Summary and Discussion

Although socioeconomic disparities in cancer have been noted previously, this report provides one of the most comprehensive analyses yet of area socioeconomic variations in cancer incidence, mortality, stage, treatment and survival in the United States, using population-based SEER incidence and national mortality data. The results provide important insights into the extent of area socioeconomic disparities in cancer for the total population as well as for the major racial and ethnic groups in the United States and are generally consistent with the findings of previous studies.

One of the most important findings of this report concerns the dynamic nature of the association between area socioeconomic position and cancer mortality. The association changed markedly over the past 25 years for all cancers combined and for lung, colorectal, prostate, and breast cancers. While socioeconomic inequalities in male lung and prostate cancer mortality have been widening, those in colorectal and breast cancer mortality narrowed over time and even appear to have reversed in the late 1990s. Against the backdrop of falling mortality rates, substantial socioeconomic inequalities in cervical cancer have persisted.

Temporal changes in area socioeconomic patterns in cancer incidence were less pronounced than those in cancer mortality. There was a marked increase in incidence for breast cancer and melanoma of the skin in all area SES groups, and a positive socioeconomic gradient remained throughout the study period. On the other hand, a negative but somewhat diminishing socioeconomic gradient in cervical cancer incidence was observed as incidence rates declined substantially for all area groups during 1975–1999.

As regards the other cancer outcomes, for each of the cancers considered, both men and women in high poverty areas had substantially higher rates of late-stage cancer diagnosis and lower rates of cancer survival than those in low poverty areas. Cancer survival rates for residents of higher poverty areas remained lower even after controlling for differences in stage. Residents of higher poverty areas were also less likely to receive preferred treatment for lung and breast cancers and to undergo radical prostatectomy.

Another important finding of the report relates to the substantial effect of area socioeconomic position on cancer risks for each racial/ethnic group. Poorer survival and smaller probabilities of early detection and preferred treatment of cancers were associated with lower SES for each racial/ethnic group. The socioeconomic gradients in incidence and mortality from some cancers, however, varied by ethnicity not only in magnitude but sometimes in direction as well. An example of the differential pattern is lung cancer incidence, which increased during 1988–1992 with increasing poverty rate for non-Hispanic white and black men and women and API men, but decreased with increasing poverty rate for Hispanic men and women. Such differences in pattern may partially reflect the impact of acculturation on smoking patterns for Hispanics and to some extent APIs (106). While area SES does contribute to racial/ethnic differences in cancer outcomes, ethnic differences remain within each area poverty group. Residual ethnic differences may reflect differences in individual socioeconomic and cultural characteristics as well as differences in area socioeconomic position not completely accounted for by poverty rates.

Do socioeconomic patterns in cancer based on poverty rates that are reported here also apply to other frequently used area measures, such as median family income and percentage of population with at least a high school diploma? To address this question, we compared differentials in cancer incidence, mortality, stage, treatment, and survival by area poverty levels with those based on median family income and education. Similar patterns in cancer incidence, mortality, and survival were observed for all of the area measures, and the size of the gradients associated with education and family income corresponded fairly closely with that based on area poverty levels.

Because of temporal proximity, the 1980 poverty rate is more likely than the 1990 poverty rate to accurately characterize the socioeconomic characteristics of counties during 1975–1984. Despite a high correlation and categorical correspondence between the 1980 and 1990 poverty rates, we wanted to examine the impact on cancer mortality and incidence trends of any potential area misclassification that may have arisen from using the 1990 poverty rate throughout the study period. As shown in Figure 7.1, page 124, for cervical cancer as an example, the use of the 1980 and 1990 county poverty rates produced essentially similar trends in mortality and incidence during 1975–1999.

For most of the analyses in this report, we selected three broad poverty categories for a simpler presentation of data and for minimizing the extent of potential misclassification of areas over time. However, it is important to emphasize that the impact of socioeconomic position on cancer is not limited to the differences between the lowest and highest poverty areas. Rather, a graded relationship may be observed for many of the cancers across the entire range of the social hierarchy, as shown for lung and cervical cancer incidence and mortality in Figures 3.56–3.59, pages 62–63. Moreover, within the broad category of areas with poverty rates < 10%, the areas with lower poverty rates generally had a significantly lower likelihood of a late-stage cancer diagnosis than those with higher poverty rates (e.g., men in census tracts with poverty rates < 2% were 34% less likely to be diagnosed with distant-stage prostate cancer than men in census tracts with poverty rates between 8% and 10%). Similarly, within the broad category of areas with poverty rates ≥ 20%, the likelihood of late-stage cancer diagnosis increased with increasing poverty rates (e.g., men in census tracts with poverty rates exceeding 50% were 38% more likely to be diagnosed with distant-stage prostate cancer than men in census tracts with poverty rates between 20% and 23%). Similar heterogeneity in survival can be noted within the three broad poverty categories. For example, for the 1988–1994 patient cohort, 83.9% of men diagnosed with prostate cancer and living in census tracts with poverty rates between 20% and 23% had survived at least five years, as compared with 79.9% of men in census tracts with poverty rates exceeding 50%.

