	Retail trade	73	6.10	11.97 7.90
	Printing & publishing	4	5.64	0.71 15.91
	Textile & apparel mfg	40	5.11	7.82 7.50
	Metal Industries	57	4.98	11.45 6.79
	Mining	3	4.79	0.63 15.44
	Professional & related services	83	4.51	18.40 5.78
	Other manufacturing	27	4.07	6.63 6.19
	Transportation, communication & utilities	158	3.97	39.84 4.76
	Paper & allied products mfg	5	3.95	1.27 10.22
	Machinery & transportation equipment mfg	53	3.71	14.31 4.96
	Military	32	3.14	10.19 5.00
	Public administration	51	3.01	16.96 4.08
	Rubber & misc plastic's mfg	3	2.34	1.28 7.76
	Agriculture, forestry, and fisheries	54	10.57	5.11 14.85
	Mining	5	10.52	0.48 31.06
	Entertainment & recreation services	10	7.25	1.38 15.08
	Rubber & misc plastics mfg	8	7.07	1.13 15.70
	Stone,clay,glass,concrete products mfg	9	6.57	1.37 14.11
	Wholesale trade	17	6.46	2.63 10.90
	Paper & allied products mfg	8	6.27	1.28 13.79
	Business & repair services	50	6.11	8.19 8.44
	Food & tobacco mfg	25	5.10	4.90 8.23
	Construction	135	5.03	26.83 6.13
	Chemical & allied product mfg	12	4.36	2.75 8.21
	Printing & publishing	5	4.26	1.17 10.71
	Personal Services	20	4.01	4.99 6.89
	Lumber, wood products, furniture mfg	23	3.99	5.77 6.53
	Retail trade	44	3.52	12.49 4.87
	Textile & apparel mfg	19	3.23	5.89 5.44
Finance, insurance, & real estate	9	3.15	2.85 6.26	
Machinery & transportation equipment mfg	45	3.12	14.42 4.30	
Transportation, communication & utilities	105	3.07	34.19 3.82	

Group/cancer site	Industry	Deaths	SRR	95% CI
MN-small intestine	Professional & related services	60	2.94	20.44 3.89
	Public administration	43	2.78	15.49 3.87
	Metal Industries	31	2.54	12.23 3.76
	Lumber, wood products, furniture mfg	3	19.05	0.16 116.26
	Public administration	8	6.47	1.24 15.20
	Metal Industries	3	6.39	0.47 25.47
	Military	3	6.10	0.49 33.11
	Transportation, communication & utilities	9	3.76	2.39 8.12
	Construction	7	3.38	2.07 7.70
	Personal Services	48	4.71	10.20 6.73
MN-colon	Agriculture, forestry, and fisheries	54	3.52	15.34 4.80
	Printing & publishing	9	3.34	2.70 6.59
	Stone,clay,glass,concrete products mfg	14	3.17	4.42 5.79
	Finance, insurance, & real estate	26	3.16	8.22 4.73
	Business & repair services	60	3.16	18.98 4.17
	Entertainment & recreation services	10	2.89	3.46 5.81
	Rubber & misc plastics mfg	10	2.80	3.58 5.40
	Metal Industries	80	2.76	29.02 3.55
	Lumber, wood products, furniture mfg	32	2.47	12.97 3.65
	Retail trade	88	2.45	35.90 3.06
MN-rectum	Wholesale trade	19	2.41	7.90 3.86
	Paper & allied products mfg	8	2.36	3.39 4.92
	Professional & related services	132	2.29	57.75 2.75
	Public administration	98	2.23	43.87 2.77
	Textile & apparel mfg	39	2.17	17.96 3.08
	Machinery & transportation equipment mfg	87	2.10	41.40 2.63
	Entertainment & recreation services	5	5.36	0.93 14.63
	Personal Services	13	4.50	2.89 8.87
	Rubber & misc plastics mfg	3	3.86	0.78 13.51
	Stone,clay,glass,concrete products mfg	4	3.64	1.10 10.60
MN-rectum	Machinery & transportation equipment mfg	23	3.59	6.40 5.68
	Business & repair services	15	3.22	4.66 5.59
	Retail trade	24	2.85	8.42 4.44
	Paper & allied products mfg	3	2.84	1.06 9.60
	Professional & related services	24	2.71	8.87 4.20
	Agriculture, forestry, and fisheries	10	2.58	3.87 5.62

Group/cancer site	Industry	Deaths	SRR	95% CI
MN-liver and intrahepatic bile ducts	Wholesale trade	5	2.31	2.16 5.73
	Chemical & allied product mfg	3	2.24	1.34 7.50
	Finance, insurance, & real estate	3	2.21	1.36 7.08
	Other manufacturing	9	2.21	4.07 4.43
	Lumber, wood products, furniture mfg	7	2.14	3.27 4.94
	Construction	33	2.09	15.76 3.02
	Public administration	20	2.06	9.73 3.30
	Agriculture, forestry, and fisheries	21	8.39	2.50 14.63
	Printing & publishing	4	7.72	0.52 22.42
	Rubber & misc plastics mfg	5	7.12	0.70 19.33
	Personal Services	19	6.13	3.10 11.03
	Wholesale trade	9	5.90	1.53 12.04
	Business & repair services	24	5.71	4.21 9.07
	Finance, insurance, & real estate	8	5.17	1.55 10.95
	Stone, clay, glass, concrete products mfg	4	4.86	0.82 14.45
	Chemical & allied product mfg	5	4.22	1.19 11.09
	Metal Industries	23	4.09	5.63 6.62
	Machinery & transportation equipment mfg	26	3.80	6.84 5.79
	Professional & related services	39	3.67	10.63 5.24
	Retail trade	27	3.65	7.40 5.49
MN-gall bladder and extrahepatic bile ducts	Construction	65	3.60	18.07 4.73
	Other manufacturing	12	3.42	3.51 6.35
	Food & tobacco mfg	7	2.88	2.43 6.67
	Textile & apparel mfg	12	2.87	4.17 5.48
	Lumber, wood products, furniture mfg	8	2.80	2.86 6.24
	Public administration	21	2.55	8.23 4.08
	Personal Services	3	14.29	0.21 71.36
	Chemical & allied product mfg	3	7.67	0.39 28.72
	Other manufacturing	3	4.95	0.61 17.77
	Lumber, wood products, furniture mfg	3	3.71	0.81 14.35
MN-pancreas	Construction	13	3.47	3.75 6.37
	Retail trade	5	3.13	1.60 7.95
	Public administration	5	3.04	1.65 8.06
	Agriculture, forestry, and fisheries	38	3.90	9.75 5.58
	Personal Services	28	3.65	7.67 5.72
	Paper & allied products mfg	9	3.56	2.53 7.29

Group/cancer site	Industry	Deaths	SRR	95% CI	
MN-peritoneum & other/unspec digestive organs	Lumber, wood products, furniture mfg	29	3.30	8.79 5.07	
	Stone,clay,glass,concrete products mfg	8	3.15	2.54 6.65	
	Printing & publishing	5	2.93	1.71 7.25	
	Machinery & transportation equipment mfg	65	2.73	23.84 3.54	
	Business & repair services	36	2.70	13.35 3.84	
	Wholesale trade	11	2.63	4.18 4.91	
	Food & tobacco mfg	27	2.58	10.48 3.92	
	Chemical & allied product mfg	11	2.50	4.40 4.70	
	Construction	111	2.40	46.28 2.94	
	Other manufacturing	22	2.38	9.26 3.71	
	Textile & apparel mfg	23	2.34	9.84 3.68	
	Professional & related services	78	2.13	36.59 2.71	
	Public administration	59	2.10	28.13 2.77	
	Metal Industries	38	2.06	18.46 2.92	
	Retail trade	43	2.05	20.99 2.80	
	Entertainment & recreation services	5	2.02	2.48 5.12	
	Agriculture, forestry, and fisheries	3	7.22	0.42 27.64	
	MN-nasal cavity	Metal Industries	3	6.03	0.50 27.18
		Lumber, wood products, furniture mfg	3	5.60	0.54 23.01
		Personal Services	3	4.92	0.61 20.48
Machinery & transportation equipment mfg		5	4.41	1.13 12.23	
Public administration		4	3.69	1.08 11.58	
Professional & related services		7	2.70	2.60 6.16	
Construction		7	2.21	3.17 4.91	
Other manufacturing		4	9.28	0.43 30.85	
Metal Industries		3	4.70	0.64 18.84	
Construction		5	3.54	1.41 9.49	
Agriculture, forestry, and fisheries		30	13.85	2.17 22.06	
Finance, insurance, & real estate		8	13.77	0.58 30.65	
Personal Services		17	9.28	1.83 18.55	
MN-larynx	Entertainment & recreation services	6	7.29	0.82 19.00	
	Other manufacturing	15	7.20	2.08 13.09	
	Business & repair services	26	6.92	3.76 10.90	
	Wholesale trade	7	6.31	1.11 14.13	
	Stone,clay,glass,concrete products mfg	4	6.24	0.64 19.55	

Group/cancer site	Industry	Deaths	SRR	95% CI
MN-trachea, bronchus and lung	Retail trade	30	6.23	4.81 9.35
	Construction	106	6.07	17.47 7.63
	Metal Industries	24	5.81	4.13 9.42
	Lumber, wood products, furniture mfg	12	5.20	2.31 10.46
	Food & tobacco mfg	13	4.78	2.72 9.19
	Professional & related services	24	4.66	5.15 7.38
	Chemical & allied product mfg	5	4.58	1.09 12.14
	Textile & apparel mfg	11	4.00	2.75 8.05
	Machinery & transportation equipment mfg	20	3.49	5.73 5.63
	Transportation, communication & utilities	51	2.83	18.05 3.85
	Public administration	12	2.56	4.69 4.77
	Agriculture, forestry, and fisheries	390	5.11	76.28 5.74
	Petroleum & coal products mfg	13	4.62	2.81 9.08
	Personal Services	222	3.76	59.00 4.41
	Stone,clay,glass,concrete products mfg	102	3.74	27.28 4.63
	Printing & publishing	42	3.63	11.57 4.98
	Finance, insurance, & real estate	115	3.59	32.07 4.35
	Leather mfg	9	3.56	2.53 7.97
	Chemical & allied product mfg	117	3.42	34.22 4.17
	Wholesale trade	122	3.22	37.88 3.89
	Professional & related services	585	3.17	184.85 3.47
	Lumber, wood products, furniture mfg	288	3.02	95.31 3.46
	Entertainment & recreation services	66	2.95	22.39 3.84
	Metal Industries	456	2.69	169.44 2.98
	Food & tobacco mfg	228	2.68	85.08 3.10
	Construction	1292	2.58	500.08 2.74
	Business & repair services	316	2.45	128.86 2.76
	Paper & allied products mfg	45	2.41	18.70 3.29
	Retail trade	415	2.39	173.74 2.64
	Machinery & transportation equipment mfg	461	2.38	193.95 2.62
	Other manufacturing	207	2.21	93.61 2.56
	Public administration	413	2.18	189.10 2.43
	Mining	23	2.18	10.55 3.49
Construction	7	5.70	1.23 13.76	
Agriculture, forestry, and fisheries	5	6.68	0.75 19.78	
Transportation, communication & utilities	10	4.70	2.13 10.23	
MN-other parts of the respiratory system				
MN-bone				

Group/cancer site	Industry	Deaths	SRR	95% CI
MN-connective and other soft tissue	Food & tobacco mfg	3	3.58	0.84 13.61
	Construction	8	2.59	3.09 5.53
	Business & repair services	3	2.58	1.16 8.70
	Chemical & allied product mfg	3	4.24	0.71 15.41
	Military	3	3.22	0.93 14.69
	Business & repair services	8	3.05	2.62 6.51
	Construction	21	2.98	7.04 4.78
	Public administration	12	2.98	4.03 5.67
	Machinery & transportation equipment mfg	6	2.45	2.45 6.09
	Lumber, wood products, furniture mfg	5	2.41	2.07 6.56
	Retail trade	13	2.36	5.51 4.40
	Paper & allied products mfg	4	12.87	0.31 43.74
	Metal Industries	12	8.56	1.40 17.85
MN-other malignant neoplasm of the skin	Agriculture, forestry, and fisheries	9	6.74	1.34 14.56
	Other manufacturing	5	6.36	0.79 17.66
	Food & tobacco mfg	7	6.18	1.13 15.59
	Lumber, wood products, furniture mfg	6	5.72	1.05 15.36
	Personal Services	10	5.14	1.94 11.67
	Construction	24	3.43	7.00 5.37
	Machinery & transportation equipment mfg	6	2.64	2.27 6.22
	Transportation, communication & utilities	18	2.30	7.84 3.84
	Professional & related services	8	2.00	3.99 4.25
	Food & tobacco mfg	3	9.08	0.33 40.59
	Machinery & transportation equipment mfg	4	7.64	0.52 24.55
	Construction	6	7.53	0.80 20.41
	MN-prostate	Stone,clay,glass,concrete products mfg	20	14.53	1.38 25.69
Wholesale trade		24	8.01	2.99 12.49
Personal Services		36	7.14	5.05 10.96
Paper & allied products mfg		9	6.15	1.46 12.87
Business & repair services		51	5.51	9.26 7.57
Rubber & misc plastics mfg		6	5.24	1.15 12.72
Printing & publishing		5	5.20	0.96 13.10
Food & tobacco mfg		32	5.09	6.29 7.70
Agriculture, forestry, and fisheries		56	5.08	11.02 6.84
Machinery & transportation equipment mfg		73	4.71	15.50 6.07
Metal Industries		59	4.38	13.48 5.90

Group/cancer site	Industry	Deaths	SRR	95% CI
	Construction	148	4.32	34.24 5.20
	Entertainment & recreation services	6	4.31	1.39 10.51
	Finance, insurance, & real estate	16	4.27	3.74 7.17
	Chemical & allied product mfg	15	3.96	3.79 6.90
	Public administration	65	3.84	16.93 5.07
	Retail trade	53	3.81	13.91 5.09
	Professional & related services	104	3.76	27.65 4.68
	Lumber, wood products, furniture mfg	29	3.69	7.86 5.70
	Textile & apparel mfg	27	3.49	7.74 5.38
	Other manufacturing	22	3.49	6.31 5.50
	Transportation, communication & utilities	120	3.17	37.90 3.88
MN-penis & other male genital organs	Personal Services	4	27.13	0.15 149.18
	Construction	6	3.59	1.67 8.82
MN-bladder	Agriculture, forestry, and fisheries	12	5.25	2.29 10.08
	Paper & allied products mfg	3	4.27	0.70 14.67
	Wholesale trade	7	4.22	1.66 9.23
	Retail trade	16	2.17	7.37 3.62
	Public administration	15	2.02	7.42 3.49
	Personal Services	7	2.02	3.47 4.60
	Printing & publishing	5	5.47	0.91 13.87
MN-kidney & other/unspec urinary organs	Rubber & misc plastics mfg	4	5.09	0.79 15.30
	Finance, insurance, & real estate	11	3.74	2.94 6.96
	Personal Services	16	3.45	4.64 6.23
	Stone,clay,glass,concrete products mfg	4	2.93	1.36 8.65
	Entertainment & recreation services	6	2.74	2.19 6.50
	Agriculture, forestry, and fisheries	16	2.64	6.07 4.71
	Wholesale trade	9	2.62	3.43 5.22
	Textile & apparel mfg	16	2.58	6.19 4.50
	Business & repair services	18	2.51	7.18 4.12
	Other manufacturing	15	2.48	6.05 4.28
	Lumber, wood products, furniture mfg	10	2.46	4.07 4.95
	Construction	62	2.31	26.90 3.02
	Chemical & allied product mfg	5	2.23	2.24 6.29
	Machinery & transportation equipment mfg	28	2.08	13.49 3.14
	Printing & publishing	6	3.21	1.87 7.38
MN-brain	Stone,clay,glass,concrete products mfg	7	2.28	3.08 5.13

Group/cancer site	Industry	Deaths	SRR	95% CI
MN-thyroid gland	Military	3	11.15	0.27 72.21
Lymphosarcoma & reticulosarcoma	Lumber, wood products, furniture mfg	3	8.57	0.35 39.58
	Finance, insurance, & real estate	3	6.37	0.47 22.16
	Machinery & transportation equipment mfg	7	3.00	2.33 7.19
	Retail trade	7	2.51	2.79 5.70
Hodgkin's disease	Chemical & allied product mfg	3	8.38	0.36 33.46
	Food & tobacco mfg	5	4.05	1.24 11.66
	Machinery & transportation equipment mfg	6	2.90	2.07 7.35
	Metal Industries	5	2.76	1.81 8.21
	Finance, insurance, & real estate	3	2.76	1.09 9.13
	Textile & apparel mfg	5	2.61	1.91 7.52
	Personal Services	3	2.40	1.25 8.50
	Construction	14	2.26	6.19 3.59
Other lymphatic neoplasms	Entertainment & recreation services	7	3.57	1.96 8.26
	Paper & allied products mfg	5	3.12	1.60 8.08
	Lumber, wood products, furniture mfg	12	2.46	4.88 4.67
	Printing & publishing	3	2.46	1.22 7.90
	Metal Industries	24	2.31	10.38 3.75
	Other manufacturing	17	2.29	7.43 3.80
	Stone,clay,glass,concrete products mfg	5	2.00	2.50 5.21
Multiple myeloma	Mining	4	10.50	0.38 30.02
	Printing & publishing	4	8.97	0.45 26.20
	Rubber & misc plastics mfg	4	8.74	0.46 26.81
	Stone,clay,glass,concrete products mfg	8	8.33	0.96 19.10
	Chemical & allied product mfg	9	6.25	1.44 13.25
	Retail trade	33	6.13	5.38 9.00
	Finance, insurance, & real estate	6	5.59	1.07 13.28
	Food & tobacco mfg	16	5.02	3.19 9.05
	Textile & apparel mfg	16	4.97	3.22 9.08
	Personal Services	10	4.63	2.16 9.96
	Wholesale trade	7	4.62	1.52 10.17
	Machinery & transportation equipment mfg	25	4.19	5.97 6.44
	Other manufacturing	12	3.88	3.10 7.23
	Business & repair services	13	3.85	3.38 7.03
	Military	12	3.81	3.15 7.87
	Construction	51	3.79	13.47 5.16

Group/cancer site	Industry	Deaths	SRR	95% CI
Acute lymphocytic leukemia Chronic lymphocytic leukemia	Entertainment & recreation services	3	3.72	0.81 12.96
	Agriculture, forestry, and fisheries	15	3.55	4.23 6.32
	Lumber, wood products, furniture mfg	9	3.37	2.67 7.31
	Metal Industries	19	3.36	5.65 5.63
	Professional & related services	38	3.35	11.36 4.77
	Public administration	26	3.09	8.42 4.74
	Transportation, communication & utilities	47	2.82	16.64 3.90
	Business & repair services	4	3.58	1.12 10.40
	Agriculture, forestry, and fisheries	7	4.45	1.57 10.47
	Metal Industries	7	3.89	1.80 9.17
	Retail trade	7	3.52	1.99 7.79
	Lumber, wood products, furniture mfg	3	3.22	0.93 12.06
	Military	3	3.01	1.00 12.65
	Food & tobacco mfg	4	2.72	1.47 8.34
	Construction	10	2.07	4.84 4.01
	Paper & allied products mfg	3	9.70	0.31 44.17
	Personal Services	7	5.67	1.23 14.01
	Stone,clay,glass,concrete products mfg	3	5.66	0.53 22.37
	Chronic myeloid leukemia	Agriculture, forestry, and fisheries	5	3.58	1.40 9.77
Textile & apparel mfg		10	3.26	3.06 6.90
Wholesale trade		4	9.08	0.44 27.22
Metal Industries		4	4.82	0.83 17.37
Personal Services		5	4.77	1.05 15.40
Lumber, wood products, furniture mfg		4	4.43	0.90 14.05
Construction		15	3.47	4.32 6.12
Transportation, communication & utilities		16	3.36	4.76 5.91
Professional & related services		12	2.89	4.15 5.44
Public administration		7	2.51	2.79 5.74
Retail trade		7	2.06	3.41 4.78
Other leukemia	Chemical & allied product mfg	4	13.23	0.30 43.84
	Stone,clay,glass,concrete products mfg	5	7.81	0.64 25.14
	Textile & apparel mfg	9	4.37	2.06 9.94
	Wholesale trade	4	3.72	1.08 10.49
	Metal Industries	6	2.91	2.06 7.91
	Machinery & transportation equipment mfg	11	2.50	4.40 4.69
	Professional & related services	11	2.00	5.49 3.82

Group/cancer site	Industry	Deaths	SRR	95% CI
All Leukemias	Paper & allied products mfg	7	10.76	0.65 28.76
	Stone,clay,glass,concrete products mfg	10	5.67	1.76 11.90
	Entertainment & recreation services	7	4.94	1.42 11.83
	Printing & publishing	5	4.49	1.11 11.63
	Personal Services	15	4.24	3.54 7.85
	Rubber & misc plastics mfg	7	4.14	1.69 9.43
	Chemical & allied product mfg	8	3.59	2.23 8.11
	Wholesale trade	12	3.47	3.46 6.35
	Mining	3	3.03	0.99 9.69
	Textile & apparel mfg	24	2.68	8.95 4.28
	Agriculture, forestry, and fisheries	17	2.50	6.80 4.44
	Metal Industries	22	2.37	9.30 3.99
	Lumber, wood products, furniture mfg	13	2.16	6.02 4.00
	Other manufacturing	3	5.31	0.57 19.68
	Personal Services	4	4.77	0.84 16.89
	Agriculture, forestry, and fisheries	85	7.25	11.73 9.38
	Personal Services	61	5.53	11.04 7.61
	Stone,clay,glass,concrete products mfg	24	4.99	4.81 7.95
	Business & repair services	87	4.08	21.33 5.16
	Printing & publishing	6	3.85	1.56 8.93
Entertainment & recreation services	17	3.51	4.84 5.93	
All other specified malignant neoplasms	Construction	290	3.45	84.02 3.93
	Retail trade	104	3.36	31.00 4.13
	Mining	6	3.34	1.79 7.59
	Finance, insurance, & real estate	21	3.31	6.35 5.19
	Metal Industries	85	3.22	26.43 4.13
	Wholesale trade	22	3.22	6.84 5.00
	Lumber, wood products, furniture mfg	47	3.15	14.93 4.40
	Petroleum & coal products mfg	3	3.14	0.96 10.38
	Paper & allied products mfg	10	2.87	3.48 5.64
	Professional & related services	121	2.87	42.15 3.50
MN-ill-defined & unspecified	Food & tobacco mfg	39	2.83	13.80 4.04
	Rubber & misc plastics mfg	7	2.78	2.52 6.87
	Public administration	89	2.60	34.20 3.28
	Other manufacturing	42	2.56	16.40 3.55
	Machinery & transportation equipment mfg	78	2.54	30.75 3.21

Group/cancer site	Industry	Deaths	SRR	95% CI
	Chemical & allied product mfg	12	2.02	5.95 3.68

Table 2.3 continued.

Group/cancer site	Industry	Deaths	SRR	95% CI
Asian Men				
MN-oral cavity, & pharynx	Retail trade	7	4.72	1.48 10.07
	Professional & related services	4	2.33	1.72 6.76
MN-esophagus	Machinery & transportation equipment mfg	3	5.11	0.59 16.35
MN-stomach	Wholesale trade	3	26.97	0.11 91.96
	Business & repair services	4	17.03	0.23 46.00
	Other manufacturing	3	16.92	0.18 57.66
	Public administration	3	10.44	0.29 33.03
	Transportation, communication & utilities	3	7.10	0.42 22.40
	Personal Services	3	5.78	0.52 18.67
	Retail trade	8	4.82	1.66 9.81
	Professional & related services	6	2.07	2.89 4.66
MN-colon	Finance, insurance, & real estate	5	14.79	0.34 38.55
	Agriculture, forestry, and fisheries	4	11.59	0.35 41.16
	Public administration	4	4.70	0.85 12.58
MN-rectum	Retail trade	3	2.41	1.25 7.54
MN-liver and intrahepatic bile ducts	Lumber, wood products, furniture mfg	3	197.49	0.02 664.65
	Textile & apparel mfg	5	128.08	0.04 337.93
	Business & repair services	5	90.80	0.06 231.77
	Wholesale trade	5	72.15	0.07 186.64
	Other manufacturing	7	65.42	0.11 152.66
	Personal Services	10	29.39	0.34 59.87
	Retail trade	24	23.86	1.01 36.77
	Construction	4	23.60	0.17 66.44
	Transportation, communication & utilities	5	21.37	0.23 52.46
	Public administration	3	18.79	0.16 59.35
	Professional & related services	15	14.18	1.06 35.17
	Military	3	13.91	0.22 49.97
	Machinery & transportation equipment mfg	4	13.31	0.30 38.17
MN-pancreas	Machinery & transportation equipment mfg	3	2.97	1.01 9.79
MN-trachea, bronchus and lung	Agriculture, forestry, and fisheries	8	6.32	1.27 14.96
	Entertainment & recreation services	4	5.01	0.80 13.64
	Wholesale trade	4	2.62	1.53 7.34
	Finance, insurance, & real estate	3	2.51	1.20 8.45

Group/cancer site	Industry	Deaths	SRR	95% CI
MN-kidney & other/unspec urinary organs	Chemical & allied product mfg	4	2.48	1.61 6.99
Other lymphatic neoplasms	Personal Services	3	6.69	0.45 21.69
Acute lymphocytic leukemia	Business & repair services	3	13.23	0.23 46.60
Acute myeloid leukemia	Retail trade	6	2.22	2.71 5.00
Other leukemia	Retail trade	4	20.07	0.20 56.39
All Leukemias	Professional & related services	7	5.68	1.23 13.36
	Professional & related services	3	3.15	0.95 10.00
	Public administration	3	13.41	0.22 45.89
	Retail trade	7	3.86	1.81 8.19
	Professional & related services	12	3.31	3.62 6.30
MN-ill-defined & unspecified	Food & tobacco mfg	3	17.84	0.17 67.10
	Personal Services	5	4.70	1.06 11.56
	Retail trade	9	2.02	4.46 3.92

Table 2.3 continued.

Group/cancer site	Industry	Deaths	SRR	95% CI	
Latino Men MN-oral cavity, & pharynx	Other manufacturing	5	4.12	1.21 10.22	
	Metal Industries	5	3.17	1.58 8.05	
	Agriculture, forestry, and fisheries	7	3.07	2.28 6.61	
	Food & tobacco mfg	4	2.12	1.89 5.82	
	Construction	19	2.02	9.39 3.20	
	Personal Services	3	2.32	1.29 7.65	
	Stone,clay,glass,concrete products mfg	3	30.36	0.10 110.74	
	Lumber, wood products, furniture mfg	6	23.02	0.26 53.95	
	Chemical & allied product mfg	3	9.38	0.32 32.06	
	Other manufacturing	9	6.46	1.39 12.82	
	Wholesale trade	4	5.54	0.72 15.64	
	Finance, insurance, & real estate	3	5.49	0.55 18.35	
	Machinery & transportation equipment mfg	12	5.27	2.28 9.44	
	Metal Industries	11	4.99	2.21 9.55	
	Business & repair services	11	4.57	2.41 8.58	
	Entertainment & recreation services	3	4.33	0.69 14.30	
	Food & tobacco mfg	4	4.10	0.98 12.39	
MN-esophagus MN-stomach	Transportation, communication & utilities	18	3.20	5.63 5.17	
	Public administration	11	3.11	3.54 5.73	
	Agriculture, forestry, and fisheries	7	3.07	2.28 6.68	
	Professional & related services	15	2.92	5.14 4.93	
	Construction	21	2.73	7.68 4.25	
	Retail trade	11	2.47	4.45 4.60	
	Stone,clay,glass,concrete products mfg	3	8.44	0.36 29.85	
	Finance, insurance, & real estate	9	5.28	1.70 10.44	
	Mining	6	3.57	1.68 8.24	
	Textile & apparel mfg	3	2.62	1.15 8.20	
	Personal Services	6	2.53	2.38 6.02	
	Entertainment & recreation services	3	2.21	1.36 7.58	
	Business & repair services	11	2.21	4.98 4.11	
	Machinery & transportation equipment mfg	13	2.18	5.98 3.77	
	Machinery & transportation equipment mfg	3	2.86	1.05 9.08	
	MN-colon MN-rectum	Other manufacturing	5	4.12	1.21 10.22
		Metal Industries	5	3.17	1.58 8.05
Agriculture, forestry, and fisheries		7	3.07	2.28 6.61	
Food & tobacco mfg		4	2.12	1.89 5.82	
Construction		19	2.02	9.39 3.20	
Personal Services		3	2.32	1.29 7.65	
Stone,clay,glass,concrete products mfg		3	30.36	0.10 110.74	
Lumber, wood products, furniture mfg		6	23.02	0.26 53.95	
Chemical & allied product mfg		3	9.38	0.32 32.06	
Other manufacturing		9	6.46	1.39 12.82	
Wholesale trade		4	5.54	0.72 15.64	
Finance, insurance, & real estate		3	5.49	0.55 18.35	
Machinery & transportation equipment mfg		12	5.27	2.28 9.44	
Metal Industries		11	4.99	2.21 9.55	
Business & repair services		11	4.57	2.41 8.58	
Entertainment & recreation services		3	4.33	0.69 14.30	
Food & tobacco mfg		4	4.10	0.98 12.39	
Transportation, communication & utilities	18	3.20	5.63 5.17		
Public administration	11	3.11	3.54 5.73		
Agriculture, forestry, and fisheries	7	3.07	2.28 6.68		
Professional & related services	15	2.92	5.14 4.93		
Construction	21	2.73	7.68 4.25		
Retail trade	11	2.47	4.45 4.60		
Stone,clay,glass,concrete products mfg	3	8.44	0.36 29.85		
Finance, insurance, & real estate	9	5.28	1.70 10.44		
Mining	6	3.57	1.68 8.24		
Textile & apparel mfg	3	2.62	1.15 8.20		
Personal Services	6	2.53	2.38 6.02		
Entertainment & recreation services	3	2.21	1.36 7.58		
Business & repair services	11	2.21	4.98 4.11		
Machinery & transportation equipment mfg	13	2.18	5.98 3.77		
Machinery & transportation equipment mfg	3	2.86	1.05 9.08		

Group/cancer site	Industry	Deaths	SRR	95% CI	
MN-liver and intrahepatic bile ducts	Public administration	6	2.74	2.19 6.22	
	Professional & related services	7	2.68	2.61 5.74	
	Business & repair services	11	10.32	1.07 19.87	
	Finance, insurance, & real estate	3	8.81	0.34 29.03	
	Entertainment & recreation services	3	8.43	0.36 31.24	
	Public administration	15	8.33	1.80 14.36	
	Machinery & transportation equipment mfg	6	5.82	1.03 13.28	
	Agriculture, forestry, and fisheries	6	4.84	1.24 11.43	
	Professional & related services	12	4.14	2.90 7.46	
	Other manufacturing	3	3.69	0.81 11.88	
MN-gall bladder and extrahepatic bile ducts	Transportation, communication & utilities	8	2.89	2.77 5.87	
	Retail trade	6	2.48	2.42 5.60	
	Construction	11	2.17	5.07 3.96	
	Transportation, communication & utilities	3	3.89	0.77 12.64	
	Wholesale trade	6	5.40	1.11 12.51	
	Entertainment & recreation services	3	5.24	0.57 17.00	
	Other manufacturing	5	2.51	1.99 6.13	
	Public administration	15	2.45	6.13 4.12	
	Retail trade	15	2.14	7.01 3.58	
	Business & repair services	7	2.03	3.46 4.47	
MN-larynx	Personal Services	3	6.54	0.46 24.86	
	Public administration	5	4.76	1.05 11.87	
	Metal Industries	3	4.26	0.70 14.76	
	Agriculture, forestry, and fisheries	3	2.84	1.06 9.07	
	Professional & related services	3	2.20	1.37 7.02	
	Rubber & misc plastics mfg	5	3.45	1.45 8.52	
	Printing & publishing	7	3.19	2.19 6.73	
	Food & tobacco mfg	4	14.74	0.27 49.25	
	Public administration	3	4.27	0.70 13.74	
	Agriculture, forestry, and fisheries	3	2.46	1.22 8.00	
Malignant melanoma of the skin	Business & repair services	6	2.83	2.12 6.50	
	Professional & related services	4	9.17	0.44 28.05	
	Agriculture, forestry, and fisheries	4	6.06	0.66 17.21	
	Transportation, communication & utilities	3	2.29	1.31 7.34	
	Entertainment & recreation services	3	4.30	0.70 14.21	
	Mining	3	2.47	1.22 7.83	
	Other malignant neoplasm of the skin	Public administration	6	2.74	2.19 6.22
		Professional & related services	7	2.68	2.61 5.74
		Business & repair services	11	10.32	1.07 19.87
		Finance, insurance, & real estate	3	8.81	0.34 29.03
Entertainment & recreation services		3	8.43	0.36 31.24	
Public administration		15	8.33	1.80 14.36	
Machinery & transportation equipment mfg		6	5.82	1.03 13.28	
Agriculture, forestry, and fisheries		6	4.84	1.24 11.43	
Professional & related services		12	4.14	2.90 7.46	
Other manufacturing		3	3.69	0.81 11.88	
MN-trachea, bronchus and lung	Transportation, communication & utilities	8	2.89	2.77 5.87	
	Retail trade	6	2.48	2.42 5.60	
	Construction	11	2.17	5.07 3.96	
	Transportation, communication & utilities	3	3.89	0.77 12.64	
	Wholesale trade	6	5.40	1.11 12.51	
	Entertainment & recreation services	3	5.24	0.57 17.00	
	Other manufacturing	5	2.51	1.99 6.13	
	Public administration	15	2.45	6.13 4.12	
	Retail trade	15	2.14	7.01 3.58	
	Business & repair services	7	2.03	3.46 4.47	
MN-connective and other soft tissue	Personal Services	3	6.54	0.46 24.86	
	Public administration	5	4.76	1.05 11.87	
	Metal Industries	3	4.26	0.70 14.76	
	Agriculture, forestry, and fisheries	3	2.84	1.06 9.07	
	Professional & related services	3	2.20	1.37 7.02	
	Rubber & misc plastics mfg	5	3.45	1.45 8.52	
	Printing & publishing	7	3.19	2.19 6.73	
	Food & tobacco mfg	4	14.74	0.27 49.25	
	Public administration	3	4.27	0.70 13.74	
	Agriculture, forestry, and fisheries	3	2.46	1.22 8.00	
MN-prostate	Business & repair services	6	2.83	2.12 6.50	
	Professional & related services	4	9.17	0.44 28.05	
	Agriculture, forestry, and fisheries	4	6.06	0.66 17.21	
	Transportation, communication & utilities	3	2.29	1.31 7.34	
	Entertainment & recreation services	3	4.30	0.70 14.21	
	Mining	3	2.47	1.22 7.83	

Group/cancer site	Industry	Deaths	SRR	95% CI
MN-testis	Public administration	8	2.10	3.80 4.26
	Metal industries	3	57.56	0.05 232.54
MN-bladder	Construction	3	2.50	1.20 8.00
	Metal industries	3	3.20	0.94 10.25
MN-kidney & other/unspec urinary organs	Retail trade	13	2.76	4.72 4.80
	Metal industries	7	2.60	2.69 5.57
	Public administration	9	2.55	3.52 4.99
	Transportation, communication & utilities	14	2.33	6.02 4.02
	Construction	16	2.11	7.60 3.47
	Machinery & transportation equipment mfg	5	2.02	2.48 4.95
	Printing & publishing	3	8.65	0.35 27.44
	Wholesale trade	4	5.52	0.72 16.18
	Entertainment & recreation services	4	5.25	0.76 15.25
	Public administration	12	2.37	5.07 4.26
Lymphosarcoma & reticulosarcoma	Mining	3	2.02	1.49 6.39
	Machinery & transportation equipment mfg	5	2.00	2.49 5.31
	Agriculture, forestry, and fisheries	3	5.41	0.55 18.37
	Public administration	3	4.07	0.74 13.25
	Construction	3	2.24	1.34 7.15
	Business & repair services	4	5.76	0.69 16.37
	Public administration	3	2.97	1.01 9.88
	Professional & related services	5	2.87	1.74 7.13
	Finance, insurance, & real estate	7	12.92	0.54 28.82
	Mining	5	6.68	0.75 17.11
Hodgkin's disease	Metal industries	7	4.13	1.70 9.59
	Other manufacturing	6	3.23	1.86 7.35
	Professional & related services	15	2.57	5.84 4.70
	Transportation, communication & utilities	17	2.39	7.10 3.93
	Personal Services	4	2.19	1.83 6.08
	Retail trade	17	2.16	7.86 3.62
	Agriculture, forestry, and fisheries	8	2.06	3.89 4.24
	Military	3	14.56	0.21 113.09
	Agriculture, forestry, and fisheries	4	12.15	0.33 38.73
	Public administration	3	8.24	0.36 29.33
Other lymphatic neoplasms	Transportation, communication & utilities	3	3.79	0.79 12.38
	Retail trade	3	3.51	0.86 12.76
Acute lymphocytic leukemia	Public administration	8	2.10	3.80 4.26
	Metal industries	3	57.56	0.05 232.54
	Construction	3	2.50	1.20 8.00
	Metal industries	3	3.20	0.94 10.25
	Retail trade	13	2.76	4.72 4.80
	Metal industries	7	2.60	2.69 5.57
	Public administration	9	2.55	3.52 4.99
	Transportation, communication & utilities	14	2.33	6.02 4.02
	Construction	16	2.11	7.60 3.47
	Machinery & transportation equipment mfg	5	2.02	2.48 4.95
Printing & publishing	3	8.65	0.35 27.44	
Wholesale trade	4	5.52	0.72 16.18	
Entertainment & recreation services	4	5.25	0.76 15.25	
Public administration	12	2.37	5.07 4.26	
Mining	3	2.02	1.49 6.39	
Machinery & transportation equipment mfg	5	2.00	2.49 5.31	
Agriculture, forestry, and fisheries	3	5.41	0.55 18.37	
Public administration	3	4.07	0.74 13.25	
Construction	3	2.24	1.34 7.15	
Business & repair services	4	5.76	0.69 16.37	
Public administration	3	2.97	1.01 9.88	
Professional & related services	5	2.87	1.74 7.13	
Finance, insurance, & real estate	7	12.92	0.54 28.82	
Mining	5	6.68	0.75 17.11	
Metal industries	7	4.13	1.70 9.59	
Other manufacturing	6	3.23	1.86 7.35	
Professional & related services	15	2.57	5.84 4.70	
Transportation, communication & utilities	17	2.39	7.10 3.93	
Personal Services	4	2.19	1.83 6.08	
Retail trade	17	2.16	7.86 3.62	
Agriculture, forestry, and fisheries	8	2.06	3.89 4.24	
Military	3	14.56	0.21 113.09	
Agriculture, forestry, and fisheries	4	12.15	0.33 38.73	
Public administration	3	8.24	0.36 29.33	
Transportation, communication & utilities	3	3.79	0.79 12.38	
Retail trade	3	3.51	0.86 12.76	

Group/cancer site	Industry	Deaths	SRR	95% CI
Acute myeloid leukemia	Construction	3	2.61	1.15 8.41
	Agriculture, forestry, and fisheries	4	3.23	1.24 9.01
Chronic myeloid leukemia	Public administration	4	7.16	0.56 20.95
	Machinery & transportation equipment mfg	3	5.25	0.57 16.63
Other leukemia	Construction	5	3.30	1.51 8.20
	Business & repair services	4	4.06	0.98 11.28
All Leukemias	Transportation, communication & utilities	6	2.76	2.17 6.33
	Chemical & allied product mfg	5	20.05	0.25 52.48
	Mining	6	5.93	1.01 13.96
	Wholesale trade	4	3.76	1.06 10.51
All other specified malignant neoplasms	Metal industries	4	3.15	1.27 9.86
	Agriculture, forestry, and fisheries	10	2.67	3.75 5.13
	Public administration	10	2.43	4.11 4.66
	Food & tobacco mfg	5	2.40	2.09 6.87
	Business & repair services	7	2.22	3.16 4.76
	Construction	4	4.75	0.84 13.29
	Rubber & misc plastics mfg	3	11.53	0.26 37.80
	Lumber, wood products, furniture mfg	3	4.53	0.66 14.53
	Personal Services	7	3.25	2.16 7.64
	Machinery & transportation equipment mfg	11	2.86	3.85 5.41
MN-ill-defined & unspecified	Wholesale trade	6	2.69	2.23 6.05
	Agriculture, forestry, and fisheries	13	2.57	5.06 4.54
	Retail trade	26	2.37	10.96 3.54

Table 2.3 continued.

Group/cancer site	Industry	Deaths	SRR	95% CI
Native American Men				
MN-oral cavity, & pharynx	Construction	7	5.00	1.40 10.68
MN-esophagus	Professional & related services	4	18.44	0.22 49.48
MN-stomach	Agriculture, forestry, and fisheries	4	34.64	0.12 96.10
	Construction	5	5.11	0.98 12.47
MN-colon	Food & tobacco mfg	3	82.92	0.04 285.35
	Agriculture, forestry, and fisheries	6	13.22	0.45 32.07
	Professional & related services	3	5.23	0.57 16.26
	Transportation, communication & utilities	4	3.85	1.04 10.54
MN-rectum	Agriculture, forestry, and fisheries	3	22.10	0.14 74.74
	Construction	5	8.30	0.60 20.29
MN-liver and intrahepatic bile ducts	Construction	7	8.76	0.80 18.59
MN-pancreas	Agriculture, forestry, and fisheries	3	10.91	0.27 35.58
	Transportation, communication & utilities	3	2.92	1.03 9.09
MN-trachea, bronchus and lung	Wholesale trade	5	24.82	0.20 59.73
	Lumber, wood products, furniture mfg	11	18.90	0.58 35.85
	Food & tobacco mfg	3	12.70	0.24 45.67
	Metal Industries	8	12.10	0.66 24.20
	Mining	5	9.70	0.52 24.91
	Other manufacturing	7	7.90	0.89 16.80
	Agriculture, forestry, and fisheries	18	7.30	2.46 12.12
	Business & repair services	8	5.09	1.57 10.72
	Textile & apparel mfg	3	4.51	0.67 16.21
	Machinery & transportation equipment mfg	8	4.39	1.82 8.79
	Professional & related services	7	3.44	2.04 7.24
	Retail trade	7	3.09	2.26 6.49
MN-prostate	Lumber, wood products, furniture mfg	3	94.58	0.03 300.00
MN-kidney & other/unspec urinary organs	Agriculture, forestry, and fisheries	5	24.02	0.21 67.28
	Construction	3	2.52	1.19 7.86
MN-brain	Public administration	4	7.79	0.51 21.69
	Construction	3	2.27	1.32 7.04
Other lymphatic neoplasms	Retail trade	3	11.88	0.25 37.13
	Construction	3	2.40	1.25 7.62

Group/cancer site	Industry	Deaths	SRR	95% CI
Multiple myeloma	Professional & related services	3	22.78	0.13 71.68
Chronic myeloid leukemia	Construction	3	16.36	0.18 52.58
All Leukemias	Construction	5	4.21	1.19 10.27
MN-ill-defined & unspecified	Machinery & transportation equipment mfg	4	15.78	0.25 43.61
	Agriculture, forestry, and fisheries	4	10.38	0.39 29.31
	Professional & related services	3	6.28	0.48 19.64

Table 2.3 continued.

Group/cancer site	Industry	Deaths	SRR	95% CI	
African-American Women MN-oral cavity, & pharynx	Agriculture, forestry, and fisheries	8	46.20	0.17 158.56	
	Stone,clay,glass,concrete products mfg	3	40.53	0.07 248.33	
	Personal Services	54	5.07	10.66 7.66	
	Business & repair services	9	4.75	1.90 10.36	
	Finance, insurance, & real estate	5	4.60	1.09 12.22	
	Transportation, communication & utilities	7	4.28	1.64 10.03	
	Food & tobacco mfg	4	3.80	1.05 13.01	
	Retail trade	13	2.69	4.83 4.76	
	Professional & related services	47	2.34	20.11 3.24	
	Agriculture, forestry, and fisheries	7	107.70	0.06 530.83	
	Food & tobacco mfg	9	20.63	0.44 76.27	
	Business & repair services	11	19.66	0.56 53.97	
	Personal Services	78	9.80	7.96 15.28	
	Retail trade	24	9.16	2.62 14.57	
	Textile & apparel mfg	17	7.97	2.13 15.80	
	Other manufacturing	6	4.64	1.29 12.08	
	Public administration	9	4.62	1.95 10.09	
MN-esophagus	Transportation, communication & utilities	4	3.74	1.07 11.96	
	Professional & related services	55	3.56	15.45 4.90	
	Machinery & transportation equipment mfg	5	3.03	1.65 8.11	
	Entertainment & recreation services	4	26.09	0.15 90.74	
	Wholesale trade	4	18.67	0.21 59.93	
	Agriculture, forestry, and fisheries	3	12.11	0.25 48.40	
	Other manufacturing	8	6.09	1.31 14.48	
	Retail trade	26	3.86	6.73 5.91	
	Transportation, communication & utilities	7	3.34	2.10 7.71	
	Textile & apparel mfg	20	3.31	6.05 5.64	
	Business & repair services	8	3.09	2.59 6.80	
	Professional & related services	103	3.03	33.99 3.81	
	Food & tobacco mfg	4	2.67	1.50 8.54	
	Personal Services	45	2.44	18.47 3.69	
	Public administration	13	2.40	5.42 4.45	
	MN-stomach	Agriculture, forestry, and fisheries	8	46.20	0.17 158.56
		Stone,clay,glass,concrete products mfg	3	40.53	0.07 248.33
Personal Services		54	5.07	10.66 7.66	
Business & repair services		9	4.75	1.90 10.36	
Finance, insurance, & real estate		5	4.60	1.09 12.22	
Transportation, communication & utilities		7	4.28	1.64 10.03	
Food & tobacco mfg		4	3.80	1.05 13.01	
Retail trade		13	2.69	4.83 4.76	
Professional & related services		47	2.34	20.11 3.24	
Agriculture, forestry, and fisheries		7	107.70	0.06 530.83	
Food & tobacco mfg		9	20.63	0.44 76.27	
Business & repair services		11	19.66	0.56 53.97	
Personal Services		78	9.80	7.96 15.28	
Retail trade		24	9.16	2.62 14.57	
Textile & apparel mfg		17	7.97	2.13 15.80	
Other manufacturing		6	4.64	1.29 12.08	
Public administration		9	4.62	1.95 10.09	
Transportation, communication & utilities	4	3.74	1.07 11.96		
Professional & related services	55	3.56	15.45 4.90		
Machinery & transportation equipment mfg	5	3.03	1.65 8.11		
Entertainment & recreation services	4	26.09	0.15 90.74		
Wholesale trade	4	18.67	0.21 59.93		
Agriculture, forestry, and fisheries	3	12.11	0.25 48.40		
Other manufacturing	8	6.09	1.31 14.48		
Retail trade	26	3.86	6.73 5.91		
Transportation, communication & utilities	7	3.34	2.10 7.71		
Textile & apparel mfg	20	3.31	6.05 5.64		
Business & repair services	8	3.09	2.59 6.80		
Professional & related services	103	3.03	33.99 3.81		
Food & tobacco mfg	4	2.67	1.50 8.54		
Personal Services	45	2.44	18.47 3.69		
Public administration	13	2.40	5.42 4.45		