While temporal socioeconomic patterns in cancer rates may be related to increasing temporal differences in socioeconomic conditions between areas, such patterns can be examined in terms of how social patterns in behavioral and lifestyle factors have changed over time. Specifically, area socioeconomic gradients in cancer incidence and mortality may be related to area differences in smoking rates, tobacco regulation and advertising, availability of cigarettes, public awareness of the harmful health effects of smoking, fatty diet, physical inactivity, reproductive factors, human papillomavirus (HPV) infection, sun exposure, or other factors. Individual-level data on many of these variables demonstrate a faster rate of smoking decline or a more rapid adoption of healthier lifestyles (including the availability of cancer screening) over time among the members of higher SES groups (7,16,17). Temporal and cross-sectional ecological data (especially at the small area level) on social, environmental, behavioral, and health care disparities by area SES are particularly lacking in the U.S.

To address these data gaps and to help interpret the above area socioeconomic gradients in cancer incidence and mortality, we used a variety of national databases (107–112) to determine cross-sectional associations between poverty, tobacco control policy, behavioral factors, cancer screening, and cancer mortality at the state level (Table 7.1, page 129, and Figures 7.2–7.7, pages 125–127). These data illustrate a high degree of correlation between poverty and behavioral and health care factors such as smoking, physical activity, and cancer screening, as well as between behavioral factors, policy variables, and cancer mortality at the area level. Of particular interest is the substantial association of poverty with current smoking rates, anti-smoking policy measures, physical inactivity, obesity, mammography use and colorectal cancer screening rates, and lack of health insurance. Several of the behavioral and policy variables, such as current smoking rates, obesity and physical inactivity levels, and workplace and home restrictions on smoking are, in turn, strongly linked to overall cancer mortality and mortality from lung, colorectal, prostate, and breast cancers (Table 7.1, page 129). For example, states with higher rates of workplace and home restrictions on tobacco use in 1993 generally had substantially lower smoking prevalence in 1996 ($r = -0.62$ and -0.72 respectively) and lung cancer mortality rates during 1995–1999 ($r = -0.58$ and -0.64 respectively).

Data presented in this report are subject to several potential limitations. The association between area socioeconomic position and cancer incidence, stage, and survival for specific racial/ethnic groups may be affected by the degree of ethnic misclassification in patient records. Information on race/ethnicity in the SEER cancer registries is routinely obtained from the patient's medical record or death certificate and often reflects a subjective assessment made by hospital personnel or a funeral director or coroner (113). Hispanic ethnicity may also be derived by using the census surname list. However, not all persons with Hispanic surnames are Hispanic, and name changes are especially problematic when classifying women. Cancer registry data for whites and blacks are expected to be reasonably accurate, though published data evaluating this issue are generally lacking (113). Registry data for Hispanics were found to be problematic in a study completed by the Greater Bay Area cancer registry in California (114). The investigators determined that the percentage of self-identified Hispanics who were classified as Hispanic in registry records was just 68%. A similar study of misclassification of Vietnamese in the same cancer registry reported that 74% of patients that the registry classified as Vietnamese agreed with this classification during a telephone interview (115). Misclassification of Asian ethnicity might be expected to be less of a factor in this report, however, since the composite grouping of all Asian and Pacific Islanders was used.

Caution should also be exercised when comparing mortality rates among various racial/ethnic groups. Mortality rates shown in this report are based on the death certificate data. Two potential sources of error—the misclassification of race/ethnicity on the death certificate (resulting in an underreporting of deaths for ethnic minority groups such as APIs, American Indians, and Hispanics) and the undercoverage of ethnic minority groups in the census and resultant population estimates—may affect ethnic comparisons in mortality rates (116–118). The joint effect of these two sources of error may result in an underestimation of mortality for American Indians, APIs, and Hispanics by 17.1%, 9.7%, and 1.6% respectively, and an overestimation of mortality for whites and blacks by 1% and 5% respectively (116,117).