Group/cancer site	Industry	Deaths	SRR	95% CI	
MN-small intestine	Machinery & transportation equipment mfg	8	2.05	3.89 4.36	
	Retail trade	3	4.49	0.67 15.37	
MN-colon	Professional & related services	10	2.30	4.36 4.65	
	Agriculture, forestry, and fisheries	10	6.74	1.48 14.16	
	Rubber & misc plastics mfg	6	5.11	1.17 12.54	
	Printing & publishing	4	4.86	0.82 13.46	
	Construction	4	4.82	0.83 13.41	
	Stone,clay,glass,concrete products mfg	4	3.76	1.06 11.10	
	Lumber, wood products, furniture mfg	6	3.17	1.89 7.57	
	Finance, insurance, & real estate	25	2.88	8.69 4.42	
	Other manufacturing	25	2.67	9.38 4.16	
	Entertainment & recreation services	3	2.60	1.15 8.37	
	Metal Industries	7	2.58	2.71 5.69	
	Retail trade	83	2.57	32.32 3.23	
MN-rectum	Food & tobacco mfg	24	2.54	9.44 4.12	
	Wholesale trade	4	2.51	1.59 7.09	
	Personal Services	165	2.46	66.97 3.05	
	Transportation, communication & utilities	29	2.14	13.54 3.26	
	Machinery & transportation equipment mfg	33	2.02	16.36 2.92	
	Agriculture, forestry, and fisheries	3	20.68	0.15 106.41	
	Chemical & allied product mfg	3	15.33	0.20 94.73	
	Food & tobacco mfg	3	2.95	1.02 11.43	
	Professional & related services	62	2.53	24.52 3.37	
	Machinery & transportation equipment mfg	4	2.07	1.93 6.28	
	Personal Services	32	2.87	11.14 4.75	
	Finance, insurance, & real estate	4	2.51	1.59 8.05	
MN-gall bladder and extrahepatic bile ducts	Other manufacturing	4	2.50	1.60 7.95	
	Professional & related services	47	2.23	21.11 3.08	
	Retail trade	9	2.01	4.47 4.03	
	Machinery & transportation equipment mfg	4	2.01	1.99 5.87	
	Finance, insurance, & real estate	4	5.95	0.67 18.23	
	Retail trade	8	3.85	2.08 8.12	
	Personal Services	17	2.99	5.69 6.05	
	Construction	3	9.61	0.31 32.20	
	Agriculture, forestry, and fisheries	4	8.89	0.45 29.61	
	Rubber & misc plastics mfg	4	4.86	0.82 15.07	
	MN-pancreas	Professional & related services	47	2.23	21.11 3.08
		Retail trade	9	2.01	4.47 4.03
Machinery & transportation equipment mfg		4	2.01	1.99 5.87	
Finance, insurance, & real estate		4	5.95	0.67 18.23	
Retail trade		8	3.85	2.08 8.12	
Personal Services		17	2.99	5.69 6.05	
Construction		3	9.61	0.31 32.20	
Agriculture, forestry, and fisheries		4	8.89	0.45 29.61	
Rubber & misc plastics mfg		4	4.86	0.82 15.07	
Professional & related services		47	2.23	21.11 3.08	
Retail trade		9	2.01	4.47 4.03	
Machinery & transportation equipment mfg		4	2.01	1.99 5.87	
Finance, insurance, & real estate	4	5.95	0.67 18.23		
Retail trade	8	3.85	2.08 8.12		
Personal Services	17	2.99	5.69 6.05		
Construction	3	9.61	0.31 32.20		
Agriculture, forestry, and fisheries	4	8.89	0.45 29.61		
Rubber & misc plastics mfg	4	4.86	0.82 15.07		

Group/cancer site	Industry	Deaths	SRR	95% CI
MN-larynx	Lumber, wood products, furniture mfg	3	4.35	0.69 15.07
	Metal Industries	4	3.49	1.15 9.90
	Public administration	36	3.44	10.48 5.00
	Retail trade	53	3.10	17.10 4.13
	Transportation, communication & utilities	16	2.69	5.94 4.67
	Professional & related services	212	2.39	88.76 2.79
	Other manufacturing	10	2.18	4.60 4.26
	Personal Services	87	2.17	40.15 2.88
	Finance, insurance, & real estate	9	2.16	4.17 4.41
	Business & repair services	11	2.15	5.12 4.12
	Retail trade	8	5.91	1.35 12.73
	Business & repair services	5	5.52	0.91 16.34
	Public administration	4	4.89	0.82 16.08
	Personal Services	23	4.61	4.99 8.77
	Professional & related services	11	2.37	4.64 4.66
	Petroleum & coal products mfg	3	10.18	0.29 36.50
	Printing & publishing	18	7.42	2.43 12.06
	Agriculture, forestry, and fisheries	17	4.34	3.92 7.43
	Entertainment & recreation services	15	3.83	3.92 6.50
	Construction	9	3.62	2.49 7.09
	Paper & allied products mfg	7	3.13	2.24 7.09
	Leather mfg	3	2.34	1.28 7.42
	Wholesale trade	10	2.22	4.51 4.23
	Finance, insurance, & real estate	50	2.15	23.27 2.89
	Transportation, communication & utilities	76	2.15	35.41 2.76
	Metal Industries	16	2.09	7.65 3.69
	Stone,clay,glass,concrete products mfg	11	2.03	5.41 3.81
Personal Services	3	15.31	0.20 169.04	
Finance, insurance, & real estate	3	12.58	0.24 58.68	
Retail trade	4	7.73	0.52 25.27	
Retail trade	4	3.73	1.07 12.15	
Textile & apparel mfg	5	3.39	1.47 10.68	
Machinery & transportation equipment mfg	8	6.85	1.17 16.48	
Retail trade	19	5.25	3.62 8.74	
Business & repair services	6	4.83	1.24 12.60	
Food & tobacco mfg	8	3.11	2.58 7.96	
MN-other parts of the respiratory system				
MN-bone				
MN-connective and other soft tissue				

Group/cancer site	Industry	Deaths	SRR	95% CI
MN-other malignant neoplasm of the skin MN-female breast	Finance, insurance, & real estate	6	2.57	2.33 6.59
	Transportation, communication & utilities	6	2.38	2.52 6.14
	Public administration	9	2.17	4.15 4.68
	Personal Services	8	4.82	1.66 14.74
	Military	6	6.08	0.99 29.49
	Construction	12	5.93	2.02 11.28
	Agriculture, forestry, and fisheries	26	5.82	4.47 9.18
	Printing & publishing	19	5.78	3.29 9.27
	Wholesale trade	25	5.02	4.98 7.63
	Rubber & misc plastics mfg	17	4.23	4.02 7.17
	Paper & allied products mfg	12	3.55	3.38 6.86
	Lumber, wood products, furniture mfg	17	3.34	5.10 5.67
	Stone, clay, glass, concrete products mfg	11	3.11	3.54 5.99
	Entertainment & recreation services	11	3.06	3.60 5.73
	Metal Industries	27	2.86	9.45 4.28
	Retail trade	268	2.52	106.24 2.87
	Finance, insurance, & real estate	107	2.29	46.83 2.85
	Personal Services	450	2.12	212.10 2.40
	Business & repair services	83	2.08	39.87 2.64
	Machinery & transportation equipment mfg	114	2.07	55.19 2.55
Public administration	204	2.06	98.84 2.41	
Transportation, communication & utilities	132	2.06	64.22 2.52	
Other manufacturing	76	2.05	37.02 2.65	
Textile & apparel mfg	214	2.02	105.80 2.37	
MN-cervix uteri	Agriculture, forestry, and fisheries	19	23.78	0.80 46.72
	Wholesale trade	4	7.30	0.55 21.68
	Printing & publishing	5	6.97	0.72 17.99
	Business & repair services	28	4.78	5.85 7.47
	Personal Services	148	4.65	31.80 5.94
	Paper & allied products mfg	3	4.65	0.65 19.40
	Rubber & misc plastics mfg	4	4.62	0.87 13.99
	Metal Industries	7	4.14	1.69 9.63
	Retail trade	81	4.09	19.81 5.22
	Lumber, wood products, furniture mfg	5	3.44	1.45 9.31
	Other manufacturing	25	3.43	7.28 5.49
	Food & tobacco mfg	24	3.41	7.05 5.80

Group/cancer site	Industry	Deaths	SRR	95% CI
	Professional & related services	180	3.22	55.95 3.83
	Textile & apparel mfg	41	2.79	14.68 4.07
	Transportation, communication & utilities	16	2.72	5.88 4.83
	Public administration	26	2.65	9.82 4.19
	Finance, insurance, & real estate	12	2.49	4.82 5.04
	Chemical & allied product mfg	3	2.25	1.33 7.68
	Machinery & transportation equipment mfg	14	2.12	6.60 3.90
MN-uterine corpus	Agriculture, forestry, and fisheries	4	55.59	0.07 307.77
	Finance, insurance, & real estate	4	5.80	0.69 16.51
	Personal Services	34	3.68	9.23 6.21
	Textile & apparel mfg	9	3.13	2.88 6.75
MN-ovary and uterine adnexa	Printing & publishing	5	5.08	0.99 12.66
	Agriculture, forestry, and fisheries	4	3.00	1.34 8.97
	Wholesale trade	3	2.88	1.04 9.17
	Rubber & misc plastics mfg	4	2.66	1.51 7.70
MN-other/unsp parts of uterus & other female genital organs	Agriculture, forestry, and fisheries	5	32.53	0.15 125.38
	Metal Industries	3	13.28	0.23 57.19
	Personal Services	49	5.03	9.74 7.86
	Other manufacturing	7	4.24	1.65 10.04
	Finance, insurance, & real estate	5	4.19	1.19 11.60
	Retail trade	19	3.23	5.89 5.25
	Food & tobacco mfg	7	2.64	2.65 6.55
	Business & repair services	6	2.53	2.37 6.26
	Machinery & transportation equipment mfg	6	2.34	2.56 5.69
	Professional & related services	65	2.28	28.50 3.01
	Textile & apparel mfg	11	2.28	4.82 4.56
	Other manufacturing	3	7.02	0.43 28.25
	Public administration	5	4.51	1.11 12.73
MN-bladder	Transportation, communication & utilities	4	4.19	0.96 12.52
	Retail trade	7	3.11	2.25 6.81
	Professional & related services	29	2.62	11.06 4.00
	Business & repair services	3	2.50	1.20 8.92
	Personal Services	17	2.26	7.53 4.23
MN-kidney & other/unspec urinary organs	Entertainment & recreation services	3	27.75	0.11 125.50
	Agriculture, forestry, and fisheries	3	6.10	0.49 22.66

Group/cancer site	Industry	Deaths	SRR	95% CI
Lymphosarcoma & reticulosarcoma	Finance, insurance, & real estate	6	3.25	1.84 8.45
	Machinery & transportation equipment mfg	7	3.03	2.31 7.07
	Business & repair services	7	2.69	2.60 6.21
	Retail trade	17	2.22	7.65 3.69
	Finance, insurance, & real estate	4	5.77	0.69 21.28
	Public administration	3	3.30	0.91 12.86
	Public administration	5	2.73	1.83 8.56
	Transportation, communication & utilities	4	2.72	1.47 8.40
	Agriculture, forestry, and fisheries	3	11.93	0.25 54.16
	Paper & allied products mfg	3	8.95	0.34 35.95
	Metal Industries	3	2.94	1.02 10.17
	Finance, insurance, & real estate	10	2.18	4.58 4.63
	Agriculture, forestry, and fisheries	6	20.68	0.29 65.86
	Metal Industries	4	9.99	0.40 31.43
	Other manufacturing	7	9.79	0.72 25.80
	Textile & apparel mfg	22	6.46	3.41 11.34
	Retail trade	26	5.42	4.80 8.28
Multiple myeloma	Chemical & allied product mfg	3	5.39	0.56 21.10
	Personal Services	45	5.18	8.69 8.26
	Public administration	17	5.10	3.34 9.17
	Food & tobacco mfg	7	3.82	1.83 9.59
	Finance, insurance, & real estate	6	3.71	1.62 8.91
	Professional & related services	89	2.95	30.17 3.77
	Business & repair services	6	2.10	2.86 5.09
	Finance, insurance, & real estate	3	3.24	0.93 11.38
	Public administration	3	6.32	0.47 25.28
	Professional & related services	17	3.12	5.45 5.48
	Machinery & transportation equipment mfg	3	2.62	1.14 9.22
	Business & repair services	5	2.85	1.76 7.68
	Textile & apparel mfg	12	2.38	5.04 4.67
	Finance, insurance, & real estate	3	4.04	0.74 14.41
	Machinery & transportation equipment mfg	5	3.79	1.32 10.43
	Personal Services	10	3.24	3.08 7.87
	Retail trade	5	2.42	2.07 6.28
Acute lymphocitic leukemia	Professional & related services	31	2.10	14.79 3.12
	Other manufacturing	3	2.62	1.15 9.30
Acute myeloid leukemia				
Chronic myeloid leukemia				
Other leukemia				

Group/cancer site	Industry	Deaths	SRR	95% CI
All Leukemias	Personal Services	15	2.26	6.63 4.52
	Stone,clay,glass,concrete products mfg	5	12.73	0.39 43.85
	Agriculture, forestry, and fisheries	5	5.48	0.91 16.43
	Machinery & transportation equipment mfg	15	2.16	6.93 3.83
	Business & repair services	12	2.08	5.77 3.88
	Finance, insurance, & real estate	12	2.04	5.89 4.04
	Public administration	4	23.16	0.17 127.80
	Personal Services	9	5.30	1.70 15.70
	Agriculture, forestry, and fisheries	16	12.62	1.27 24.26
	Metal Industries	9	5.17	1.74 10.70
	Chemical & allied product mfg	7	4.20	1.67 9.87
	Printing & publishing	3	3.95	0.76 12.65
MN-ill-defined & unspecified	Rubber & misc plastics mfg	5	3.61	1.38 9.25
	Stone,clay,glass,concrete products mfg	4	3.57	1.12 10.59
	Lumber, wood products, furniture mfg	4	3.26	1.23 9.52
	Entertainment & recreation services	3	3.13	0.96 10.19
	Wholesale trade	3	3.10	0.97 10.10
	Personal Services	163	3.01	54.19 3.75
	Finance, insurance, & real estate	18	2.74	6.56 4.63
	Food & tobacco mfg	17	2.47	6.89 4.33
	Professional & related services	263	2.09	125.94 2.39

Table 2.3 continued.

Group/cancer site	Industry	Deaths	SRR	95% CI
Asian Women				
MN-oral cavity, & pharynx	Retail trade	4	7.33	0.55 20.20
MN-stomach	Textile & apparel mfg	3	18.68	0.16 61.08
	Professional & related services	7	8.95	0.78 19.45
	Retail trade	5	6.45	0.77 15.92
MN-colon	Machinery & transportation equipment mfg	5	9.99	0.50 25.89
	Textile & apparel mfg	3	3.47	0.86 11.08
MN-liver and intrahepatic bile ducts	Professional & related services	6	11.55	0.52 26.66
	Personal Services	3	11.02	0.27 36.81
	Retail trade	3	6.13	0.49 19.86
MN-pancreas	Retail trade	5	2.68	1.86 6.58
	Professional & related services	4	2.25	1.78 6.00
MN-trachea, bronchus and lung	Transportation, communication & utilities	3	6.85	0.44 33.39
	Finance, insurance, & real estate	4	4.50	0.89 12.14
	Food & tobacco mfg	3	3.68	0.82 12.81
	Public administration	4	3.33	1.20 9.22
MN-female breast	Machinery & transportation equipment mfg	5	5.88	0.85 15.30
	Transportation, communication & utilities	3	5.22	0.57 25.43
	Business & repair services	3	4.89	0.61 15.20
	Finance, insurance, & real estate	5	4.10	1.22 10.42
	Entertainment & recreation services	3	3.49	0.86 10.95
	Public administration	4	3.20	1.25 8.54
	Food & tobacco mfg	3	2.65	1.13 8.61
MN-cervix uteri	Professional & related services	5	3.15	1.59 8.13
	Personal Services	4	2.65	1.51 7.20
	Retail trade	6	2.51	2.40 5.63
MN-ovary and uterine adnexa	Personal Services	3	5.30	0.57 25.97
MN-kidney & other/unspec urinary organs	Professional & related services	5	4.20	1.19 10.55
MN-brain	Public administration	3	18.80	0.16 74.77
Other lymphatic neoplasms	Professional & related services	4	2.77	1.44 7.73
Acute myeloid leukemia	Professional & related services	4	3.16	1.27 8.48
All Leukemias	Personal Services	3	3.01	1.00 9.50
	Professional & related services	5	2.02	2.48 5.22

Group/cancer site	Industry	Deaths	SRR	95% CI
MN-ill-defined & unspecified	Public administration	3	12.59	0.24 39.39
	Other manufacturing	3	7.89	0.38 24.97
	Personal Services	5	2.93	1.71 7.25

Table 2.3 continued.

Group/cancer site	Industry	Deaths	SRR	95% CI
Latino Women				
MN-oral cavity, & pharynx	Public administration	3	12.25	0.24 52.61
MN-stomach	Transportation, communication & utilities	3	12.72	0.24 41.29
	Personal Services	8	4.01	1.99 8.67
	Retail trade	6	3.47	1.73 7.92
	Professional & related services	13	2.95	4.41 5.20
MN-small intestine	Professional & related services	3	6.39	0.47 20.90
MN-colon	Transportation, communication & utilities	5	4.70	1.06 11.47
	Public administration	10	4.00	2.50 7.95
	Business & repair services	3	2.55	1.18 8.04
MN-liver and intrahepatic bile ducts	Personal Services	3	2.42	1.24 7.87
MN-gall bladder and extrahepatic bile ducts	Retail trade	6	9.20	0.65 21.64
	Personal Services	3	6.82	0.44 23.92
MN-pancreas	Textile & apparel mfg	4	4.10	0.98 11.19
	Other manufacturing	5	3.62	1.38 9.19
	Public administration	4	2.78	1.44 7.66
	Retail trade	11	2.27	4.84 4.17
MN-trachea, bronchus and lung	Agriculture, forestry, and fisheries	4	15.71	0.25 43.61
	Transportation, communication & utilities	9	2.68	3.36 5.26
	Finance, insurance, & real estate	7	2.08	3.37 4.40
MN-female breast	Stone,clay,glass,concrete products mfg	3	11.72	0.26 38.21
	Rubber & misc plastics mfg	3	10.87	0.28 35.17
	Transportation, communication & utilities	22	4.43	4.97 6.86
	Entertainment & recreation services	4	4.36	0.92 13.65
	Business & repair services	13	3.54	3.67 6.40
	Wholesale trade	3	3.03	0.99 9.45
	Machinery & transportation equipment mfg	14	2.68	5.22 4.68
	Finance, insurance, & real estate	14	2.61	5.37 4.49
	Textile & apparel mfg	19	2.09	9.11 3.32
	Public administration	23	2.06	11.16 3.15
MN-cervix uteri	Transportation, communication & utilities	4	6.14	0.65 17.45
	Machinery & transportation equipment mfg	3	4.53	0.66 15.27
	Finance, insurance, & real estate	3	4.39	0.68 13.83

Group/cancer site	Industry	Deaths	SRR	95% CI
	Textile & apparel mfg	4	4.18	0.96 11.87
	Personal Services	14	3.05	4.58 5.38
	Professional & related services	21	2.96	7.09 4.60
	Public administration	3	2.35	1.28 7.79
MN-ovary and uterine adnexa	Finance, insurance, & real estate	6	4.98	1.21 11.35
	Public administration	9	3.40	2.64 6.71
	Textile & apparel mfg	8	3.07	2.61 6.25
	Machinery & transportation equipment mfg	3	2.18	1.37 7.10
	Personal Services	4	2.66	1.51 7.41
MN-other/unsp parts of uterus & other female genital organs	Finance, insurance, & real estate	4	17.02	0.24 47.93
MN-kidney & other/unspec urinary organs	Retail trade	3	5.87	0.51 19.12
Lymphosarcoma & reticulosarcoma	Professional & related services	4	2.67	1.50 7.36
Other lymphatic neoplasms	Machinery & transportation equipment mfg	3	6.42	0.47 21.17
	Textile & apparel mfg	3	4.69	0.64 15.12
Multiple myeloma	Personal Services	4	3.79	1.06 10.73
Acute myeloid leukemia	Retail trade	3	2.34	1.28 7.35
Chronic myeloid leukemia	Public administration	3	15.44	0.19 53.65
Other leukemia	Professional & related services	5	2.17	2.31 5.34
All Leukemias	Public administration	5	3.55	1.41 8.92

Table 2.3 continued.

Group/cancer site	Industry	Deaths	SRR	95% CI
Native American Women				
MN-oral cavity, & pharynx	Professional & related services	3	15.93	0.19 54.39
MN-stomach	Personal Services	5	35.72	0.14 100.61
	Professional & related services	4	11.90	0.34 34.07
MN-colon	Professional & related services	10	3.89	2.57 7.27
MN-pancreas	Professional & related services	5	3.90	1.28 9.40
MN-trachea, bronchus and lung	Food & tobacco mfg	3	47.13	0.06 146.64
	Machinery & transportation equipment mfg	3	9.82	0.31 32.34
	Retail trade	8	4.48	1.79 9.18
	Textile & apparel mfg	4	3.38	1.18 9.41
MN-connective and other soft tissue	Public administration	3	41.11	0.07 150.48
MN-breast	Agriculture, forestry, and fisheries	4	43.36	0.09 118.35
	Entertainment & recreation services	4	29.70	0.13 95.04
	Textile & apparel mfg	6	6.38	0.94 14.71
	Public administration	6	2.63	2.28 6.09
MN-cervix uteri	Personal Services	6	22.97	0.26 57.01
	Textile & apparel mfg	4	19.73	0.20 53.81
	Retail trade	4	12.38	0.32 35.00
	Professional & related services	4	5.50	0.73 14.85
MN-ovary and uterine adnexa	Textile & apparel mfg	3	14.94	0.20 46.75
	Retail trade	3	7.19	0.42 23.52
	Professional & related services	6	2.64	2.27 6.38
Acute myeloid leukemia	Professional & related services	3	11.78	0.25 39.30
All Leukemias	Personal Services	4	16.09	0.25 44.43
	Professional & related services	4	5.53	0.72 16.20
MN-ill-defined & unspecified	Other manufacturing	3	31.75	0.09 129.94
	Professional & related services	7	3.76	1.86 7.96

Table 2.4. Standardized mortality rate ratios (SRRs) and 95% confidence intervals (CIs) for minority workers by occupation, relative to white workers in the same occupation. Ages 20-64, SRRs directly adjusted for age. Selected results with SRR > 2.0 and >2 deaths.

Group/cancer site	Occupation	Deaths	SRR	95% CI
African-American Men MN-oral cavity, & pharynx	Fishing & hunting	4	244.10	41.05 1451.44
	Farming, Agriculture, & Forestry	91	14.16	10.68 18.77
	Freight, stock, and materials handlers	42	7.55	4.64 12.26
	Services	158	5.14	4.17 6.33
	Laborers	210	4.95	4.09 6.00
	Helpers	6	4.51	1.30 15.74
	Administrative support & clerical	37	4.46	3.09 6.42
	Precision production workers	32	4.10	2.80 6.01
	Construction trades	81	3.99	3.13 5.08
	Professional specialists	23	3.83	2.48 5.89
	Technicians and related support workers	3	3.81	1.15 12.63
	Sales	15	3.62	2.15 6.09
	Mechanics & repairers	32	3.47	2.39 5.05
	Machine operators & tenders	69	3.14	2.38 4.14
	Motor Vehicle Operators	67	3.07	2.31 4.07
	Other handlers & cleaners	7	2.83	1.15 6.98
	Oth transportation & material moving occs	22	2.49	1.55 3.99
	Farming, Agriculture, & Forestry	126	19.50	15.04 25.29
	Helpers	8	15.20	3.94 58.63
	MN-esophagus	Freight, stock, and materials handlers	44	12.06	6.96 20.91
Laborers		317	7.71	6.45 9.21
Other handlers & cleaners		8	7.28	2.52 20.98
Construction trades		136	6.65	5.45 8.11
Inspectors, testers, samplers, & weighers		6	6.08	2.43 15.22
Technicians and related support workers		6	5.34	2.22 12.87
Mechanics & repairers		46	5.30	3.84 7.31
Oth transportation & material moving occs		43	5.26	3.64 7.60
Services		195	5.26	4.34 6.37
Fabricators, assemblers & hand workers		23	5.22	3.20 8.51
Military		31	4.50	2.81 7.22
Machine operators & tenders		110	4.14	3.29 5.20

Group/cancer site	Occupation	Deaths	SRR	95% CI
MN-stomach	Precision production workers	44	4.11	2.97 5.68
	Administrative support & clerical	34	3.65	2.52 5.30
	Motor Vehicle Operators	92	3.31	2.60 4.23
	Professional specialists	21	2.38	1.53 3.72
	Executives, administrators, managers	23	2.16	1.42 3.30
	Extracrine occupations	4	12.32	4.23 35.90
	Farming, Agriculture, & Forestry	62	9.56	6.92 13.20
	Freight, stock, and materials handlers	29	7.06	4.01 12.41
	Technicians and related support workers	7	5.07	2.16 11.94
	Sales	20	4.47	2.83 7.05
	Construction trades	70	4.30	3.31 5.59
	Motor Vehicle Operators	86	4.26	3.28 5.53
	Fabricators, assemblers & hand workers	22	4.15	2.53 6.82
	Administrative support & clerical	30	3.85	2.58 5.74
	Other handlers & cleaners	6	3.67	1.31 10.23
	Precision production workers	35	3.47	2.41 5.01
	Laborers	117	3.34	2.64 4.23
	Inspectors, testers, samplers, & weighers	3	3.24	0.91 11.48
	Oth transportation & material moving occs	24	3.08	1.94 4.89
	Professional specialists	27	2.92	1.97 4.33
	Machine operators & tenders	67	2.69	2.04 3.54
	Mechanics & repairers	24	2.67	1.73 4.11
	Military	14	2.60	1.34 5.07
Services	92	2.46	1.93 3.14	
MN-small intestine	Freight, stock, and materials handlers	4	17.98	1.99 162.65
	Technicians and related support workers	3	14.27	3.73 54.60
	Military	3	8.22	1.53 44.11
	Mechanics & repairers	3	6.55	1.77 24.20
	Precision production workers	3	5.79	1.52 22.03
	Professional specialists	4	4.56	1.59 13.09
	Construction trades	5	3.83	1.46 10.08
	Laborers	5	3.66	1.15 11.66
	Motor Vehicle Operators	6	3.60	1.36 9.49
	Other handlers & cleaners	9	4.14	1.70 10.06
	Farming, Agriculture, & Forestry	70	3.73	2.82 4.94
	Sales	48	3.18	2.38 4.25
	MN-colon			

Group/cancer site	Occupation	Deaths	SRR	95% CI
MN-rectum	Technicians and related support workers	13	2.88	1.58 5.23
	Inspectors, testers, samplers, & weighers	6	2.43	1.04 5.69
	Administrative support & clerical	57	2.41	1.82 3.18
	Services	208	2.34	1.99 2.75
	Precision production workers	65	2.29	1.77 2.97
	Mechanics & repairers	47	2.23	1.64 3.04
	Professional specialists	63	2.16	1.67 2.78
	Inspectors, testers, samplers, & weighers	4	8.77	2.65 29.00
	Technicians and related support workers	5	7.41	2.72 20.20
	Professional specialists	15	3.18	1.86 5.44
	Construction trades	26	2.80	1.84 4.25
	Precision production workers	15	2.54	1.46 4.42
	Mechanics & repairers	13	2.52	1.39 4.57
	Sales	7	2.34	1.10 4.98
	Freight, stock, and materials handlers	7	2.19	0.90 5.29
	Executives, administrators, managers	13	2.16	1.23 3.77
	Farming, Agriculture, & Forestry	11	2.11	1.00 4.44
	Services	42	2.04	1.44 2.91
	Inspectors, testers, samplers, & weighers	6	14.68	5.24 41.15
	Farming, Agriculture, & Forestry	24	7.68	4.54 12.99
	Other handlers & cleaners	4	5.93	1.56 22.56
	Freight, stock, and materials handlers	9	5.29	2.10 13.34
	Professional specialists	21	4.70	2.97 7.43
Administrative support & clerical	23	4.65	2.91 7.43	
Precision production workers	20	4.06	2.49 6.62	
Construction trades	34	3.52	2.42 5.10	
Executives, administrators, managers	20	3.23	2.04 5.11	
Services	64	3.13	2.31 4.24	
Fabricators, assemblers & hand workers	9	2.98	1.43 6.24	
Laborers	67	2.87	2.12 3.88	
Mechanics & repairers	13	2.86	1.60 5.11	
Military	9	2.22	1.01 4.90	
Machine operators & tenders	32	2.22	1.50 3.28	
Fabricators, assemblers & hand workers	4	6.82	1.97 23.61	
Sales	4	6.13	2.19 17.12	
Precision production workers	4	3.37	1.12 10.14	
MN-gall bladder and extrahepatic bile ducts				

Group/cancer site	Occupation	Deaths	SRR	95% CI
MN-pancreas	Construction trades	6	2.57	1.09 6.05
	Laborers	11	2.55	1.23 5.27
	Administrative support & clerical	3	2.36	0.70 8.00
	Farming, Agriculture, & Forestry	3	2.04	0.61 6.83
	Technicians and related support workers	12	5.81	3.14 10.76
	Farming, Agriculture, & Forestry	52	4.39	3.20 6.04
	Freight, stock, and materials handlers	20	3.30	1.86 5.85
	Mechanics & repairers	43	3.08	2.24 4.24
	Oth transportation & material moving occs	37	2.92	2.02 4.21
	Fabricators, assemblers & hand workers	22	2.49	1.56 3.99
	Helpers	3	2.42	0.52 11.29
	Precision production workers	42	2.38	1.73 3.27
	Professional specialists	39	2.37	1.71 3.28
	Administrative support & clerical	32	2.29	1.58 3.31
	Services	122	2.08	1.69 2.56
	Farming, Agriculture, & Forestry	4	5.62	1.71 18.45
MN-peritoneum & other/unspec digestive organs	Administrative support & clerical	4	4.28	1.42 12.92
	Precision production workers	3	3.75	1.07 13.19
	Motor Vehicle Operators	6	2.70	1.04 7.00
	Services	9	2.38	1.09 5.20
	Laborers	8	8.15	2.66 24.99
	Precision production workers	4	6.31	2.04 19.53
	Construction trades	4	4.26	1.43 12.75
	Services	4	2.19	0.68 6.99
	Farming, Agriculture, & Forestry	34	11.54	7.41 17.97
	Helpers	3	8.13	1.30 50.63
MN-nasal cavity	Freight, stock, and materials handlers	16	6.80	3.22 14.40
	Other handlers & cleaners	6	6.63	2.10 20.97
	Sales	9	5.41	2.74 10.68
	Precision production workers	21	4.99	3.10 8.04
	Services	61	4.89	3.50 6.84
	Machine operators & tenders	42	4.69	3.21 6.86
	Construction trades	42	4.24	3.02 5.94
	Laborers	105	4.07	3.14 5.28
	Mechanics & repairers	16	3.62	2.13 6.15
	MN-larynx	Construction trades	6	2.57	1.09 6.05
Laborers		11	2.55	1.23 5.27
Administrative support & clerical		3	2.36	0.70 8.00
Farming, Agriculture, & Forestry		3	2.04	0.61 6.83
Technicians and related support workers		12	5.81	3.14 10.76
Farming, Agriculture, & Forestry		52	4.39	3.20 6.04
Freight, stock, and materials handlers		20	3.30	1.86 5.85
Mechanics & repairers		43	3.08	2.24 4.24
Oth transportation & material moving occs		37	2.92	2.02 4.21
Fabricators, assemblers & hand workers		22	2.49	1.56 3.99

Group/cancer site	Occupation	Deaths	SRR	95% CI	
MN-trachea, bronchus and lung	Professional specialists	9	3.40	1.71 5.76	
	Administrative support & clerical	9	3.13	1.53 6.37	
	Executives, administrators, managers	9	2.93	1.49 5.80	
	Fabricators, assemblers & hand workers	4	2.35	0.82 6.77	
	Motor Vehicle Operators	28	2.24	1.48 3.41	
	Oth transportation & material moving occs	9	2.08	1.01 4.30	
	Fishing & hunting	11	8.91	4.40 18.05	
	Farming, Agriculture, & Forestry	493	5.07	4.56 5.63	
	Helpers	33	4.76	2.84 7.97	
	Technicians and related support workers	69	4.73	3.65 6.12	
	Other handlers & cleaners	57	2.96	2.12 4.13	
	Professional specialists	207	2.80	2.43 3.22	
	Administrative support & clerical	285	2.58	2.28 2.93	
	Freight, stock, and materials handlers	190	2.53	2.12 3.01	
	Inspectors, testers, samplers, & weighers	29	2.41	1.64 3.54	
	Sales	140	2.22	1.88 2.63	
	Construction trades	628	2.16	1.99 2.35	
	Precision production workers	335	2.14	1.91 2.40	
	Laborers	1317	2.06	1.93 2.19	
MN-pleura	Oth transportation & material moving occs	255	2.02	1.76 2.32	
	Sales	3	23.89	6.33 90.16	
	Laborers	7	8.97	2.61 30.82	
	Machine operators & tenders	4	3.51	1.08 11.42	
	Freight, stock, and materials handlers	4	8.09	1.76 37.18	
	Farming, Agriculture, & Forestry	5	6.20	2.02 18.98	
	Mechanics & repairers	3	3.23	0.95 10.99	
	Construction trades	4	2.64	0.92 7.62	
	Technicians and related support workers	4	4.41	1.50 12.97	
	Military	3	4.18	0.93 18.81	
MN-other parts of the respiratory system	Administrative support & clerical	13	3.42	1.86 6.31	
	Oth transportation & material moving occs	4	3.36	0.99 11.41	
	Construction trades	10	2.77	1.41 5.44	
	Mechanics & repairers	6	2.54	1.05 6.14	
	Farming, Agriculture, & Forestry	7	2.50	1.07 5.85	
	Sales	4	2.23	0.82 6.07	
	Precision production workers	6	2.17	0.93 5.07	
	MN-bone	Professional specialists	9	3.40	1.71 5.76
		Administrative support & clerical	9	3.13	1.53 6.37
		Executives, administrators, managers	9	2.93	1.49 5.80
Fabricators, assemblers & hand workers		4	2.35	0.82 6.77	
Motor Vehicle Operators		28	2.24	1.48 3.41	
Oth transportation & material moving occs		9	2.08	1.01 4.30	
Fishing & hunting		11	8.91	4.40 18.05	
Farming, Agriculture, & Forestry		493	5.07	4.56 5.63	
Helpers		33	4.76	2.84 7.97	
Technicians and related support workers		69	4.73	3.65 6.12	
MN-connective and other soft tissue	Other handlers & cleaners	57	2.96	2.12 4.13	
	Professional specialists	207	2.80	2.43 3.22	
	Administrative support & clerical	285	2.58	2.28 2.93	
	Freight, stock, and materials handlers	190	2.53	2.12 3.01	
	Inspectors, testers, samplers, & weighers	29	2.41	1.64 3.54	
	Sales	140	2.22	1.88 2.63	
	Construction trades	628	2.16	1.99 2.35	
	Precision production workers	335	2.14	1.91 2.40	
	Laborers	1317	2.06	1.93 2.19	
	Oth transportation & material moving occs	255	2.02	1.76 2.32	

Group/cancer site	Occupation	Deaths	SRR	95% CI
MN-other malignant neoplasm of the skin	Freight, stock, and materials handlers	4	14.26	1.58 128.61
	Fabricators, assemblers & hand workers	6	6.25	2.24 17.43
	Farming, Agriculture, & Forestry	10	4.95	2.38 10.32
	Oth transportation & material moving occs	7	4.23	1.73 10.37
	Laborers	32	4.02	2.52 6.43
	Administrative support & clerical	9	3.88	1.86 8.10
	Precision production workers	6	3.61	1.46 8.96
	Motor Vehicle Operators	12	2.54	1.31 4.92
	Machine operators & tenders	12	2.50	1.31 4.76
	Sales	3	2.45	0.77 7.78
MN-male breast	Military	4	2.08	0.60 7.19
	Laborers	6	4.30	1.44 12.85
	Machine operators & tenders	4	4.20	1.26 13.94
	Other handlers & cleaners	12	21.00	6.75 65.36
MN-prostate	Freight, stock, and materials handlers	30	7.41	4.21 13.07
	Helpers	4	6.60	1.10 39.77
	Technicians and related support workers	7	5.67	2.48 12.99
	Inspectors, testers, samplers, & weighers	5	5.52	2.08 14.61
	Administrative support & clerical	46	4.96	3.57 6.88
	Farming, Agriculture, & Forestry	64	4.56	3.44 6.05
	Machine operators & tenders	89	4.44	3.44 5.74
	Sales	24	4.41	2.92 6.67
	Precision production workers	54	4.37	3.26 5.84
	Mechanics & repairers	39	4.19	2.98 5.90
	Construction trades	86	4.15	3.28 5.26
	Motor Vehicle Operators	88	4.01	3.11 5.18
	Fabricators, assemblers & hand workers	19	4.01	2.39 6.74
	Laborers	142	4.00	3.20 5.01
	Professional specialists	52	3.94	2.96 5.25
	Oth transportation & material moving occs	37	3.88	2.66 5.66
	Services	136	3.82	3.08 4.75
MN-penis & other male genital organs	Military	24	2.73	1.71 4.35
	Executives, administrators, managers	43	2.69	1.97 3.66
	Construction trades	3	3.21	0.93 11.00
	Laborers	6	3.07	1.09 8.63
	Farming, Agriculture, & Forestry	14	4.79	2.59 8.87
MN-bladder				

Group/cancer site	Occupation	Deaths	SRR	95% CI
	Helpers	3	3.96	0.82 19.05
	Professional specialists	17	3.93	2.38 6.49
	Technicians and related support workers	3	2.83	0.79 10.06
MN-kidney & other/unspec urinary organs	Precision production workers	25	2.54	1.65 3.93
	Oth transportation & material moving occs	19	2.40	1.42 4.04
	Fabricators, assemblers & hand workers	10	2.36	1.19 4.70
	Mechanics & repairers	22	2.36	1.50 3.69
	Farming, Agriculture, & Forestry	17	2.33	1.31 4.14
	Services	70	2.22	1.68 2.92
	Technicians and related support workers	5	2.14	0.85 5.41
	Construction trades	31	2.09	1.44 3.05
	Freight, stock, and materials handlers	12	2.08	1.04 4.14
MN-brain	Sales	20	2.49	1.59 3.91
MN-thyroid gland	Military	3	10.15	1.90 54.33
Lymphosarcoma & reticulosarcoma	Fabricators, assemblers & hand workers	4	6.07	1.89 19.47
	Farming, Agriculture, & Forestry	3	4.47	1.29 15.49
	Sales	3	2.90	0.91 9.25
	Professional specialists	5	2.53	1.00 6.36
	Mechanics & repairers	4	3.23	1.08 9.65
Hodgkin's disease	Precision production workers	5	3.05	1.11 8.40
	Motor Vehicle Operators	11	2.60	1.31 5.15
	Professional specialists	7	2.41	1.09 5.32
	Freight, stock, and materials handlers	5	2.31	0.75 7.15
Other lymphatic neoplasms	Inspectors, testers, samplers, & weighers	3	3.47	0.90 13.36
	Freight, stock, and materials handlers	14	2.82	1.45 5.47
	Administrative support & clerical	30	2.33	1.58 3.43
	Farming, Agriculture, & Forestry	22	2.27	1.42 3.62
	Helpers	3	8.37	1.33 52.55
Multiple myeloma	Other handlers & cleaners	5	8.08	1.75 37.18
	Military	12	5.16	2.50 10.64
	Sales	12	5.02	2.79 9.04
	Administrative support & clerical	18	4.81	2.84 8.15
	Machine operators & tenders	40	4.48	3.05 6.58
	Motor Vehicle Operators	50	4.31	3.05 6.09
	Fabricators, assemblers & hand workers	7	4.22	1.79 9.94
	Precision production workers	18	3.89	2.35 6.44

Group/cancer site	Occupation	Deaths	SRR	95% CI
All Leukemias	Fabricators, assemblers & hand workers	3	2.25	0.64 7.95
	Inspectors, testers, samplers, & weighers	3	4.49	1.20 16.79
	Freight, stock, and materials handlers	18	2.47	1.39 4.40
	Farming, Agriculture, & Forestry	20	2.26	1.33 3.84
All other specified malignant neoplasms	Fabricators, assemblers & hand workers	13	2.18	1.19 4.02
	Professional specialists	4	3.24	1.15 9.18
	Precision production workers	3	3.11	0.92 10.54
	Motor Vehicle Operators	4	2.03	0.66 6.18
MN-ill-defined & unspecified	Farming, Agriculture, & Forestry	105	6.97	5.49 8.85
	Other handlers & cleaners	21	5.00	2.70 9.25
	Helpers	7	4.36	1.55 12.25
	Mechanics & repairers	72	3.27	2.54 4.21
	Laborers	298	3.11	2.69 3.60
	Construction trades	144	2.92	2.45 3.49
	Administrative support & clerical	51	2.75	2.05 3.71
	Services	230	2.64	2.26 3.08
	Sales	29	2.60	1.79 3.78
	Professional specialists	50	2.56	1.92 3.43
	Precision production workers	62	2.37	1.81 3.09
	Freight, stock, and materials handlers	35	2.16	1.45 3.22
	Oth transportation & material moving occs	41	2.14	1.50 3.06
Machine operators & tenders	121	2.11	1.73 2.58	

Table 2.4 continued.

Group/cancer site	Occupation	Deaths	SRR	95% CI
Asian Men				
MN-oral cavity, & pharynx	Technicians and related support workers	3	12.79	3.22 50.82
	Services	5	5.65	2.30 13.88
	Executives, administrators, managers	4	5.03	1.31 19.28
	Professional specialists	5	2.62	1.05 6.51
MN-stomach	Machine operators & tenders	7	22.23	10.45 47.27
	Precision production workers	3	9.23	2.93 29.02
	Services	8	6.67	3.23 13.76
	Sales	4	4.86	1.76 13.43
	Executives, administrators, managers	7	3.30	1.55 7.02
MN-colon	Farming, Agriculture, & Forestry	5	14.22	4.74 42.62
	Sales	5	2.15	0.88 5.24
MN-rectum	Executives, administrators, managers	3	3.50	1.12 10.94
MN-liver and intrahepatic bile ducts	Military	4	762.24	275.14 2111.66
	Fabricators, assemblers & hand workers	7	134.39	59.60 303.07
	Farming, Agriculture, & Forestry	3	117.21	21.95 625.82
	Machine operators & tenders	9	47.24	23.98 93.06
	Construction trades	3	45.09	14.32 142.01
	Sales	11	31.65	16.12 62.15
	Services	22	29.83	18.88 47.13
	Precision production workers	5	24.03	9.58 60.27
	Technicians and related support workers	4	19.63	6.19 62.33
	Executives, administrators, managers	13	12.03	6.84 21.16
	Professional specialists	16	11.49	6.63 19.91
MN-pancreas	Machine operators & tenders	3	7.15	2.29 22.33
	Sales	6	4.40	1.79 10.81
MN-trachea, bronchus and lung	Military	4	28.98	10.88 77.16
	Freight, stock, and materials handlers	3	11.45	3.65 35.91
	Farming, Agriculture, & Forestry	6	3.41	1.26 9.24
	Construction trades	6	3.22	1.44 7.20
	Mechanics & repairers	3	2.58	0.83 8.01
	Administrative support & clerical	6	2.41	1.08 5.38
MN-kidney & other/unspec urinary organs	Sales	3	2.93	0.92 9.36

Group/cancer site	Occupation	Deaths	SRR	95% CI
MN-brain	Services	3	2.31	0.74 7.22
Other lymphatic neoplasms	Sales	3	2.12	0.67 6.77
	Sales	5	7.24	2.17 24.15
Acute myeloid leukemia	Services	4	2.37	0.86 6.52
	Professional specialists	6	3.05	1.29 7.22
Chronic myeloid leukemia	Professional specialists	3	5.21	1.52 17.80
Other leukemias	Executives, administrators, managers	3	9.75	2.18 43.56
All Leukemias	Sales	4	5.15	1.69 15.68
	Executives, administrators, managers	5	3.22	0.95 10.96
MN-ill-defined & unspecified	Professional specialists	12	2.43	1.28 4.61
	Laborers	3	7.89	2.51 24.86
	Precision production workers	3	3.58	1.14 11.22
	Executives, administrators, managers	10	2.34	1.24 4.39

Table 2.4 continued.