The data shown in this report could also be affected by the extent to which patients in SEER were incorrectly geocoded or assigned to specific census tracts. The area socioeconomic effects would be underestimated if patients in poorer and rural census tracts were more likely to have missing census tract information than their wealthier, urban counterparts. Area effects could also be biased if the area socioeconomic category associated with residence at the time of diagnosis or death differed from that at exposure.

Area socioeconomic variations in cancer incidence, mortality, stage, and survival should not be considered as proxies for socioeconomic differentials at the individual level. Such consideration may lead to the ecological fallacy, implying that the socioeconomic effects at the aggregate level are being interpreted as those occurring at the individual level (10,16,17,119). In this report, area variations in cancer outcomes, particularly incidence and mortality rates, were analyzed as a function of an ecological variable, area poverty rate. Although area socioeconomic patterns in several of the cancer outcomes are generally consistent with those at the individual level, the area-level effects shown here may be smaller in magnitude than individual socioeconomic effects (6,10,15–18,120). This may be partly due to the compositional heterogeneity of the areas examined, particularly counties, which, unlike census tracts, may contain substantial socioeconomic variability (16,17).

Census-based area socioeconomic measures, including the poverty rate, can serve as valuable surveillance tools for documenting social inequalities in cancer and monitoring trends in the extent of cancer-related health inequalities over time. In the absence of individual-level socioeconomic data, characterization of patterns in cancer incidence, stage, treatment, survival, and mortality by area socioeconomic measures may be useful in cancer control planning and resource allocation (16). Area socioeconomic measures can also be used in conjunction with other ecological variables, such as rural-urban continuum or behavioral factors, to examine differences in cancer outcomes after adjusting for area socioeconomic position. While policy interventions (e.g., smoking prevention and cancer control programs) aimed at reducing disparities in cancer generally should target socioeconomically disadvantaged areas, there may be a need to develop ethnic, cultural, and gender-specific programs. Obviously, social policy actions can have a profound effect on the magnitude of social inequalities in cancer. Although reducing poverty, improving access to education and employment opportunities, and improving working conditions remain the fundamental social policy measures for reducing health inequalities (4,53), improving access to health care and specific cancer screening programs and cancer control interventions among the disadvantaged has the potential to substantially reduce the cancer burden and cancer disparities among population groups and geographic areas.

Figure 7.1. Comparison of Trends in U.S. Cervical Cancer Mortality and SEER Cervical Cancer Incidence by 1990 and 1980 County Poverty Rates

Note: Rates are age-adjusted to the 2000 U.S. standard population. SEER incidence rates are based on data from 9 SEER registries.

Figure 7.2. Relationship Between State-Specific Physical Inactivity Levels and Total Cancer Mortality, United States, 1995–1999 (N = 51)