Group/cancer site	Occupation	Deaths	SRR	95% CI
Latino Men MN-oral cavity, & pharynx MN-stomach	Freight, stock, and materials handlers	4	5.55	1.83 16.84
	Farming, Agriculture, & Forestry	8	2.91	1.42 5.97
	Mechanics & repairers	5	2.30	0.95 5.58
	Inspectors, testers, samplers, & weighers	3	26.48	7.08 99.07
	Freight, stock, and materials handlers	3	12.04	3.24 44.81
	Motor Vehicle Operators	13	6.59	3.71 11.68
	Fabricators, assemblers & hand workers	5	6.09	2.40 15.47
	Executives, administrators, managers	16	4.37	2.64 7.25
	Machine operators & tenders	20	4.28	2.70 6.77
	Mechanics & repairers	9	3.88	1.99 7.57
	Precision production workers	11	3.77	2.05 6.95
	Oth transportation & material moving occs	5	3.36	1.36 8.29
	Professional specialists	9	3.35	1.73 6.51
MN-colon MN-rectum MN-liver and intrahepatic bile ducts	Farming, Agriculture, & Forestry	8	3.05	1.47 6.32
	Construction trades	13	2.94	1.67 5.17
	Administrative support & clerical	5	2.85	1.15 7.06
	Sales	4	2.27	0.84 6.13
	Services	21	2.25	1.42 3.56
	Freight, stock, and materials handlers	5	4.12	1.59 10.71
	Extractive occupations	3	3.53	1.00 12.43
	Sales	13	2.17	1.25 3.77
	Administrative support & clerical	4	3.36	1.23 9.18
	Motor Vehicle Operators	4	3.14	1.16 8.54
	Farming, Agriculture, & Forestry	6	3.01	1.31 6.93
	Construction trades	6	2.42	1.06 5.56
	Executives, administrators, managers	4	2.09	0.77 5.65
Motor Vehicle Operators	7	6.68	3.01 14.83	
Mechanics & repairers	6	5.19	2.27 11.84	
Services	23	4.57	2.90 7.19	
Military	4	4.56	1.31 15.94	
Farming, Agriculture, & Forestry	6	4.56	1.94 10.74	
Sales	4	3.90	1.44 10.54	

Group/cancer site	Occupation	Deaths	SRR	95% CI
	Laborers	21	3.85	2.42 6.14
	Administrative support & clerical	4	3.44	1.26 9.42
	Professional specialists	4	3.01	1.11 8.11
	Precision production workers	4	2.51	0.92 6.84
MN-pancreas	Fabricators, assemblers & hand workers	4	4.10	1.50 11.27
	Sales	12	3.40	1.92 6.04
	Professional specialists	10	2.10	1.12 3.92
MN-larynx	Military	3	2.01	0.56 7.18
	Mechanics & repairers	5	4.65	1.89 11.43
	Farming, Agriculture, & Forestry	4	3.21	1.16 8.86
MN-connective and other soft tissue	Technicians and related support workers	5	23.28	8.79 61.71
	Motor Vehicle Operators	3	5.29	1.64 17.06
	Farming, Agriculture, & Forestry	3	2.77	0.85 9.03
Malignant melanoma of the skin	Motor Vehicle Operators	3	2.40	0.75 7.66
Other malignant neoplasm of the skin	Farming, Agriculture, & Forestry	4	4.64	1.64 13.08
MN-prostate	Executives, administrators, managers	13	2.30	1.33 3.98
	Sales	5	2.29	0.94 5.57
MN-testis	Precision production workers	3	11.56	3.43 39.00
	Laborers	5	3.28	1.27 8.44
MN-kidney & other/unspec urinary organs	Oth transportation & material moving occs	4	4.55	1.67 12.38
	Sales	9	3.91	2.01 7.58
	Mechanics & repairers	6	2.45	1.09 5.53
	Administrative support & clerical	5	2.45	1.00 5.99
	Construction trades	10	2.43	1.28 4.59
MN-brain	Motor Vehicle Operators	5	2.20	0.90 5.35
Lymphosarcoma & reticulosarcoma	Technicians and related support workers	5	4.55	1.75 11.83
	Farming, Agriculture, & Forestry	3	5.03	1.50 16.83
	Services	4	2.39	0.83 6.87
Hodgkin's disease	Professional specialists	3	3.89	1.17 12.96
	Executives, administrators, managers	4	3.62	1.32 9.93
	Machine operators & tenders	3	3.20	0.99 10.35
Other lymphatic neoplasms	Motor Vehicle Operators	12	5.26	2.89 9.58
	Oth transportation & material moving occs	5	4.44	1.70 11.65
	Fabricators, assemblers & hand workers	3	3.84	1.17 12.55
	Administrative support & clerical	7	3.64	1.69 7.84
	Technicians and related support workers	3	3.20	0.95 10.76

Group/cancer site	Occupation	Deaths	SRR	95% CI	
Multiple myeloma	Professional specialists	11	2.65	1.42 4.93	
	Precision production workers	8	2.58	1.25 5.34	
	Sales	7	2.35	1.11 4.99	
	Executives, administrators, managers	5	2.02	0.83 4.89	
	Military	3	17.91	2.48 129.09	
	Farming, Agriculture, & Forestry	3	7.79	2.18 27.85	
	Laborers	5	7.38	2.69 20.26	
	Machine operators & tenders	4	6.32	2.21 18.14	
	Professional specialists	4	2.60	0.96 7.01	
	Sales	3	7.30	2.27 23.49	
Acute myeloid leukemia	Construction trades	4	4.44	1.60 12.29	
	Executives, administrators, managers	3	4.41	1.37 14.16	
	Services	5	3.67	1.42 9.49	
	Mechanics & repairers	4	4.97	1.81 13.65	
	Services	5	2.49	1.00 6.20	
	Machine operators & tenders	4	2.40	0.88 6.57	
	Extractive occupations	3	6.29	1.67 23.62	
	Oth transportation & material moving occs	4	4.83	1.67 13.97	
	Fabricators, assemblers & hand workers	3	3.93	1.20 12.83	
	Sales	10	3.62	1.93 6.81	
Chronic myeloid leukemia	Mechanics & repairers	8	2.68	1.32 5.42	
	Professional specialists	10	2.42	1.27 4.60	
	Construction trades	3	7.89	2.34 26.61	
	Inspectors, testers, samplers, & weighers	4	12.60	4.30 36.95	
	Sales	18	4.13	2.58 6.60	
	Administrative support & clerical	9	2.67	1.35 5.28	
	Farming, Agriculture, & Forestry	15	2.67	1.57 4.53	
	MN-other leukemia	Professional specialists	11	2.65	1.42 4.93
		Precision production workers	8	2.58	1.25 5.34
		Sales	7	2.35	1.11 4.99
Executives, administrators, managers		5	2.02	0.83 4.89	
Military		3	17.91	2.48 129.09	
Farming, Agriculture, & Forestry		3	7.79	2.18 27.85	
Laborers		5	7.38	2.69 20.26	
Machine operators & tenders		4	6.32	2.21 18.14	
Professional specialists		4	2.60	0.96 7.01	
Sales		3	7.30	2.27 23.49	
All Leukemias	Construction trades	4	4.44	1.60 12.29	
	Executives, administrators, managers	3	4.41	1.37 14.16	
	Services	5	3.67	1.42 9.49	
	Mechanics & repairers	4	4.97	1.81 13.65	
	Services	5	2.49	1.00 6.20	
	Machine operators & tenders	4	2.40	0.88 6.57	
	Extractive occupations	3	6.29	1.67 23.62	
	Oth transportation & material moving occs	4	4.83	1.67 13.97	
	Fabricators, assemblers & hand workers	3	3.93	1.20 12.83	
	Sales	10	3.62	1.93 6.81	
All other specified malignant neoplasms	Mechanics & repairers	8	2.68	1.32 5.42	
	Professional specialists	10	2.42	1.27 4.60	
	Construction trades	3	7.89	2.34 26.61	
	Inspectors, testers, samplers, & weighers	4	12.60	4.30 36.95	
	Sales	18	4.13	2.58 6.60	
	Administrative support & clerical	9	2.67	1.35 5.28	
	Farming, Agriculture, & Forestry	15	2.67	1.57 4.53	
	MN-ill-defined & unspecified	Professional specialists	11	2.65	1.42 4.93
		Precision production workers	8	2.58	1.25 5.34
		Sales	7	2.35	1.11 4.99
Executives, administrators, managers		5	2.02	0.83 4.89	
Military		3	17.91	2.48 129.09	
Farming, Agriculture, & Forestry		3	7.79	2.18 27.85	
Laborers		5	7.38	2.69 20.26	
Machine operators & tenders		4	6.32	2.21 18.14	
Professional specialists		4	2.60	0.96 7.01	
Sales		3	7.30	2.27 23.49	

Table 2.4 continued.

Group/cancer site	Occupation	Deaths	SRR	95% CI
Native-American Men				
MN-oral cavity, & pharynx	Construction trades ;	4	5.75	2.11 15.68
MN-stomach	Farming, Agriculture, & Forestry	3	23.05	7.32 72.59
	Construction trades	3	5.90	1.86 18.66
MN-colon	Farming, Agriculture, & Forestry	6	16.54	6.34 43.17
	Executives, administrators, managers	4	6.74	2.28 19.91
	Precision production workers	4	5.40	1.94 15.00
	Laborers	3	2.05	0.66 6.39
MN-rectum	Construction trades	5	17.11	7.01 41.72
MN-liver and intrahepatic bile ducts	Construction trades	4	11.88	4.39 32.12
	Laborers	3	8.13	2.58 25.56
MN-pancreas	Farming, Agriculture, & Forestry	3	12.03	3.71 39.00
	Executives, administrators, managers	3	6.86	2.21 21.31
MN-trachea, bronchus and lung	Extractive occupations	4	21.40	7.28 62.94
	Fabricators, assemblers & hand workers	5	11.83	4.51 31.05
	Sales	8	10.86	5.42 21.76
	Farming, Agriculture, & Forestry	19	8.92	5.27 15.12
	Administrative support & clerical	4	8.85	3.26 24.07
	Fishing & hunting	3	8.63	2.55 29.18
	Machine operators & tenders	8	6.79	3.35 13.77
	Professional specialists	7	6.72	3.09 14.63
	Mechanics & repairers	10	3.75	2.01 6.98
	Precision production workers	15	3.68	2.18 6.23
	Oth transportation & material moving occs	3	2.23	0.68 7.27
	Services	10	2.22	1.13 4.35
	Executives, administrators, managers	7	2.10	0.99 4.45
MN-prostate	Mechanics & repairers	3	21.60	6.49 71.85
MN-kidney & other/unspec urinary organs	Farming, Agriculture, & Forestry	4	16.42	6.06 44.51
	Laborers	3	5.59	1.79 17.50
MN-brain	Services	4	14.01	4.83 40.63
	Construction trades	3	4.08	1.31 12.71
Other lymphatic neoplasms	Laborers	3	6.38	1.91 21.35
All Leukemias	Professional specialists	3	19.51	5.86 64.89

Group/cancer site	Occupation	Deaths	SRR	95% CI
MN-ill-defined & unspecified	Professional specialists	4	19.08	6.75 53.89
	Farming, Agriculture, & Forestry	4	10.95	3.91 30.67
	Services	6	5.56	2.43 12.74
	Laborers	3	2.70	0.81 8.99

Table 2.4 continued.

Group/cancer site	Occupation	Deaths	SRR	95% CI
African-American Women MN-oral cavity, & pharynx	Farming, Agriculture, & Forestry	7	105.10	12.76 865.77
	Administrative support & clerical	24	3.74	2.37 5.93
	Laborers	9	3.52	1.57 7.86
	Services	81	2.78	2.08 3.73
	Machine operators & tenders	16	2.46	1.37 4.42
	Sales	8	9.75	4.44 21.40
	Laborers	13	7.51	3.41 16.53
	Machine operators & tenders	29	6.63	3.83 11.47
	Services	116	6.20	4.60 8.36
	Executives, administrators, managers	9	4.12	2.03 8.36
	Professional specialists	20	3.77	2.27 6.28
	Administrative support & clerical	15	3.49	2.00 6.08
	Technicians and related support workers	4	2.41	0.77 7.58
MN-stomach	Fabricators, assemblers & hand workers	4	2.38	0.76 7.45
	Farming, Agriculture, & Forestry	5	42.59	9.79 185.19
	Fabricators, assemblers & hand workers	6	4.61	1.65 12.86
	Sales	12	4.61	2.47 8.57
	Inspectors, testers, samplers, & weighers	4	3.60	1.02 12.71
	Laborers	10	3.59	1.67 7.73
	Professional specialists	33	3.33	2.24 4.95
	Technicians and related support workers	7	3.16	1.28 7.81
	Administrative support & clerical	29	2.87	1.91 4.32
	Services	108	2.87	2.22 3.72
	Machine operators & tenders	33	2.45	1.63 3.69
	Executives, administrators, managers	9	2.13	1.06 4.28
	Administrative support & clerical	5	4.09	1.47 11.37
MN-small intestine MN-colon	Farming, Agriculture, & Forestry	10	5.03	2.31 10.93
	Mechanics & repairers	3	4.32	1.25 14.97
	Other handlers & cleaners	6	3.32	1.29 8.52
	Precision production workers	23	3.01	1.85 4.93
	Sales	36	2.75	1.94 3.91
	Technicians and related support workers	47	2.47	1.77 3.45

Group/cancer site	Occupation	Deaths	SRR	95% CI	
MN-rectum	Administrative support & clerical	122	2.44	2.01 2.97	
	Motor Vehicle Operators	6	2.35	0.93 5.96	
	Fabricators, assemblers & hand workers	21	2.27	1.38 3.72	
	Professional specialists	142	2.24	1.87 2.68	
	Laborers	36	2.19	1.50 3.19	
	Farming, Agriculture, & Forestry	3	23.73	3.79 148.46	
	Inspectors, testers, samplers, & weighers	5	14.38	3.79 54.54	
	Technicians and related support workers	5	5.09	1.61 16.13	
	Professional specialists	28	3.11	2.03 4.78	
	Inspectors, testers, samplers, & weighers	3	7.41	1.74 31.54	
MN-liver and intrahepatic bile ducts	Precision production workers	3	3.45	0.95 12.56	
	Professional specialists	21	2.67	1.65 4.34	
	Sales	5	2.28	0.88 5.88	
	Administrative support & clerical	17	2.14	1.22 3.76	
	Services	49	2.03	1.42 2.90	
	Farming, Agriculture, & Forestry	5	14.20	4.53 44.52	
	Freight, stock, and materials handlers	5	6.16	2.23 17.07	
	Motor Vehicle Operators	3	5.66	1.49 21.50	
	Sales	22	3.33	2.14 5.20	
	Administrative support & clerical	62	2.70	2.06 3.55	
MN-pancreas	Precision production workers	10	2.50	1.27 4.95	
	Services	217	2.40	2.01 2.86	
	Professional specialists	75	2.21	1.72 2.83	
	Laborers	14	2.10	1.16 3.82	
	Professional specialists	6	3.36	1.34 8.43	
	Services	36	2.81	1.81 4.36	
	Construction trades	5	7.74	2.95 20.29	
	Farming, Agriculture, & Forestry	19	5.03	2.94 8.61	
	Mechanics & repairers	9	3.37	1.65 6.88	
	Motor Vehicle Operators	24	2.93	1.83 4.67	
MN-trachea, bronchus and lung	Precision production workers	59	2.08	1.56 2.77	
	Administrative support & clerical	277	2.02	1.78 2.29	
	Sales	3	23.87	5.00 113.97	
	Services	5	2.84	0.86 9.37	
	Machine operators & tenders	4	2.15	0.65 7.10	
	Laborers	5	6.45	2.00 20.76	
	MN-larynx	Administrative support & clerical	122	2.44	2.01 2.97
		Motor Vehicle Operators	6	2.35	0.93 5.96
		Fabricators, assemblers & hand workers	21	2.27	1.38 3.72
		Professional specialists	142	2.24	1.87 2.68
Laborers		36	2.19	1.50 3.19	
Farming, Agriculture, & Forestry		3	23.73	3.79 148.46	
Inspectors, testers, samplers, & weighers		5	14.38	3.79 54.54	
Technicians and related support workers		5	5.09	1.61 16.13	
Professional specialists		28	3.11	2.03 4.78	
Inspectors, testers, samplers, & weighers		3	7.41	1.74 31.54	
MN-other parts of the respiratory system	Precision production workers	3	3.45	0.95 12.56	
	Professional specialists	21	2.67	1.65 4.34	
	Sales	5	2.28	0.88 5.88	
	Administrative support & clerical	17	2.14	1.22 3.76	
	Services	49	2.03	1.42 2.90	
	Farming, Agriculture, & Forestry	5	14.20	4.53 44.52	
	Freight, stock, and materials handlers	5	6.16	2.23 17.07	
	Motor Vehicle Operators	3	5.66	1.49 21.50	
	Sales	22	3.33	2.14 5.20	
	Administrative support & clerical	62	2.70	2.06 3.55	
MN-bone	Precision production workers	10	2.50	1.27 4.95	
	Services	217	2.40	2.01 2.86	
	Professional specialists	75	2.21	1.72 2.83	
	Laborers	14	2.10	1.16 3.82	
	Professional specialists	6	3.36	1.34 8.43	
	Services	36	2.81	1.81 4.36	
	Construction trades	5	7.74	2.95 20.29	
	Farming, Agriculture, & Forestry	19	5.03	2.94 8.61	
	Mechanics & repairers	9	3.37	1.65 6.88	
	Motor Vehicle Operators	24	2.93	1.83 4.67	
MN-connective and other soft tissue	Precision production workers	59	2.08	1.56 2.77	
	Administrative support & clerical	277	2.02	1.78 2.29	
	Sales	3	23.87	5.00 113.97	
	Services	5	2.84	0.86 9.37	
	Machine operators & tenders	4	2.15	0.65 7.10	
	Laborers	5	6.45	2.00 20.76	

Group/cancer site	Occupation	Deaths	SRR	95% CI		
MN-other malignant neoplasm of the skin	Inspectors, testers, samplers, & weighers	4	5.55	1.65 18.72		
	Precision production workers	5	4.59	1.40 14.98		
	Sales	8	4.41	2.07 9.39		
	Executives, administrators, managers	8	2.38	1.12 5.03		
	Machine operators & tenders	15	2.36	1.25 4.46		
	Services	42	2.02	1.37 2.97		
	Professional specialists	3	3.69	0.97 14.11		
	Administrative support & clerical	3	2.77	0.83 9.28		
	Construction trades	5	7.24	2.44 21.42		
	Farming, Agriculture, & Forestry	25	6.15	3.74 10.12		
	Oth transportation & material moving occs	7	3.65	1.27 10.47		
	Mechanics & repairers	10	3.65	1.71 7.78		
	Freight, stock, and materials handlers	10	3.01	1.53 5.92		
	Motor Vehicle Operators	22	2.88	1.71 4.84		
	MN-breast	Inspectors, testers, samplers, & weighers	53	2.87	2.03 4.05	
Sales		134	2.66	2.21 3.19		
Other handlers & cleaners		14	2.49	1.32 4.70		
Precision production workers		60	2.36	1.76 3.15		
Laborers		107	2.08	1.67 2.58		
Fabricators, assemblers & hand workers		63	2.03	1.52 2.73		
Farming, Agriculture, & Forestry		19	28.49	12.76 63.61		
Freight, stock, and materials handlers		4	5.74	1.88 17.53		
Precision production workers		20	5.48	3.15 9.56		
Sales		30	4.53	3.03 6.77		
Professional specialists		56	3.75	2.76 5.09		
Laborers		34	3.65	2.42 5.51		
Executives, administrators, managers		29	3.18	2.13 4.73		
Services		288	2.85	2.45 3.33		
MN-cervix uteri		Technicians and related support workers	13	2.70	1.42 5.11	
	Administrative support & clerical	58	2.47	1.83 3.33		
	Motor Vehicle Operators	6	2.40	0.93 6.16		
	Inspectors, testers, samplers, & weighers	9	2.21	1.00 4.89		
	Farming, Agriculture, & Forestry	4	83.46	9.29 750.08		
	Machine operators & tenders	14	2.46	1.32 4.58		
	Administrative support & clerical	15	2.31	1.34 3.98		
	Farming, Agriculture, & Forestry	4	3.23	0.97 10.76		
	MN-uterine corpus	Inspectors, testers, samplers, & weighers	4	83.46	9.29 750.08	
		Farming, Agriculture, & Forestry	14	2.46	1.32 4.58	
		Machine operators & tenders	15	2.31	1.34 3.98	
		Administrative support & clerical	4	3.23	0.97 10.76	
		MN-ovary and uterine adnexa	Inspectors, testers, samplers, & weighers	4	83.46	9.29 750.08
			Farming, Agriculture, & Forestry	14	2.46	1.32 4.58
			Machine operators & tenders	15	2.31	1.34 3.98
Administrative support & clerical			4	3.23	0.97 10.76	
Technicians and related support workers			13	2.70	1.42 5.11	
Administrative support & clerical			58	2.47	1.83 3.33	
Motor Vehicle Operators			6	2.40	0.93 6.16	
Inspectors, testers, samplers, & weighers			9	2.21	1.00 4.89	
Farming, Agriculture, & Forestry			4	83.46	9.29 750.08	
Machine operators & tenders			14	2.46	1.32 4.58	
Administrative support & clerical			15	2.31	1.34 3.98	
Farming, Agriculture, & Forestry	4		3.23	0.97 10.76		

Group/cancer site	Occupation	Deaths	SRR	95% CI
MN-other/unsp parts of uterus & other female genital organs	Farming, Agriculture, & Forestry	6	56.73	10.74 299.66
	Fabricators, assemblers & hand workers	9	5.72	2.41 13.55
	Sales	7	3.46	1.54 7.76
	Precision production workers	4	3.09	1.02 9.37
	Professional specialists	29	3.02	1.99 4.57
	Laborers	8	2.67	1.17 6.09
	Executives, administrators, managers	10	2.60	1.34 5.06
	Machine operators & tenders	24	2.55	1.57 4.14
	Services	83	2.44	1.84 3.25
	Executives, administrators, managers	4	3.56	1.25 10.14
MN-bladder	Services	41	2.81	1.86 4.25
	Administrative support & clerical	7	2.11	0.95 4.68
	Farming, Agriculture, & Forestry	3	7.18	1.79 28.80
	Precision production workers	6	3.69	1.48 9.21
	Inspectors, testers, samplers, & weighers	5	3.62	1.31 10.00
	Administrative support & clerical	24	2.17	1.39 3.36
	Technicians and related support workers	8	2.05	0.92 4.61
	Administrative support & clerical	4	3.81	1.26 11.47
	Inspectors, testers, samplers, & weighers	3	7.23	1.53 34.20
	Executives, administrators, managers	3	2.21	0.68 7.18
Other lymphatic neoplasms	Farming, Agriculture, & Forestry	3	7.39	1.68 32.52
	Motor Vehicle Operators	3	2.54	0.69 9.40
	Farming, Agriculture, & Forestry	5	16.73	4.41 63.56
	Motor Vehicle Operators	3	9.90	2.33 42.14
	Inspectors, testers, samplers, & weighers	7	6.68	2.43 18.32
	Machine operators & tenders	33	5.23	3.28 8.34
	Precision production workers	5	4.61	1.66 12.82
	Executives, administrators, managers	16	3.96	2.32 6.76
	Technicians and related support workers	11	3.94	1.88 8.27
	Administrative support & clerical	28	3.88	2.59 5.82
Multiple myeloma	Services	95	3.72	2.78 4.98
	Sales	8	3.68	1.79 7.58
	Fabricators, assemblers & hand workers	4	3.23	1.01 10.29
	Laborers	7	2.99	1.24 7.24
	Professional specialists	33	2.90	1.97 4.26

Group/cancer site	Occupation	Deaths	SRR	95% CI
Acute lymphocytic leukemia	Sales	3	2.60	0.75 8.98
Chronic lymphocytic leukemia	Administrative support & clerical	6	5.46	2.20 13.53
	Executives, administrators, managers	3	4.55	1.27 16.31
	Professional specialists	7	2.59	1.13 5.94
Acute myeloid leukemia	Fabricators, assemblers & hand workers	4	3.07	0.85 11.13
	Laborers	7	2.55	1.07 6.07
Chronic myeloid leukemia	Laborers	4	6.96	1.73 28.06
	Sales	3	5.29	1.58 17.66
	Executives, administrators, managers	5	3.01	1.17 7.79
	Administrative support & clerical	16	2.77	1.53 5.00
	Services	24	2.46	1.45 4.16
	Technicians and related support workers	4	2.12	0.70 6.38
Other leukemia	Technicians and related support workers	6	3.69	1.41 9.67
	Laborers	3	2.47	0.65 9.32
All Leukemias	Farming, Agriculture, & Forestry	4	2.87	0.88 9.34
	Fabricators, assemblers & hand workers	9	2.81	1.22 6.50
	Laborers	15	2.58	1.42 4.68
All other specified malignant neoplasms	Executives, administrators, managers	3	4.86	1.35 17.45
	Sales	3	4.49	1.18 17.00
	Services	14	2.84	1.38 5.83
MN-ill-defined & unspecified	Farming, Agriculture, & Forestry	16	15.53	7.34 32.86
	Freight, stock, and materials handlers	8	6.60	2.92 14.93
	Sales	32	3.15	2.18 4.56
	Administrative support & clerical	92	2.49	1.98 3.13
	Motor Vehicle Operators	4	2.48	0.76 8.10
	Professional specialists	87	2.15	1.70 2.72
	Precision production workers	11	2.14	1.09 4.22
	Technicians and related support workers	24	2.01	1.28 3.16

Table 2.4 continued.

Group/cancer site	Occupation	Deaths	SRR	95% CI
Asian Women				
MN-stomach	Precision production workers	3	21.77	6.46 73.33
	Administrative support & clerical	4	13.55	4.91 37.39
	Professional specialists	3	11.63	3.67 36.88
	Machine operators & tenders	5	11.50	4.63 28.53
	Services	6	5.51	2.43 12.50
MN-colon	Fabricators, assemblers & hand workers	3	14.26	4.21 48.31
	Precision production workers	3	5.72	1.77 18.42
	Administrative support & clerical	5	4.21	1.74 10.20
	Professional specialists	7	3.85	1.74 8.50
MN-liver and intrahepatic bile ducts	Fabricators, assemblers & hand workers	3	45.82	13.00 161.51
	Professional specialists	5	16.52	6.03 45.23
	Services	6	8.97	3.93 20.47
MN-pancreas	Executives, administrators, managers	3	7.21	2.04 25.45
MN-trachea, bronchus and lung	Technicians and related support workers	4	2.94	1.10 7.86
	Sales	8	2.06	1.00 4.24
MN-breast	Executives, administrators, managers	15	3.16	1.70 5.85
	Administrative support & clerical	14	2.67	1.57 4.56
	Technicians and related support workers	5	2.62	1.05 6.50
	Precision production workers	5	2.21	0.91 5.37
MN-cervix uteri	Executives, administrators, managers	4	7.96	2.36 26.82
	Machine operators & tenders	3	6.68	1.54 29.10
	Services	8	2.74	1.24 6.02
	Professional specialists	3	2.47	0.79 7.73
MN-ovary and uterine adnexa	Sales	4	5.11	1.86 14.01
MN-brain	Professional specialists	6	2.49	1.11 5.61
Other lymphatic neoplasms	Professional specialists	3	3.25	0.97 10.89
Acute myeloid leukemia	Services	3	3.75	1.18 11.87
All Leukemias	Executives, administrators, managers	3	3.20	1.02 10.03
	Professional specialists	3	2.14	0.62 7.34
MN-ill-defined & unspecified	Executives, administrators, managers	4	5.43	1.73 17.02
	Sales	4	4.95	1.80 13.61

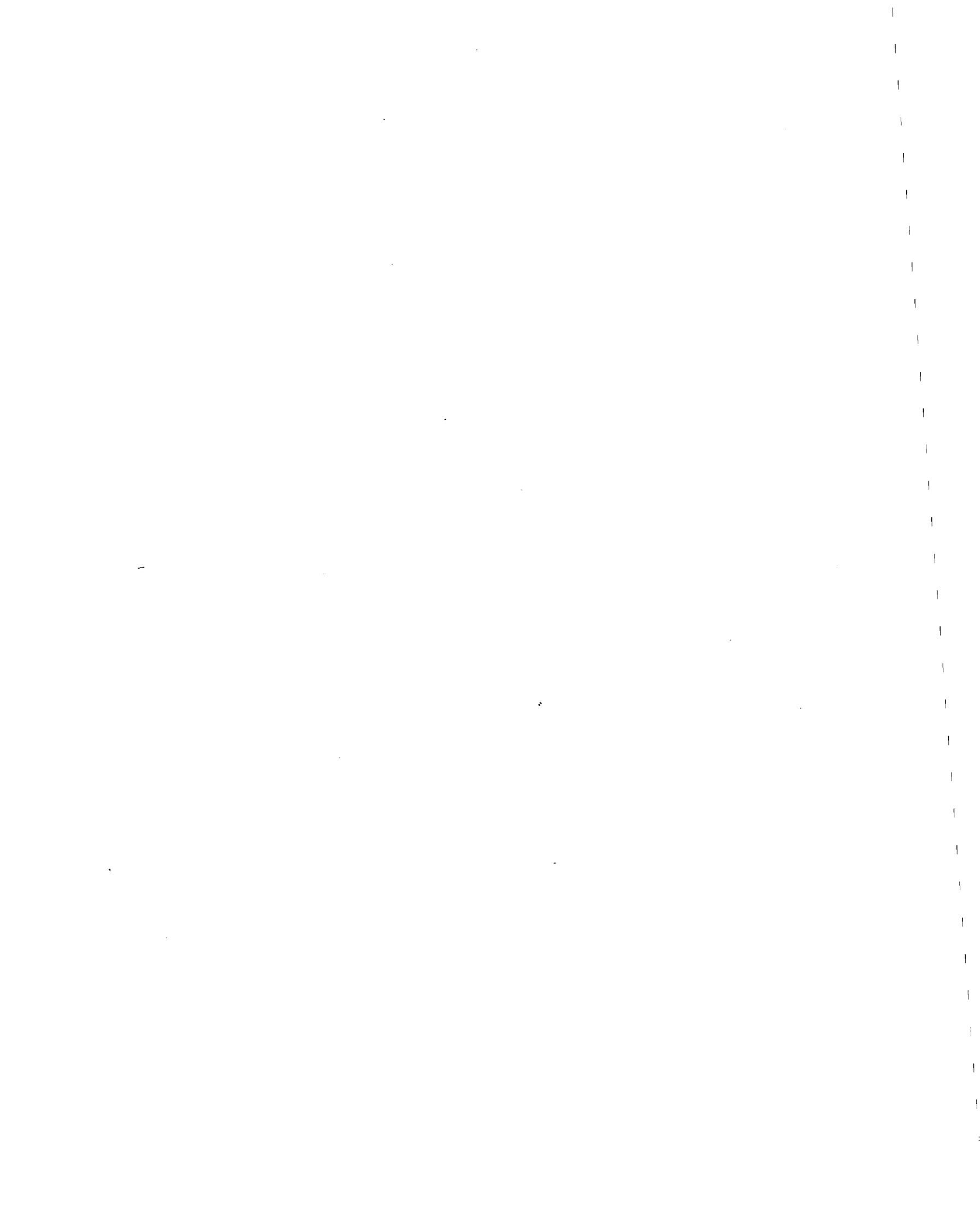
Table 2.4 continued.

Group/cancer site	Occupation	Deaths	SRR	95% CI
Latino Women MN-stomach	Sales	6	8.56	3.69 19.82
	Executives, administrators, managers	3	4.52	1.39 14.66
	Services	18	3.90	2.31 6.59
MN-colon	Administrative support & clerical	7	2.85	1.31 6.17
	Precision production workers	4	3.27	1.18 9.05
	Executives, administrators, managers	9	2.34	1.19 4.60
	Professional specialists	14	2.25	1.29 3.93
MN-liver and intrahepatic bile ducts	Machine operators & tenders	3	3.64	1.08 12.30
	Administrative support & clerical	4	2.88	1.04 7.97
MN-gall bladder and extrahepatic bile ducts	Administrative support & clerical	4	3.91	1.41 10.83
	Services	6	3.83	1.58 9.28
	Sales	8	4.26	2.08 8.71
MN-pancreas	Farming, Agriculture, & Forestry	3	15.62	4.90 49.82
	Executives, administrators, managers	3	2.85	0.84 9.70
MN-trachea, bronchus and lung Malignant melanoma of the skin MN-breast	Motor Vehicle Operators	6	10.76	4.52 25.60
	Technicians and related support workers	11	3.61	1.97 6.63
	Fabricators, assemblers & hand workers	10	3.46	1.73 6.91
	Precision production workers	13	2.69	1.54 4.71
	Executives, administrators, managers	34	2.16	1.52 3.07
	Precision production workers	4	8.59	2.32 31.88
	Executives, administrators, managers	7	4.49	2.07 9.71
	Professional specialists	7	3.81	1.79 8.12
	Administrative support & clerical	11	2.15	1.17 3.96
	Machine operators & tenders	8	2.14	1.00 4.56
	Services	27	2.11	1.40 3.17
MN-ovary and uterine adnexa	Technicians and related support workers	5	5.89	2.37 14.64
	Sales	8	2.67	1.30 5.49
	Precision production workers	4	2.63	0.95 7.23
MN-other/lunsp parts of uterus & other female genital organs	Laborers	3	2.49	0.79 7.86
	Executives, administrators, managers	5	7.70	3.03 19.58
	Machine operators & tenders	3	2.81	0.78 10.07

Group/cancer site	Occupation	Deaths	SRR	95% CI
MN-kidney & other/unspec urinary organs	Executives, administrators, managers	4	5.79	2.06 16.28
	Sales	3	2.77	0.88 8.70
MN-brain	Administrative support & clerical	5	2.21	0.90 5.44
	Executives, administrators, managers	4	2.44	0.88 6.72
Lymphosarcoma & reticulosarcoma	Services	3	3.81	1.11 13.09
	Administrative support & clerical	3	3.75	1.15 12.21
Other lymphatic neoplasms	Technicians and related support workers	3	7.68	2.39 24.66
	Sales	3	2.55	0.79 8.19
Multiple myeloma	Machine operators & tenders	3	2.84	0.88 9.21
	Professional specialists	4	3.22	1.19 8.73
Acute myeloid leukemia	Professional specialists	3	5.31	1.67 16.93
	Professional specialists	3	3.67	1.16 11.66
Chronic myeloid leukemia	Services	4	2.39	0.80 7.11
	Executives, administrators, managers	6	4.79	2.06 11.16
Other leukemias	Professional specialists	12	4.10	2.23 7.52

Table 2.4 continued.

Group/cancer site	Industry	Deaths	SRR	95% CI	
Native American Women	MN-stomach	4	56.69	20.41 157.49	
	MN-colon	5	9.16	3.46 24.27	
		3	7.20	2.32 22.39	
	MN-gall bladder and extrahepatic bile ducts	3	6.20	1.97 19.51	
		9	4.16	2.02 8.57	
	MN-pancreas	3	12.94	4.04 41.49	
		3	13.47	4.32 41.96	
	MN-trachea, bronchus and lung	3	2.06	0.66 6.43	
		5	26.21	10.51 65.34	
	MN-connective and other soft tissue	Executives, administrators, managers Services	3	7.35	2.27 23.80
			13	5.72	3.29 9.95
		Professional specialists	3	3.16	1.02 9.82
3			2.78	0.90 8.63	
Machine operators & tenders Services		3	23.08	6.95 76.61	
		3	48.22	15.03 154.69	
Professional specialists		10	5.17	2.71 9.86	
		7	4.60	1.89 11.20	
Laborers		6	3.49	1.55 7.85	
		8	2.06	0.98 4.34	
Sales		5	17.01	6.99 41.42	
		4	11.47	3.96 33.22	
Administrative support & clerical		11	8.83	4.65 16.76	
	3	7.74	2.48 24.17		
Farming, Agriculture, & Forestry	6	2.96	1.25 7.03		
	3	5.56	1.59 19.40		
Professional specialists	4	27.08	9.71 75.50		
	4	12.42	4.29 35.97		
Administrative support & clerical	3	7.38	2.24 24.27		
	6	7.24	3.06 17.16		
Professional specialists	6	19.32	8.38 44.53		
	3	6.11	1.93 19.36		
Machine operators & tenders Services	6	2.94	1.24 6.97		



Specific Aim 3: To identify, for each minority group, occupations and industries with greater than expected mortality from cancer relative to all workers in the same minority group.

For this aim, we present only PMRs, since all comparisons are internal to a single race or ethnic group. Here, we highlight PMRs >2 with 3 or more observed deaths. Groups for which the PMR estimate is particularly precise or the estimated risk is substantially elevated are discussed in further detail. Complete results are presented in the Appendix.

Industries

Results by industry are presented in Table 3.1. Compared to African-American men in all industries, African-American men in the military (PMR=7.93) experienced greatly elevated thyroid cancer proportionate mortality. African-American men in personal services (PMR=6.70) experienced elevated proportionate mortality from cancer of the penis. African-American males in printing and publishing (PMR=3.80) experienced elevated brain cancer proportionate mortality.

Asian men in professional and related services (PMR=4.12) experienced elevated proportionate mortality from acute myeloid leukemia compared to Asian men in all industries. Asian men in finance, insurance and real estate (PMR=3.73) experienced elevated colon cancer proportionate mortality.

Latino men in the military (PMR=6.79) experienced elevated proportionate mortality from acute lymphocytic leukemia compared to Latino men in all industries. All leukemias were elevated among Latino men in chemical and allied product manufacturing (PMR=4.24). Latino men in metal industries (PMR=5.27) experienced elevated testicular cancer proportionate mortality.

Compared to Native American men in all industries, Native American men in food and tobacco manufacturing (PMR=7.27) experienced greatly elevated colon cancer proportionate mortality. Native American men in retail trade (PMR=6.42) experienced elevated proportionate mortality from other lymphatic neoplasms.

African-American women and African-American men experienced excess proportionate mortality for difference cancers and different industries. African-American women in finance, insurance, and real estate (PMR=6.67) experienced elevated proportionate mortality from lymphosarcoma and reticulosarcoma. African-American women in stone, clay, glass, and concrete products manufacturing (PMR=5.82) experienced elevated oral cavity and pharyngeal cancer proportionate mortality. African-American women in this industry also experienced elevated proportionate mortality from all leukemia (PMR=4.28). African-American women in machinery and transportation equipment manufacturing (PMR=5.97) experienced elevated malignant melanoma proportionate mortality. Other lymphatic neoplasms were elevated among African-American women in paper and allied products manufacturing (PMR=5.20).

Among Asian women in different industries, the most notable result was for those in public administration; their brain cancer proportionate mortality was elevated (PMR=6.81) compared to Asian women in all industries.

Compared to Latino women in all industries, Latino women in public administration (PMR=6.80) experienced elevated chronic myeloid leukemia mortality. Latino women in rubber and miscellaneous plastic manufacturing (PMR=3.25) experienced elevated proportionate mortality from breast cancer. Breast cancer proportionate mortality was also elevated among Native American women in entertainment and recreation services (PMR=3.46) when compared to Native American women in all industries.

Occupations

Occupation-specific findings are shown in Table 3.2. Compared to African-American men in all occupations, African-American male technicians and related support workers (PMR=7.14) experienced elevated proportionate mortality for cancer of the small intestine. African-American male inspectors, testers, samplers, and weighers experienced elevated proportionate mortality of two cancers- rectal cancer (PMR=4.10) and liver cancer (PMR=3.96). African-American men in the military (PMR=8.17) experienced highly elevated proportionate mortality for thyroid cancer, and African-American salesmen (PMR=18.46) had extremely elevated cancer of the pleura. Each of the elevated PMRs cited above is based on between 3 and 7 observed cases. In contrast, two elevated PMRs are noteworthy for their impact in terms of excess deaths. African-American male professional specialists (PMR=2.56) experienced ten excess bladder cancer deaths, while African-American salesmen (PMR=2.56) experienced 12 excess brain cancer deaths.

Latino male technicians and related support workers (PMR=12.44) experienced extremely elevated proportionate mortality due to connective and other soft tissue cancer mortality compared to Latino men in all occupations. Latino males in the military (PMR=6.74) experienced highly elevated proportionate mortality due to acute lymphocytic leukemia. Prostate cancer proportionate mortality was elevated for Latino male executives, administrators, and managers (PMR=2.77). Latino males inspectors, testers, samplers, and weighers experienced elevated proportionate mortality due to two cancers- stomach cancer (PMR=4.84) and ill defined and unspecified malignant neoplasms (PMR=5.80).

Compared to African-American women in all occupations, African-American women inspectors, testers, samplers, and weighers experienced notably elevated proportionate mortality due to two cancers- rectal cancer (PMR=3.74) and Hodgkins disease (PMR=5.98). Lymphosarcoma and reticulosarcoma were elevated among African-American women administrative support and clerical workers (PMR=3.08).

Latino women professional specialists (PMR=2.91) experienced elevated proportionate mortality due to all leukemias compared to Latino women in all occupations. Compared to Asian women in all occupations, Asian women fabricators, assemblers, and hand workers (PMR=6.19) experienced elevated proportionate mortality due to liver cancer. Native American women executives, administrators, and managers (PMR=5.75) experienced elevated stomach cancer proportionate mortality compared to Native American women in all occupations.

Table 3.1. Proportionate mortality ratios (PMRs) and 95% confidence intervals (CIs) comparing minority workers in specific industries to all workers of the same race/ethnic group. Ages 20-64, PMRs directly adjusted for age. Selected results with PMR > 2.0 and >2 deaths.

Group/Cancer Site	Industry	Deaths	PMR	95% CI
African-American Men				
MN-oral cavity, & pharynx	Leather mfg	3	2.35	0.78 7.09
MN-esophagus	Petroleum & coal products mfg	6	2.90	1.31 6.40
MN-small intestine	Public administration	8	3.02	1.43 6.37
	Military	3	2.77	0.87 8.87
MN-liver and intrahepatic bile ducts	Rubber & misc plastics mfg	5	2.52	1.05 6.09
	Printing & publishing	4	2.08	0.78 5.59
MN-gall bladder and extrahepatic bile ducts	Chemical & allied product mfg	3	3.12	0.95 10.26
MN-peritoneum & other/unspec digestive organs	Machinery & transportation equipment mfg	5	2.08	0.82 5.25
MN-nasal cavity	Other manufacturing	4	4.24	1.45 12.42
MN-bone	Military	3	2.22	0.65 7.52
MN-connective and other soft tissue	Chemical & allied product mfg	3	2.14	0.67 6.78
	Public administration	12	2.07	1.14 3.76
Malignant melanoma of the skin	Personal Services	3	2.87	0.86 9.50
	Metal Industries	3	2.06	0.63 6.75
Other malignant neoplasm of the skin	Paper & allied products mfg	4	4.41	1.64 11.90
MN-breast	Food & tobacco mfg	3	4.73	1.42 15.72
	Machinery & transportation equipment mfg	4	2.87	0.99 8.34
MN-testis	Professional & related services	3	2.23	0.64 7.77
MN-penis & other male genital organs	Personal Services	4	6.70	2.20 20.43
	Construction	6	2.48	0.96 6.44
MN-bladder	Wholesale trade	7	2.67	1.26 5.65
	Paper & allied products mfg	3	2.15	0.67 6.83
MN-kidney & other/unspec urinary organs	Printing & publishing	5	2.28	0.92 5.62
MN-brain	Printing & publishing	6	3.80	1.67 8.68
MN-thyroid gland	Military	3	7.93	2.30 27.26
Lymphosarcoma & reticulosarcoma	Finance, insurance, & real estate	3	2.89	0.83 10.10
	Machinery & transportation equipment mfg	7	2.70	1.22 5.95
Hodgkin's disease	Chemical & allied product mfg	3	2.86	0.89 9.20
	Textile & apparel mfg	5	2.01	0.79 5.14
Multiple myeloma	Mining	4	2.65	1.00 7.01
Acute lymphocytic leukemia	Business & repair services	4	2.01	0.70 5.80

Group/Cancer Site	Industry	Deaths	PMR	95% CI
Acute myeloid leukemia	Paper & allied products mfg	3	3.30	1.06 10.30
	Textile & apparel mfg	10	2.34	1.19 4.60
	Wholesale trade	4	2.01	0.71 5.65
	Stone,clay,glass,concrete products mfg	5	3.52	1.43 8.65
	Textile & apparel mfg	9	2.72	1.34 5.51
	Wholesale trade	4	2.13	0.76 5.95
	Chemical & allied product mfg	4	2.12	0.78 5.76
	Rubber & misc plastics mfg	7	2.79	1.32 5.91
	Paper & allied products mfg	7	2.25	1.07 4.74
	Mining	3	2.05	0.66 6.37
All other specified malignant neoplasms	Other manufacturing	3	4.71	1.43 15.55
	Personal Services	4	3.78	1.29 11.08
Asian Men				
MN-esophagus	Machinery & transportation equipment mfg	3	3.35	0.96 11.63
	Wholesale trade	3	2.27	0.73 7.02
	Finance, insurance, & real estate	5	3.73	1.53 9.11
MN-stomach	Agriculture, forestry, and fisheries	4	2.14	0.79 5.79
	Public administration	4	2.00	0.73 5.45
	Lumber, wood products, furniture mfg	3	3.22	0.88 11.72
MN-liver and intrahepatic bile ducts	Textile & apparel mfg	5	2.41	0.99 5.82
	Personal Services	10	2.18	1.16 4.08
	Other manufacturing	7	2.14	1.02 4.51
MN-kidney & other/unspec urinary organs	Personal Services	3	4.50	1.17 17.25
	Business & repair services	3	2.46	0.72 8.37
	Retail trade	4	2.81	0.80 9.87
Other lymphatic neoplasms	Professional & related services	7	3.98	1.47 10.81
	Professional & related services	3	2.44	0.61 9.83
	Public administration	3	2.70	0.89 8.24
Acute lymphocitic leukemia	Professional & related services	12	2.26	1.13 4.50
	Food & tobacco mfg	3	5.07	1.46 17.55
	Personal Services	5	2.55	0.95 6.84
All Leukemias	Other manufacturing	5	2.54	0.98 6.59
	Food & tobacco mfg	4	2.40	0.89 6.46
Latino Men				
MN-oral cavity, & pharynx	Other manufacturing	5	2.54	0.98 6.59
	Food & tobacco mfg	4	2.40	0.89 6.46

Group/Cancer Site	Industry	Deaths	PMR	95% CI
MN-stomach	Military	3	2.11	0.67 6.60
	Lumber, wood products, furniture mfg	6	3.45	1.48 8.05
	Stone,clay,glass,concrete products mfg	3	2.29	0.72 7.28
MN-colon	Finance, insurance, & real estate	9	2.84	1.47 5.48
MN-liver and intrahepatic bile ducts	Entertainment & recreation services	3	2.70	0.86 8.47
	Public administration	15	2.14	1.25 3.68
	Military	4	2.09	0.77 5.61
MN-gall bladder and extrahepatic bile ducts	Transportation, communication & utilities	3	3.00	0.82 10.94
MN-pancreas	Wholesale trade	6	2.98	1.33 6.69
MN-larynx	Personal Services	3	2.62	0.72 9.48
	Public administration	5	2.28	0.89 5.84
MN-connective and other soft tissue	Food & tobacco mfg	4	4.47	1.46 13.71
Malignant melanoma of the skin	Business & repair services	6	3.05	1.12 8.29
Other malignant neoplasm of the skin	Agriculture, forestry, and fisheries	4	2.53	0.85 7.49
MN-prostate	Entertainment & recreation services	3	3.41	1.11 10.46
MN-testis	Metal Industries	3	5.27	1.54 18.07
MN-bladder	Metal Industries	3	3.26	0.97 10.91
MN-brain	Printing & publishing	3	3.63	1.09 12.05
	Entertainment & recreation services	4	2.35	0.70 7.83
	Public administration	12	2.08	1.13 3.83
Lymphosarcoma & reticulosarcoma	Public administration	3	3.48	0.98 12.41
Hodgkin's disease	Professional & related services	5	2.94	1.07 8.08
Hodgkin's disease	Public administration	3	2.40	0.71 8.10
Other lymphatic neoplasms	Finance, insurance, & real estate	7	2.34	0.98 5.57
	Mining	5	2.03	0.82 5.04
Acute lymphocitic leukemia	Military	3	6.79	1.91 24.13
	Public administration	3	2.94	0.87 9.95
	Agriculture, forestry, and fisheries	4	2.16	0.69 6.76
Acute myeloid leukemia	Professional & related services	4	2.09	0.69 6.32
	Agriculture, forestry, and fisheries	4	2.09	0.66 6.62
Chronic myeloid leukemia	Machinery & transportation equipment mfg	3	3.99	1.21 13.14
	Public administration	4	2.77	0.96 7.98
All Leukemias	Chemical & allied product mfg	5	4.24	1.66 10.82
	Military	6	2.93	1.26 6.84
	Wholesale trade	4	2.76	1.03 7.41
	Mining	6	2.27	0.97 5.28

Group/Cancer Site	Industry	Deaths	PMR	95% CI
All other specified malignant neoplasms	Construction	4	2.85	0.73 11.12
MN-ill-defined & unspecified	Rubber & misc plastics mfg	3	2.27	0.75 6.85
	Wholesale trade	6	2.15	0.98 4.71
Native American Men				
MN-esophagus	Professional & related services	4	3.62	1.24 10.55
MN-colon	Food & tobacco mfg	3	7.27	2.28 23.17
MN-liver and intrahepatic bile ducts	Construction	7	2.37	0.95 5.95
MN-pancreas	Transportation, communication & utilities	3	2.26	0.66 7.70
MN-trachea, bronchus and lung	Wholesale trade	5	3.10	1.41 6.84
	Metal industries	8	2.25	1.21 4.18
MN-prostate	Lumber, wood products, furniture mfg	3	4.32	1.27 14.72
MN-brain	Public administration	4	3.62	1.21 10.84
Other lymphatic neoplasms	Retail trade	3	6.42	1.57 26.27
Multiple myeloma	Professional & related services	3	5.74	1.50 21.91
MN-ill-defined & unspecified	Machinery & transportation equipment mfg	4	3.17	1.16 8.69

Table 3.1 continued.

Group/Cancer	Industry	Deaths	PMR	95% CI
African-American Women				
MN-oral cavity, & pharynx	Stone, clay, glass, concrete products mfg	3	5.82	1.86 18.24
	Agriculture, forestry, and fisheries	8	2.32	1.14 4.69
MN-stomach	Wholesale trade	4	4.06	1.48 11.16
	Entertainment & recreation services	4	2.56	0.92 7.13
MN-colon	Rubber & misc plastics mfg	6	2.03	0.90 4.57
MN-rectum	Chemical & allied product mfg	3	3.72	1.15 12.00
MN-gall bladder and extrahepatic bile ducts	Finance, insurance, & real estate	4	3.46	1.14 10.48
MN-larynx	Business & repair services	5	2.72	1.09 6.79
MN-trachea, bronchus and lung	Petroleum & coal products mfg	3	2.16	0.87 5.35
	Finance, insurance, & real estate	3	4.94	1.38 17.76
MN-other parts of the respiratory system	Retail trade	4	2.68	0.85 8.42
MN-bone	Textile & apparel mfg	5	3.18	1.20 8.42
MN-connective and other soft tissue	Machinery & transportation equipment mfg	8	2.51	1.21 5.22
	Food & tobacco mfg	8	2.26	1.10 4.63
Malignant melanoma of the skin	Machinery & transportation equipment mfg	3	5.97	1.69 21.15
MN-uterine corpus	Finance, insurance, & real estate	4	2.16	0.78 6.01
MN-ovary and uterine adnexa	Printing & publishing	5	2.51	0.98 6.44
	Machinery & transportation equipment mfg	24	2.13	1.40 3.24
	Chemical & allied product mfg	7	2.11	0.97 4.58
MN-other/unsp parts of uterus & other female genital organs	Metal Industries	3	2.28	0.69 7.50
MN-bladder	Transportation, communication & utilities	4	2.59	0.92 7.27
MN-kidney & other/unspec urinary organs	Entertainment & recreation services	3	3.26	1.00 10.67
Lymphosarcoma & reticulosarcoma	Finance, insurance, & real estate	4	6.67	1.89 23.57
	Public administration	3	2.53	0.73 8.81
Other lymphatic neoplasms	Paper & allied products mfg	3	5.20	1.72 15.75
	Metal Industries	3	2.35	0.73 7.54
	Finance, insurance, & real estate	10	2.16	1.02 4.54
Multiple myeloma	Metal Industries	4	2.17	0.78 6.09
Acute lymphocytic leukemia	Finance, insurance, & real estate	3	3.38	1.00 11.41
Chronic lymphocytic leukemia	Machinery & transportation equipment mfg	3	2.65	0.77 9.19
Acute myeloid leukemia	Textile & apparel mfg	12	2.18	1.17 4.07
Chronic myeloid leukemia	Machinery & transportation equipment mfg	5	2.45	0.94 6.41

Group/Cancer	Industry	Deaths	PMR	95% CI
All Leukemias	Stone,clay,glass,concrete products mfg	5	4.28	1.76 10.42
	Chemical & allied product mfg	4	2.26	0.83 6.12
All other specified malignant neoplasms	Public administration	4	2.73	0.95 7.84
MN-ill-defined & unspecified	Rubber & misc plastics mfg	5	2.01	0.80 5.01
Asian Women				
MN-oral cavity, & pharynx	Retail trade	4	3.91	1.01 15.15
MN-trachea, bronchus and lung	Finance, insurance, & real estate	4	2.26	0.91 5.61
MN-kidney & other/unspec urinary organs	Professional & related services	5	2.23	0.68 7.33
MN-brain	Public administration	3	6.81	2.06 22.47
Other lymphatic neoplasms	Professional & related services	4	2.71	0.79 9.24
MN-ill-defined & unspecified mn	Public administration	3	2.91	0.97 8.77
	Other manufacturing	3	2.05	0.68 6.21
Latino Women				
MN-oral cavity, & pharynx	Public administration	3	4.53	1.20 17.09
MN-colon	Public administration	10	2.14	1.11 4.14
	Transportation, communication & utilities	5	2.06	0.86 4.96
MN-pancreas	Other manufacturing	5	2.77	1.11 6.89
MN-trachea, bronchus and lung	Agriculture, forestry, and fisheries	4	2.40	0.91 6.31
MN-breast	Rubber & misc plastics mfg	3	3.25	2.50 4.22
	Stone,clay,glass,concrete products mfg	3	2.38	0.87 6.53
MN-ovary and uterine adnexa	Finance, insurance, & real estate	6	2.37	0.99 5.67
	Other manufacturing	6	2.34	1.04 5.27
MN-kidney & other/unspec urinary organs	Finance, insurance, & real estate	4	4.62	1.50 14.25
Other lymphatic neoplasms	Machinery & transportation equipment mfg	3	4.19	1.22 14.44
Chronic myeloid leukemia	Public administration	3	6.80	1.80 25.68
All Leukemias	Public administration	5	2.11	0.80 5.54
Native American Women				
MN-stomach	Personal Services	5	2.55	0.91 7.12
MN-trachea, bronchus and lung	Machinery & transportation equipment mfg	3	3.06	1.06 8.80
	Food & tobacco mfg	3	2.43	0.89 6.62
MN-connective and other soft tissue	Public administration	3	5.41	1.25 23.37
MN-breast	Entertainment & recreation services	4	3.46	1.51 7.90
MN-ovary and uterine adnexa	Textile & apparel mfg	3	2.63	0.80 8.65

Group/Cancer	Industry	Deaths	PMR	95% CI
MN-ill-defined & unspecified	Retail trade	3	2.08	0.61 7.09
	Other manufacturing	3	2.75	0.78 9.69

Table 3.2. Proportionate mortality ratios (PMRs) and 95% confidence intervals (CIs) comparing minority workers in specific occupations to all workers of the same race/ethnic group. Ages 20-64, PMRs directly adjusted for age. Selected results with PMR > 2.0 and >2 deaths.

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
African-American Men				
MN-oral cavity, & pharynx	Fishing & hunting	4	3.74	1.40 9.98
MN-stomach	Extractive occupations	4	2.50	0.96 6.53
MN-small intestine	Technicians and related support workers	3	7.14	2.04 24.99
	Military	3	2.86	0.89 9.16
	Freight, stock, and materials handlers	4	2.41	0.85 6.81
	Professional specialists	4	2.08	0.74 5.83
MN-rectum	Inspectors, testers, samplers, & weighers	4	4.10	1.54 10.95
	Technicians and related support workers	5	2.06	0.80 5.33
MN-liver and intrahepatic bile ducts	Inspectors, testers, samplers, & weighers	6	3.96	1.78 8.82
MN-gall bladder and extrahepatic bile ducts	Sales	4	3.16	1.12 8.89
	Fabricators, assemblers & hand workers	4	3.14	1.10 8.99
MN-peritoneum & other/unspec digestive organs	Administrative support & clerical	4	2.09	0.73 5.97
MN-nasal cavity	Precision production workers	4	3.22	1.13 9.16
MN-pleura	Sales	3	18.46	4.44 76.84
MN-other parts of the respiratory system	Machine operators & tenders	4	2.29	0.79 6.65
MN-bone	Freight, stock, and materials handlers	4	2.64	0.93 7.55
	Military	3	2.27	0.66 7.73
MN-connective and other soft tissue	Administrative support & clerical	13	2.65	1.46 4.82
	Technicians and related support workers	4	2.12	0.75 5.96
MN-other malignant neoplasm of the skin	Fabricators, assemblers & hand workers	6	2.06	0.89 4.78
MN-penis & other male genital organs	Construction trades	3	2.44	0.70 8.53
	Laborers	6	2.31	0.89 5.99
MN-bladder	Helpers	3	3.78	1.18 12.15
	Professional specialists	17	2.56	1.55 4.22
	Executives, administrators, managers	12	2.17	1.21 3.92
MN-brain	Sales	20	2.56	1.54 4.23
MN-thyroid gland	Military	3	8.17	2.37 28.12
Lymphosarcoma & reticulosarcoma	Fabricators, assemblers & hand workers	4	3.90	1.36 11.17
	Sales	3	2.89	0.84 9.93

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
MN-connective and other soft tissue	Technicians and related support workers	5	12.44	4.54 34.06
Malignant melanoma of the skin	Motor Vehicle Operators	3	2.32	0.68 7.88
Other malignant neoplasm of the skin	Machine operators & tenders	4	2.16	0.70 6.60
MN-prostate	Professional specialists	3	2.03	0.60 6.91
MN-testis	Farming, Agriculture, & Forestry	4	2.54	0.86 7.52
MN-kidney & other/unspec urinary organs	Executives, administrators, managers	13	2.77	1.56 4.92
MN-brain	Precision production workers	3	3.01	0.88 10.37
Hodgkin's disease	Sales	9	2.42	1.22 4.79
	Technicians and related support workers	5	3.46	1.25 9.57
	Executives, administrators, managers	4	3.15	1.05 9.47
	Professional specialists	3	2.04	0.60 7.00
Other lymphatic neoplasms	Motor Vehicle Operators	12	2.10	1.12 3.95
Multiple myeloma	Executives, administrators, managers	5	2.83	1.11 7.23
Acute lymphocytic leukemia	Military	3	6.74	1.89 24.01
Acute myeloid leukemia	Machine operators & tenders	4	2.01	0.68 5.92
Chronic myeloid leukemia	Farming, Agriculture, & Forestry	3	2.00	0.59 6.77
Other leukemia	Professional specialists	4	2.31	0.77 6.87
All Leukemias	Executives, administrators, managers	3	2.19	0.64 7.47
	Sales	3	2.16	0.58 8.01
	Mechanics & repairers	4	2.20	0.68 7.14
	Military	6	2.93	1.25 6.83
	Extractive occupations	3	2.11	0.67 6.58
All other specified malignant neoplasms	Construction trades	3	3.76	0.82 17.16
MN-ill-defined & unspecified	Inspectors, testers, samplers, & weighers	4	5.80	2.30 14.63
	Sales	18	2.12	1.30 3.47
Native American Men				
MN-colon	Executives, administrators, managers	4	2.96	1.02 8.61
	Precision production workers	4	2.58	0.90 7.39
MN-rectum	Construction trades	5	3.29	1.07 10.08
MN-liver and intrahepatic bile ducts	Construction trades	4	2.61	0.85 8.05
MN-pancreas	Executives, administrators, managers	3	4.17	1.24 14.04
MN-trachea, bronchus and lung	Sales	8	2.11	1.10 4.05
MN-prostate	Mechanics & repairers	3	3.61	0.97 13.38
MN-brain	Services	4	2.81	0.89 8.83
All Leukemias	Professional specialists	3	2.41	0.69 8.35

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
MN-ill-defined & unspecified	Services	6	2.78	1.18 6.57
	Professional specialists	4	2.68	0.94 7.59

Table 3.2. Continued.

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
African-American Women				
MN-oral cavity, & pharynx	Farming, Agriculture, & Forestry	7	2.01	0.94 4.27
MN-small intestine	Administrative support & clerical	5	2.14	0.74 6.19
MN-rectum	Inspectors, testers, samplers, & weighers	5	3.74	1.52 9.20
MN-liver and intrahepatic bile ducts	Inspectors, testers, samplers, & weighers	3	2.01	0.63 6.40
MN-pancreas	Freight, stock, and materials handlers	5	2.70	1.15 6.29
MN-trachea, bronchus and lung	Construction trades	5	2.45	1.09 5.50
	Mechanics & repairers	9	2.09	1.15 3.82
MN-other parts of the respiratory system	Sales	3	4.85	1.24 18.99
MN-connective and other soft tissue	Inspectors, testers, samplers, & weighers	4	2.78	1.02 7.61
	Precision production workers	5	2.00	0.82 4.90
MN-other/unsp parts of uterus & other female genital organs	Fabricators, assemblers & hand workers	9	2.50	1.26 4.96
MN-kidney & other/unspec urinary organs	Inspectors, testers, samplers, & weighers	5	2.58	1.05 6.33
MN-thyroid gland	Administrative support & clerical	4	2.68	0.87 8.32
Lymphosarcoma & reticulosarcoma	Administrative support & clerical	7	3.08	1.20 7.91
Hodgkin's disease	Inspectors, testers, samplers, & weighers	3	5.98	1.88 19.05
Other lymphatic neoplasms	Motor Vehicle Operators	3	2.21	0.61 8.06
Multiple myeloma	Inspectors, testers, samplers, & weighers	7	2.31	1.08 4.92
	Motor Vehicle Operators	3	2.01	0.59 6.88
Chronic lymphocytic leukemia	Executives, administrators, managers	3	2.27	0.67 7.68
Acute myeloid leukemia	Fabricators, assemblers & hand workers	4	2.60	0.94 7.21
Other leukemia	Technicians and related support workers	6	2.37	1.02 5.49
All other specified malignant neoplasms	Executives, administrators, managers	3	2.36	0.70 8.00
MN-ill-defined & unspecified	Freight, stock, and materials handlers	8	2.83	1.44 5.54
Asian Women				
MN-stomach	Precision production workers	3	2.35	0.70 7.93
MN-liver and intrahepatic bile ducts	Fabricators, assemblers & hand workers	3	6.19	2.02 18.91
MN-pancreas	Executives, administrators, managers	3	2.08	0.57 7.58
MN-ovary and uterine adnexa	Sales	4	2.21	0.73 6.71
MN-brain	Professional specialists	6	2.29	0.87 6.06
Other lymphatic neoplasms	Professional specialists	3	2.70	0.70 10.38
Acute myeloid leukemia	Services	3	2.09	0.53 8.23

Group/Cancer Site	Occupation	Deaths	PMR	95% CI
Latino Women				
MN-trachea, bronchus and lung	Farming, Agriculture, & Forestry	3	2.41	0.84 6.90
MN-malignant melanoma of the skin	Executives, administrators, managers	3	3.09	0.84 11.33
MN-breast	Motor Vehicle Operators	6	2.39	1.14 4.97
MN-kidney & other/unspec urinary organs	Executives, administrators, managers	4	2.23	0.73 6.84
MN-brain	Executives, administrators, managers	4	2.97	1.00 8.78
Other lymphatic neoplasms	Technicians and related support workers	3	2.47	0.77 7.93
Acute myeloid leukemia	Professional specialists	4	2.39	0.77 7.39
Chronic myeloid leukemia	Professional specialists	3	3.50	0.93 13.27
Other leukemias	Professional specialists	3	3.60	0.94 13.75
All Leukemias	Professional specialists	12	2.91	1.52 5.57
Native American Women				
MN-stomach	Executives, administrators, managers	4	5.75	1.77 18.61
MN-pancreas	Professional specialists	3	2.22	0.64 7.75
MN-trachea, bronchus and lung	Laborers	5	2.59	1.10 6.09
MN-connective and other soft tissue	Administrative support & clerical	13	2.17	1.22 3.87
MN-breast	Administrative support & clerical	3	3.93	0.86 17.88
MN-cervix uteri	Farming, Agriculture, & Forestry	3	2.14	0.76 6.02
Multiple myeloma	Machine operators & tenders	5	2.09	0.85 5.13
MN-ill-defined & unspecified	Administrative support & clerical	4	3.93	1.14 13.58
	Professional specialists	6	2.41	0.97 5.98

Specific Aim 4. To look for evidence of established or suspected cancer-occupation associations among minority workers.

To address this aim, we considered mortality due to cancers of the trachea, bronchus, and lung (International Classification of Diseases, Ninth Revision (ICD-9) code 162), pleura (ICD-9 163), peritoneum (ICD-9 158,159), bladder (ICD-9 188), malignant melanoma of the skin (ICD-9 172) and leukemia (ICD-9 204-208). These cancers have established associations with workplace exposures or specific occupations or industries and evidence that occupational exposures account for a substantial fraction of cases (Doll and Peto, 1981; Frumkin, 1995; IARC, 1987). We described mortality from each of the preceding cancers for each minority ethnic or racial group relative to the entire workforce, and then considered proportionate mortality for specific occupations and industries within each minority group, using all decedents in that same group as the referent. Here we highlight selected results for which the PMR was at least 2.0, at least three deaths were observed and the results are suggestive of an established association of cancer with an occupational agent. Complete results are presented in the Appendix.

The proportions of African-American workers who died from specific work-related cancers were low relative to the workforce as a whole (Table 4.1). Among Latinos, the proportionate mortality ratio was modestly elevated for cancer of the peritoneum among both women and men (Table 4.1). The PMR for cancer of the pleura was notably elevated among Latino women (PMR 2.94, 95% CI 0.71-12.16), but was based on only two deaths. PMRs for other cancers were unity or less among Latinos. Proportionate mortality from this group of cancers was generally low for Native Americans, as well (Table 4.1). The only exception was a PMR of 2.09 (95% CI 0.90-4.88) for cancer of the peritoneum among Native American women. Proportionate mortality from work-related cancers was expected or lower among Asian men, relative to all men (Table 4.1). In contrast, Asian women had elevated PMRs relative to all women for cancers of the pleura, peritoneum and bladder (Table 4.1). The numbers of deaths from these cancers were small among Native Americans and Asians, and for some categories there were no deaths.

Analyses using SRRs give a somewhat different impression than analyses with PMRs for workers under age 65 (Table 4.2). SRRs were suggestive of elevated mortality from a larger number of cancers among African-Americans relative to whites. This difference was particularly apparent among African-Americans, for whom no PMRs, but 6 SRRs, were greater than unity (Table 4.2). Associations that were particularly notable when SRRs were used include lung cancer mortality among African-American men (SRR 2.02, 95% CI 1.97-2.07) and bladder cancer mortality among African-American women (SRR 2.18, 95% CI 1.70-2.80). SRRs were also indicative of excess bladder cancer mortality among African-American men and Asian women (Table 4.2).

Selected PMRs for associations of work-related cancer with specific occupations among minority workers are shown in Table 4.3. Noteworthy associations are the excess of lung cancer among black women in construction trades, which is potentially related to asbestos or silica exposure, and excess lung and bladder cancer among black female motor vehicle operators, both potentially related to exposure to diesel exhaust. Also of interest are excess malignant melanoma of the skin among African-American men working in administrative support and clerical occupations, which may be related to acute, intermittent non-occupational sun exposure and elevated PMRs for

women working in agriculture and Latino men working in construction, which led to chronic, occupational sun exposure.

industry are shown in Table 4.4. Notable associations with industry include cancer among Latino men in the rubber industry, excess lung cancer among Native Americans in the stone, clay, glass and concrete product manufacturing industry, and excess bladder cancer among African-American men in rubber and plastics manufacturing. Bladder cancer and lung cancer in the rubber industry have been associated with exposure to aromatic amines and asbestos. Lung cancer in stone and clay products industries are associated with

associations of bladder cancer with occupation and industry in greater detail by examining subgroups within industries, in order to follow up observations of interest. The results of this analysis are presented in Table 4.5. Bladder cancer proportionately increased in several occupational groups among African American males and females as well as for Asian males in retail sales and Asian females in the personal

occupational groups within the metal industry- African American female laborers, African American male production workers, and Latino male machine operators and tenders- showed elevated bladder cancer proportionate (Table 4.5). Benzo(a)pyrene and more generally polycyclic aromatic hydrocarbon (PAH) exposure levels above those experienced by the general population are reported in the metal industry. Primary aluminum smelters and steel mills with high PAH levels would both be included in the metal industry (U.S. Bureau of the Census 1982). Both of these industries have been associated with increased risk of bladder cancer (Spinelli and others 1995), (Clavel and others 1994), (Spinelli and others 1991), (Spinelli and others 1989). In addition, African American female motor vehicle operators in the transportation, communications, and utilities industry experienced elevated bladder cancer risk. This risk was limited to all African American females. Both diesel and gasoline engine exhausts are known to be substantial sources of PAH emissions (IARC 1989).

Table 4.1 Proportionate mortality from selected work-related cancers among US minority workers relative to all US workers: all ages.

	Men			Women		
	N	PMR ^a	95% CI	N	PMR ^b	95% CI
African-Americans						
Lung	15960	0.95	0.94-0.97	4339	0.66	0.64-0.68
Pleura	25	0.39	0.25-0.59	3	0.29	0.09-0.93
Peritoneum	132	0.75	0.62-0.91	99	0.78	0.63-0.96
Melanoma of skin	66	0.10	0.08-0.13	65	0.18	0.14-0.24
Bladder	719	0.69	0.63-0.74	329	1.00	0.89-1.12
Leukemia	1142	0.71	0.67-0.76	654	0.66	0.61-0.72
Latinos						
Lung	1352	0.61	0.58-0.64	289	0.66	0.59- 0.74
Pleura	7	0.86	0.40-1.83	2	2.94	0.71-12.16
Peritoneum	33	1.42	1.00- 2.03	12	1.40	0.78- 2.51
Melanoma of skin	43	0.35	0.25-0.50	18	0.65	0.40-1.08
Bladder	116	0.77	0.59-0.74	24	1.09	0.72-1.65
Leukemia	217	0.79	0.68-0.91	74	0.96	0.75-1.22

Table 4.1 continued.

	Men			Women		
	N	PMR ^a	95% CI	N	PMR ^b	95% CI
Native Americans						
Lung	348	0.68	0.61-0.75	94	0.68	0.55-0.84
Pleura	0	0.00	-	0	0.00	-
Peritoneum	2	0.54	0.13-2.15	6	2.09	0.9-4.88
Melanoma of skin	6	0.31	0.13-0.71	2	0.11	0.03-0.42
Bladder	9	0.30	0.15-0.58	3	0.44	0.13-1.46
Leukemia	35	0.61	0.42-0.89	19	0.67	0.40-1.10
Asians						
Lung	308	0.79	0.71-0.89	94	1.02	0.81-1.28
Pleura	0	0.00	-	1	2.56	0.36-18.34
Peritoneum	4	0.96	0.35-2.61	3	2.00	0.54-7.41
Melanoma of skin	6	0.41	0.18-0.95	0	0.00	-
Bladder	24	0.96	0.64-1.44	7	1.85	0.85-4.03
Leukemia	46	0.88	0.65-1.20	20	1.00	0.55-1.81

^aProportionate mortality ratio, directly adjusted for age; referent group, all employed men.

^bProportionate mortality ratio, directly adjusted for age; referent group, all employed women.

Table 4.2a. Mortality rates and proportionate mortality from selected work-related cancers among minority men relative to all employed men: age <65

Group and cancer/site	SRR ^a	95% CI ^b	PMR ^c	95% CI		
African-Americans						
Bladder	1.34	1.15	1.56	0.59	0.50	0.69
Malignant melanoma of skin	0.11	0.08	0.16	0.04	0.03	0.06
Peritoneum	1.73	1.28	2.34	0.71	0.52	0.96
Pleura	0.58	0.27	1.24	0.23	0.11	0.50
Trachea, bronchus and lung	2.02	1.97	2.07	0.88	0.86	0.90
Latinos						
Bladder	0.43	0.28	0.67	0.52	0.33	0.81
Malignant melanoma of skin	0.26	0.18	0.38	0.22	0.14	0.33
Peritoneum	0.80	0.40	1.61	0.82	0.39	1.73
Pleura	0.23	0.03	1.67	0.23	0.03	1.61
Trachea, bronchus and lung	0.41	0.37	0.45	0.47	0.43	0.51
Native Americans						
Bladder	0.47	0.12	1.86	0.22	0.06	0.90
Malignant melanoma of skin	0.34	0.11	1.06	0.16	0.05	0.50
Peritoneum	0.00	-	-	0.00	-	-
Pleura	0.00	-	-	0.00	-	-
Trachea, bronchus and lung	1.21	1.02	1.43	0.52	0.44	0.61
Asians						
Bladder	0.34	0.13	0.91	0.61	0.23	1.65
Malignant melanoma of skin	0.07	0.02	0.31	0.13	0.03	0.54
Peritoneum	0.86	0.22	3.47	1.61	0.40	6.45
Pleura	0.00	-	-	-	-	-
Trachea, bronchus and lung	0.38	0.32	0.46	0.66	0.56	0.78

^aPMR, proportionate mortality ratio, directly standardized for age

^b95% CI, 95% confidence interval

^cSRR, directly-age standardized mortality rate ratio

Table 4.2b. Proportionate mortality and mortality rates from selected work-related cancers among minority women relative to all employed women: age <65

Group and cancer/site	SRR ^a	95% CI ^b	PMR ^c	95% CI		
African-Americans						
Bladder	2.18	1.70	2.80	1.01	0.79	1.29
Malignant melanoma of skin	0.14	0.09	0.21	0.06	0.04	0.09
Peritoneum	1.16	0.76	1.78	0.52	0.34	0.79
Pleura	0.81	0.19	3.42	0.37	0.09	1.58
Trachea , bronchus and lung	1.29	1.23	1.35	0.59	0.56	0.61
Latinos						
Bladder	0.73	0.33	1.65	0.90	0.39	2.11
Malignant melanoma of skin	0.29	0.15	0.54	0.31	0.16	0.59
Peritoneum	0.85	0.31	2.30	1.10	0.40	3.02
Pleura	1.87	0.25	13.87	2.65	0.36	19.59
Trachea , bronchus and lung	0.38	0.32	0.44	0.51	0.43	0.60
Native Americans						
Bladder	0.85	0.12	6.03	0.43	0.06	3.06
Malignant melanoma of skin	0.45	0.11	1.81	0.13	0.03	0.52
Peritoneum	4.95	1.56	15.69	2.42	0.77	7.61
Pleura	0.00	-	-	0.00	-	-
Trachea , bronchus and lung	1.16	0.88	1.53	0.55	0.42	0.72
Asians						
Bladder	1.12	0.28	4.49	1.48	0.37	5.93
Malignant melanoma of skin	0.00	-	-	0.00	-	-
Peritoneum	0.53	0.07	3.78	0.52	0.07	3.68
Pleura	4.55	0.61	33.66	5.41	0.73	39.95
Trachea , bronchus and lung	0.58	0.44	0.76	0.73	0.56	0.94

^aPMR, proportionate mortality ratio, directly standardized for age

^b95% CI, 95% confidence interval

^cSRR, directly-age standardized mortality rate ratio

Table 4.3. Selected proportionate mortality ratios (PMRs)^a and 95% confidence intervals (95% CIs) for work-related cancers and occupation.

Group	Sex	Outcome	Occupation	Obs ^b PMR ^c	95% CI
Black	female	MN-bladder	Motor Vehicle Operators	3	2.44 0.70, 8.45
Black	female	MN-malignant melanoma of the skin	Farming & agriculture	6	2.63 1.04, 6.68
Black	female	MN-trachea, bronchus and lung	Construction trades	8	2.05 1.06, 3.95
Black	female	MN-trachea, bronchus and lung	Motor Vehicle Operators	30	2.14 1.19, 3.82
Black	male	MN-malignant melanoma of the skin	Administrative support & clerical	6	2.76 1.11, 6.86
Black	male	MN-pleura	Sales	3	3.22 0.90, 11.56
Latino	female	MN-malignant melanoma of the skin	Sales	3	2.26 0.60, 8.51
Latino	female	MN-trachea, bronchus and lung	Farming & agriculture	8	2.40 1.24, 4.67
Latino	male	Leukemia	Other handlers & cleaners	3	3.99 1.05, 15.17
Latino	male	MN-bladder	Fabricators, assemblers & hand workers	4	2.82 1.01, 7.90
Latino	male	MN-malignant melanoma of the skin	Construction trades	5	2.05 0.77, 5.43
Latino	male	MN-peritoneum & other/unspec digestive organs	Motor Vehicle Operators	3	2.87 0.86, 9.57
Latino	male	MN-pleura	Services ¹	3	4.67 1.19, 18.37
Native American	female	MN-trachea, bronchus and lung	Fabricators, assemblers & hand workers	4	2.78 1.10, 7.07
Native American	female	MN-trachea, bronchus and lung	Inspectors, testers, samplers, & weighers	3	4.67 2.56, 8.54
Native American	male	Leukemia	Construction trades	6	2.09 0.76, 5.76
Native American	male	Leukemia	Extractive occupations	2	2.69 0.65, 11.04
Asian	female	Leukemia	Administrative support & clerical	2	2.67 0.42, 16.93
Asian	female	Leukemia	Precision production workers	3	6.34 1.52, 26.50
Asian	male	MN-bladder	Sales	5	2.13 0.81, 5.59

^aPMR ≥ 2.0 and observed deaths > 2 ^bObserved deaths^cProportionate mortality ratio directly adjusted for age using all deaths as the standard. Referent: all occupations within the same race/ethnic group.

Table 4.4. Selected proportionate mortality ratios (PMRs)^a and 95% confidence intervals (95% CIs) for work-related cancers and industry.

Group	Sex	Outcome	Occupation	Obs ^b PMR ^c	95% CI	
Black	female	MN-bladder	Metal Industries	4	2.74	0.95, 7.92
Black	female	MN-bladder	Wholesale trade	3	4.78	1.45, 15.79
Black	female	MN-malignant melanoma of the skin	Agriculture, forestry, and fisheries	6	2.63	1.04, 6.66
Black	female	MN-malignant melanoma of the skin	Machinery & transportation equipment mfg	4	2.59	0.85, 7.89
Black	female	MN-malignant melanoma of the skin	Transportation, communication & utilities	5	3.96	1.40, 11.22
Black	female	MN-peritoneum & other/unspec digestive organs	Transportation, communication & utilities	3	2.38	0.70, 8.02
Black	male	Leukemia	Rubber & misc plastics mfg	18	2.08	1.29, 3.35
Black	male	MN-malignant melanoma of the skin	Business & repair services	8	4.23	1.87, 9.56
Black	male	MN-peritoneum & other/unspec digestive organs	Business & repair services	9	2.48	1.21, 5.05
Black	male	MN-pleura	Other manufacturing	3	6.43	1.84, 22.50
Black	male	MN-pleura	Retail trade	5	2.61	0.93, 7.31
Black	male	MN-pleura	Public administration	3	2.01	0.60, 6.78
Latino	female	Leukemia	Chemical & allied product mfg	2	2.18	0.59, 8.10
Latino	female	MN-trachea, bronchus and lung	Agriculture, forestry, and fisheries	9	2.28	1.20, 4.34
Latino	female	MN-trachea, bronchus and lung	Printing & publishing	4	2.73	1.12, 6.62
Latino	male	Leukemia	Textile & apparel mfg	4	2.31	0.81, 6.58
Latino	male	Leukemia	Lumber, wood products, furniture mfg	5	2.03	0.81, 5.13
Latino	male	MN-bladder	Rubber & misc plastics mfg	3	6.68	2.11, 21.08
Latino	male	MN-bladder	Metal Industries	14	2.16	1.23, 3.80
Latino	male	MN-bladder	Other manufacturing	5	3.17	1.29, 7.79
Latino	male	MN-bladder	Finance, insurance, & real estate	4	2.58	0.96, 6.93
Latino	male	MN-bladder	Food & tobacco mfg	3	3.31	0.96, 11.43
Latino	male	MN-malignant melanoma of the skin	Rubber & misc plastics mfg	3	4.62	1.45, 14.69
Native American	female	MN-trachea, bronchus and lung	Machinery & transportation equipment mfg	7	4.31	1.90, 9.77
Native American	female	MN-trachea, bronchus and lung	Retail trade	25	2.84	1.83, 4.40
Native American	female	MN-trachea, bronchus and lung	Finance, insurance, & real estate	3	3.36	0.95, 11.84
Native American	female	MN-trachea, bronchus and lung	Professional & related services	5	2.12	0.71, 6.31
Native American	female	MN-trachea, bronchus and lung	Construction	3	2.47	0.61, 9.97
Native American	male	Leukemia	Textile & apparel mfg	7	2.03	0.92, 4.50
Native American	male	MN-bladder	Stone, clay, glass, concrete products mfg	4	3.48	1.44, 8.43
Native American	male	MN-trachea, bronchus and lung	Wholesale trade	9	2.17	1.12, 4.17
Native American	male	MN-trachea, bronchus and lung	Public administration	2	8.21	1.46, 46.30
Asian	female	Leukemia	Personal Services	3	2.99	0.74, 12.03
Asian	female	MN-bladder	Finance, insurance, & real estate	6	2.15	0.86, 5.38
Asian	female	MN-trachea, bronchus and lung				

Group	Sex	Outcome	Occupation	Obs ^b PMR ^c	95% CI
Asian	female	MN-trachea, bronchus and lung	Public administration	9	2.37, 6.02
Asian	male	Leukemia	Finance, insurance, & real estate	3	2.84, 9.63
Asian	male	MN-trachea, bronchus and lung	Textile & apparel mfg	5	2.79, 6.17

^aPMR ≥2.0 and observed deaths >2

^bObserved deaths

^cProportionate mortality ratio directly adjusted for age using all deaths as the standard. Referent: all occupations within the same race/ethnic group.

Table 4.5. Bladder Cancer Mortality in Selected Industries/Occupations^a, Referent Includes all Industries/Occupations in each Ethnic-Sex Group

Group	Sex	Industry	Occupation	Obs	PMR ^b	95% CI ^c
Asian	male	Retail trade	Sales	4	2.88	1.00 8.26
African American	female	Business & repair services	Professional specialists	4	2.94	1.09 7.91
African American	female	Metal Industries	Laborers	3	6.68	2.17 20.63
African American	female	Personal Services	Precision production workers	5	2.01	0.83 4.88
African American	female	Transportation communication & utilities	Motor Vehicle Operators	3	7.44	2.28 24.29
African American	male	Lumber, wood products furniture mfg	Freight stock and materials handlers	3	3.37	1.05 10.83
African American	male	Metal Industries	Precision production workers	6	2.26	0.96 5.32
African American	male	Professional & related services	Technicians and related support workers	5	3.87	1.03 14.53
African American	male	Public administration	Executives administrators managers	7	1.63	0.60 4.44
African American	male	Retail trade	Executives administrators managers	6	2.05	0.85 4.91
African American	male	Retail trade	Professional specialists	4	6.66	2.47 17.94
African American	male	Retail trade	Services	21	1.50	0.95 2.37
African American	male	Textile & apparel mfg	Machine operators & tenders	13	1.50	0.84 2.69
African American	male	Transportation communication & utilities	Machine operators & tenders	7	5.69	2.72 11.89
Latino	male	Metal Industries	Machine operators & tenders	6	2.07	0.90 4.78
Latino	male	Professional & related services	Services	5	1.65	0.67 4.08

^aIndustry/Occupation groups in which((L95≥1.0 and obs>2) or (pmr≥1.5 and obs≥5))

^bProportionate Mortality Ratio

^c95% Confidence Interval

DISCUSSION

This was the first study to comprehensively describe mortality from cancer among African-American, Latino, Asian, and Native American workers in the United States. By combining mortality surveillance data from death certificates from 21 states over an 8-year period, we were able to develop a large data base offering greater statistical precision than in most previous studies. For example, our study included more than four times as many African Americans with bladder cancer as the largest previous study to examine occupational bladder cancer among this group (Burns and Swanson, 1991). This study represents a particularly significant step forward in the availability of information about the experience of Latino, Asian, and Native American workers. The large size of the study made it possible to consider occupation- and industry-specific cancer mortality in these groups, for which Zahm (1994) previously noted a significant deficit of information in the epidemiologic literature. The large data base also made it possible to examine detailed combinations of race or ethnic group, sex, occupation, and industry for specific cancers. Such detailed assessments are often the most informative about the exposures or agents that might be responsible for observed associations.

The use of multiple referent groups in this study allowed us to examine cancer mortality among minority workers from several perspectives and to check for internal consistency. Internal analyses comparing the experience of minority workers in specific occupations or industries to the experience of all workers of the same race or ethnicity can provide insights about exposures associated with occupation or industry. Comparisons of the experience of minority workers to that of white workers in the same occupation or industry may also provide such insights. In addition, they can address questions of justice that arise from the history of minority workers frequently being assigned to undesirable work, which sometimes entailed excessive exposures to hazardous agents. Comparison of the magnitude of associations based on different referent groups can also provide a means of checking for internal consistency.

By using population data from the 1990 Census in addition to mortality surveillance records, we were able to compute directly standardized mortality rate ratios (SRRs) for workers under age 65, as well as directly standardized proportionate mortality ratios (PMRs) for all ages and workers under 65. Although SRRs are used frequently to describe occupational mortality in the United Kingdom and some other European countries, few US studies have presented SRRs based on population census and mortality data. Comparison of SRRs and PMRs can serve to provide another check for consistency.

Despite several noteworthy areas of strength, this study nevertheless has important limitations. The principal limitations derive from the nature of the information that can be obtained from death certificates. Death certificates provide only limited information about occupation in the form of a code for the decedent's "usual" occupation and the industry in which he or she worked for the longest time, as reported to the funeral director by next of kin. This information is useful for describing patterns of mortality by occupation and industry, and may also be used to infer occupational exposures to specific agents based on known or presumed associations with occupations and industries. Both uses of the occupational information were of interest in this study, although descriptive uses of the data were emphasized.

The characteristics of general population surveillance data frequently constrain the ability to detect occupational and environmental hazards (Rothman and Poole, 1988; Khoury and Holtzman, 1987). In occupational studies, inferring specific exposures from job titles is challenging. The validity of such inferences can rarely be validated directly, but it is likely that occupational titles are neither sensitive or specific as indicators of exposures to specific chemical or physical agents (Siemiatycki et al., 1989). Inferences about specific exposures can be sharpened by using job-exposure matrices (Coughlin and Chiazze, 1990; Kaupinen et al., 1992; Dosemeci et al., 1994) or assessments by experts (Gerin et al., 1985). Nevertheless, analyses of job title information are useful for basic surveillance of known epidemiologic relationships and can be a valuable source of hypotheses for subsequent, in-depth investigation.

The quality of the occupational information available for minority workers is also a potential limitation worth considering. Some previous studies suggest that the "usual" occupation and industry recorded on the death certificate may be a less useful indicator of occupational history for minority and female workers than for white men (Schade and Swanson, 1988). This may be a function of the prevalence of more frequent job changes and less stable career paths among workers who have historically been outside the "mainstream" workforce.

The quality of cancer diagnostic data on death certificates is generally good, but varies with the type of cancer, as well as with race and age (Percy et al., 1981). The potential for this type of variation may be important to consider in interpreting some comparisons. The correspondence between cancer mortality and incidence should also be weighted in the interpretation of these results. Cancer survival varies significantly by race, with African-Americans, in particular, having cancers of more advanced stage at diagnosis, poorer prognosis, and shorter survival, relative to whites (Horm et al., 1996).

The limitations of the PMR as a measure of epidemiologic association have been discussed at length previously (Checkoway et al., 1989; Decoufle et al., 1980; Miettinen & Wang, 1981; Rothman and Greenland, 1998). As noted above, the PMR reflects the relative importance of a specific cause of death among all deaths, and only approximates the relative rate of death under certain conditions. These conditions are likely to be violated in comparisons of populations with substantially different all-cause mortality rates, such as African-Americans and whites in the United States. Consequently, we conducted additional analyses using the SRR as the measure of association.

The SRR is generally preferred as a basis for inferences about the effect of an exposure on the risk of disease. A disadvantage relative to the PMR, however, is that computation of SRRs requires enumeration or estimation of the population at risk. With the data currently available in the United States, it is not possible to directly enumerate the size of the worker populations at risk of dying from cancer. This problem is exacerbated for populations whose last work experience was many years ago because the census provides information only on work in the previous year. We consequently restricted the analysis to people under age 65, who are most likely to have been working recently, and used the number of people who reported working in a given occupation or industry in the 1990 Census as a surrogate estimate of the population at risk.

In general, SRRs indicated a larger number of positive occupation-cancer associations than PMRs did for minority workers. This tendency was most notable for African Americans and Native Americans, intermediate for Latinos and weak for Asians. African-Americans and Native Americans had relatively higher rates of mortality from non-cancer causes of death, which would tend to suppress cancer PMRs in comparisons to whites. This pattern is consistent with expectations, however, given that African Americans and Native Americans have markedly higher all-cause mortality than whites, while Latinos and Asians have low overall mortality (Department of Health and Human Services, 1991). These results suggest that PMRs may have poor sensitivity for detecting occupation-cancer associations when minority workers are compared to whites or to the entire work force.

This study generated a large number of PMRs and SRRs and hence a large number of statistical comparisons. Multiple comparisons are often cited as a potential source of spurious associations. A common view is that as the number of comparisons increases, so does the probability that one or more will return a statistically "significant" result by chance, when no association exists. While this view is embedded in the statistical literature, its appropriateness to epidemiology has been questioned (Rothman, 1990; Savitz and Olshan, 1995).

The fundamental problem is that the classical view of multiple comparisons is based on a conceptual model that is generally not relevant to observational epidemiologic studies. The model assumes that all null hypotheses are true and, further, requires a willingness to accept "chance" as a scientific explanation for empirical phenomena. To say that chance could explain the result of a randomized trial is simply to acknowledge that the act of randomly assigning subjects to treatment groups determines the composition of the study population and may therefore introduce associations between treatment (exposure) status and other study variables. In an observational study, however, there is no analogous random process. The selection of workers into occupations is, in fact, decidedly non-random, being influenced by the availability of work, employer preferences, worker skills, and other factors.

There are, nevertheless, some legitimate reasons for concern about studies that generate large numbers of comparisons. Such studies are typically based on surveillance data, which provide many observations but only a limited amount of information for each one. In a study of associations between cancer mortality and occupation, like this one, these qualities of surveillance data imply that specific workplace exposures will usually not be identifiable, and that workers in some occupational groups are likely to experience excess cancer for reasons that cannot be explained by the available data. Such cancer excesses may be produced by occupational exposures, but may also result from the prevalence of other risk factors in the affected groups. Taking these considerations into account, a realistic view of multiple comparisons in studies that describe large occupational data bases is that such studies are likely to identify numerous associations and that these associations are real, in the sense that they reflect the disease experience of workers in the study during the time period that was considered. The ability to attribute those associations to a particular cause, whether occurring in the workplace or outside of it is, however, likely to require knowledge external to the study. This knowledge may come either from prior research or from follow-up in later studies.

In summary, we do not share the view that the act of making multiple comparisons can produce spurious associations. However, we do believe that the limitations of the data must be acknowledged in the interpretation of the results of studies like this one, which exploit large surveillance data bases. Several key limitations of our data are discussed above. While we observed a large number of exposure-disease associations, we regard these associations as descriptions of the epidemiological situation of particular groups of workers, rather than as formal tests of hypotheses. The quality of the inferences that can be made on the basis of these descriptions depends to a large extent on support from outside the study. However, followup of specific associations using modern multiple-comparison methods, such as empirical-Bayes modeling, may be helpful (Thomas et al., 1998; Rothman and Greenland, 1998).

A related limitation of the study is that statistical precision was poor for some comparisons. The numbers of deaths from specific cancers were small for some combinations of race or ethnicity with occupation or industry, despite the large overall size of the study. Our ability to consider the experience of Asian and Native American women, in particular, was affected by small numbers, as there were no deaths among these women in many occupation and industry categories. For many other comparisons, the confidence intervals were wide, even when unity was not included. This limitation reflects the nature of the original data, which have a fixed sample size and therefore do not afford the opportunity to augment study power by adding subjects. We used all of the data available at the time of this study, but future studies could have greater power if additional years of data and/or additional states could be added to the mortality data base. The data base currently omits several of the largest states, which also have large minority populations. Efforts should be made to add New York, California, Texas, and Florida to the list of states that provide death certificate occupational information to the NCHS.

It is also worth noting that the approach to presenting the results of the study in this report may also be considered a limitation of the research. Because the study generated a large volume of information, we could not describe all of the findings in the text. We chose to highlight relationships selected on the basis of the magnitude of the association and its statistical precision. This strategy tended to emphasize relatively common cancers and large occupational groups, because of the larger numbers of deaths attributed to them. This approach is consistent with the specific aims of the research. However, other methods can be used to examine the results with different goals in mind. For example, occupations and industries with common exposures could be selected to evaluate inferences about associations between cancer and workplace agents.

CONCLUSIONS

The principal conclusions based on the four specific aims are as follows:

1. Overall, the most notable associations when the experience of African-American, Latino, Native American and Asian workers was compared to that of whites or the entire workforce were for cancers known to be related to race and ethnicity, but which do not have strong links to occupational exposures. Associations of this type include stomach cancer in Asians, cancer of the gall bladder among Native Americans, and Esophageal cancer among African Americans.
2. In these comparisons, proportionate mortality ratios (PMRs) tended to give an impression of low cancer mortality among minority workers, while standardized mortality rate ratios (SRRs) more frequently suggested excess cancer mortality among minority workers. This tendency is likely to be a consequence of the well-known dependence of the PMR on all-cause mortality rates, which differ markedly for African Americans and Native Americans, relative to whites. This observation suggests that PMRs may not be sensitive indicators of association in studies comparing these ethnic and racial groups.
3. The cancers and work settings for which excess mortality was observed varied among the four minority groups, suggesting that the common practice of aggregating "non-white" workers is likely to obscure significant variation.
4. In internal analyses, associations of cancer with occupation or industry were often markedly different for women and men of the same race or ethnic group. This observation underscores the need for separate analyses of male and female workers, because of their different patterns of employment and mortality.
5. We observed evidence of established associations of cancer with and the work environment, including: bladder cancer and leukemia in the rubber industry among African-American men and Latino men, respectively; lung cancer in the construction industry and in stone, glass, clay, and concrete products manufacturing, among African-American women and Native-American men, respectively; lung and bladder-cancer among motor vehicle operators, in African-American women, and bladder cancer among several groups of metal workers potentially exposed to polycyclic aromatic hydrocarbons. Excess cancer of the pleura in several groups of African-American workers is also suggestive of widespread exposure to asbestos.
6. This study demonstrated the utility of analyzing surveillance data bases to conduct epidemiologic studies of workers whose numbers in any single any workplace or community may not be sufficient for study with other methods. By combining information for multiple states, years, and employers, we were able to examine the experience of male and female minority workers in many occupations and industries. Nevertheless, the study was still limited by small numbers in some groups, notably Native Americans and Asians.
7. The study demonstrated the benefits of combining population and mortality data to compute

SRRs as measures of occupation-cancer associations. SRRs may be more informative indicators of association than the more common PMR in some cases. However, the ability to generate SRRs for populations defined by occupation and industry is currently limited by the methods used to collect occupational information in the US census. Computation of SRRs for elderly people who are no longer in the labor force is particularly difficult, because the census only requests information about recent work. We consequently chose to generate SRRs only for people under age 65, who are most likely to be active in the labor force. This approach is not ideal, however, because most cancer occurs at older ages. The usefulness of census occupational data for epidemiologic studies of chronic diseases could be improved significantly by adding questions about usual, lifetime occupation and industry to the census form.

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