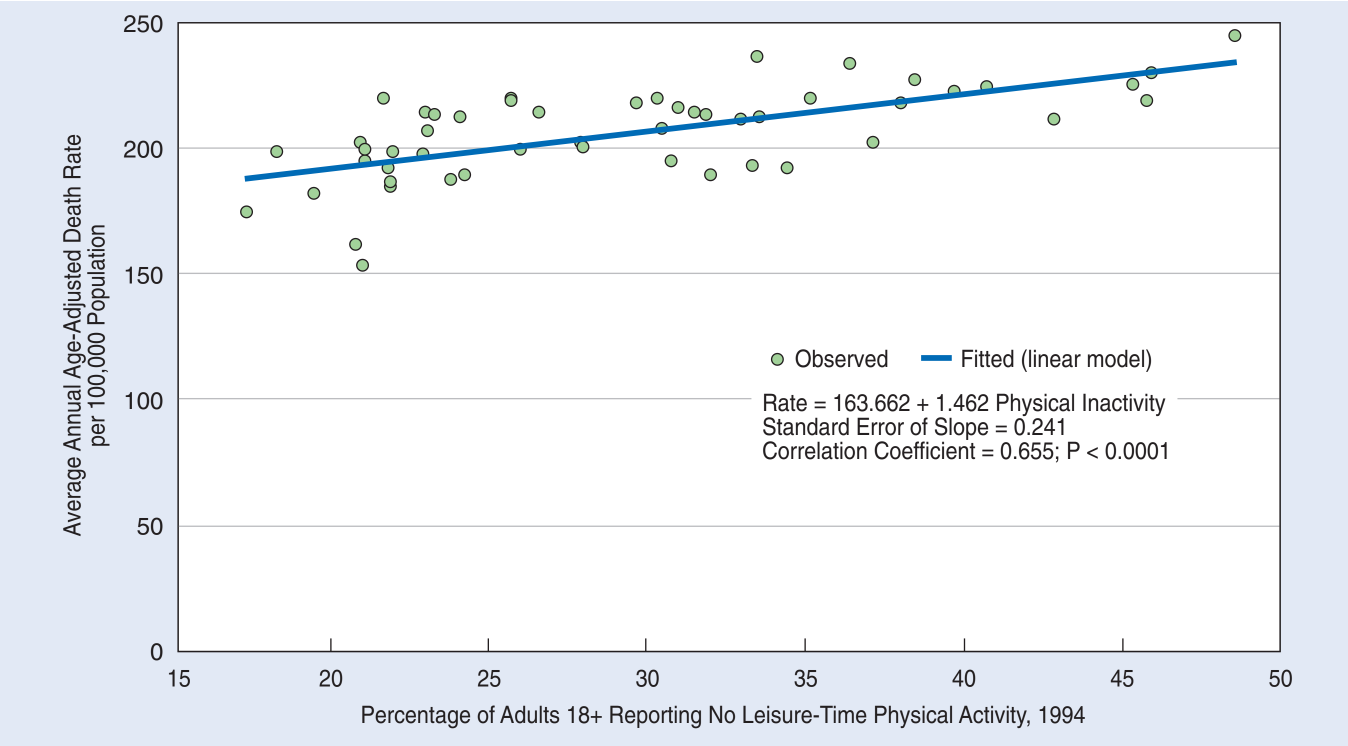
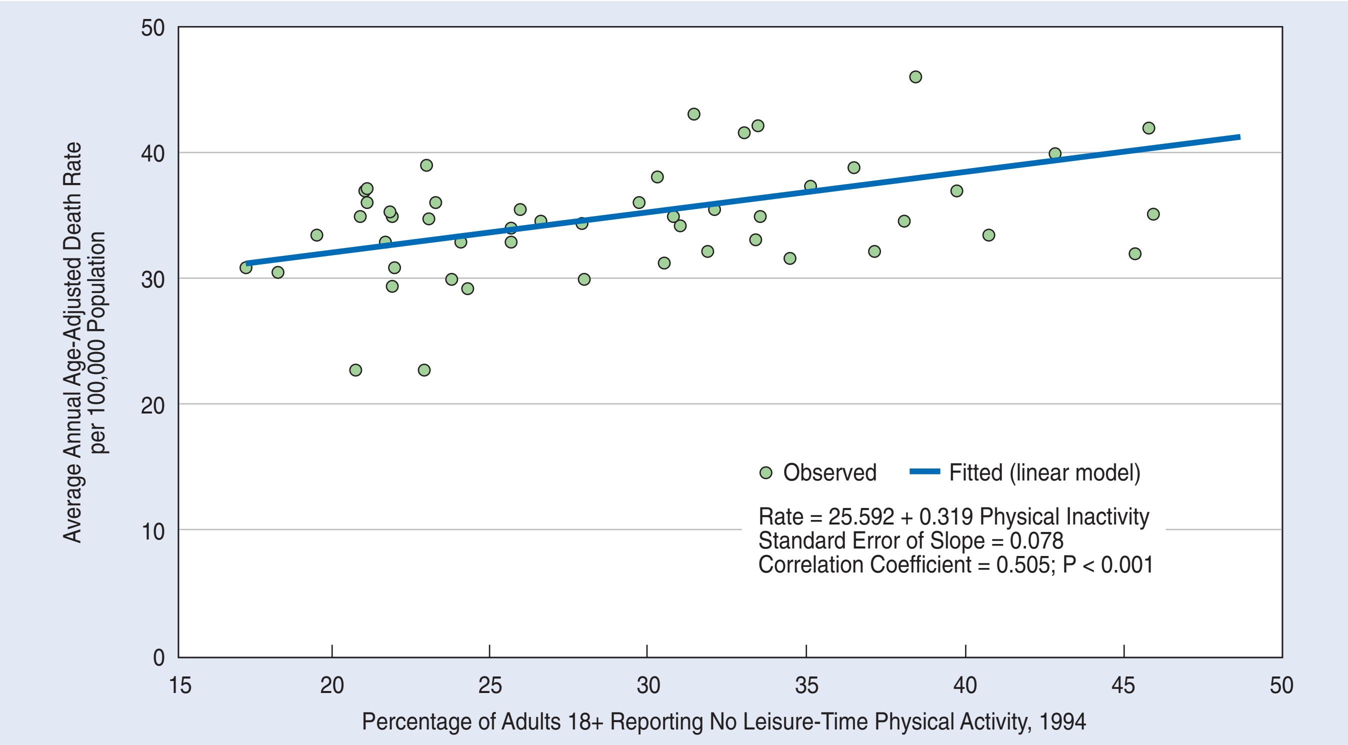
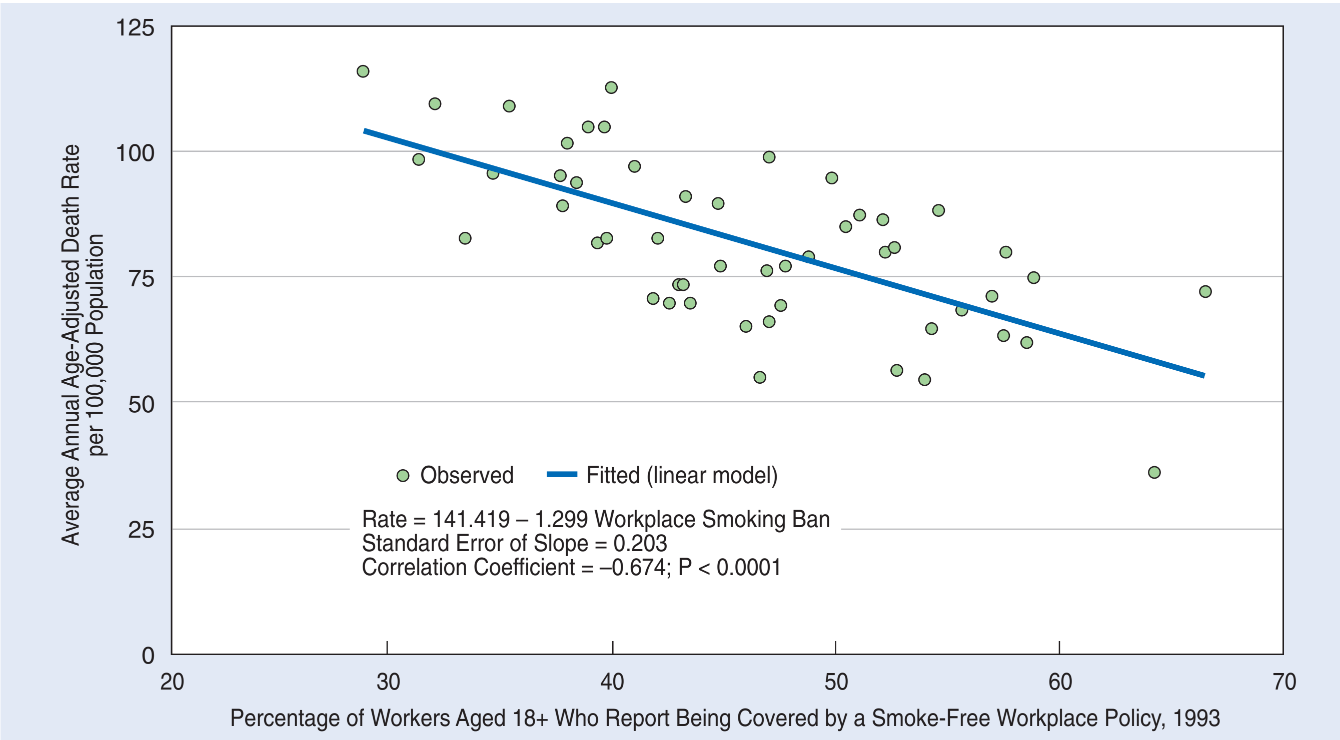


Figure 7.3. Relationship Between State-Specific Physical Inactivity Levels and Prostate Cancer Mortality, United States, 1995–1999 (N = 51)



Note: Rates are age-adjusted to the 2000 U.S. standard population.

Figure 7.4. Relationship Between State-Level Smoke-Free Workplace Policy and Male Lung Cancer Mortality, United States, 1995–1999 (N = 51)



Note: Rates are age-adjusted to the 2000 U.S. standard population.

Figure 7.5. Relationship Between State-Specific Poverty Rates and Physical Inactivity Levels, United States, 1994 (N = 51)

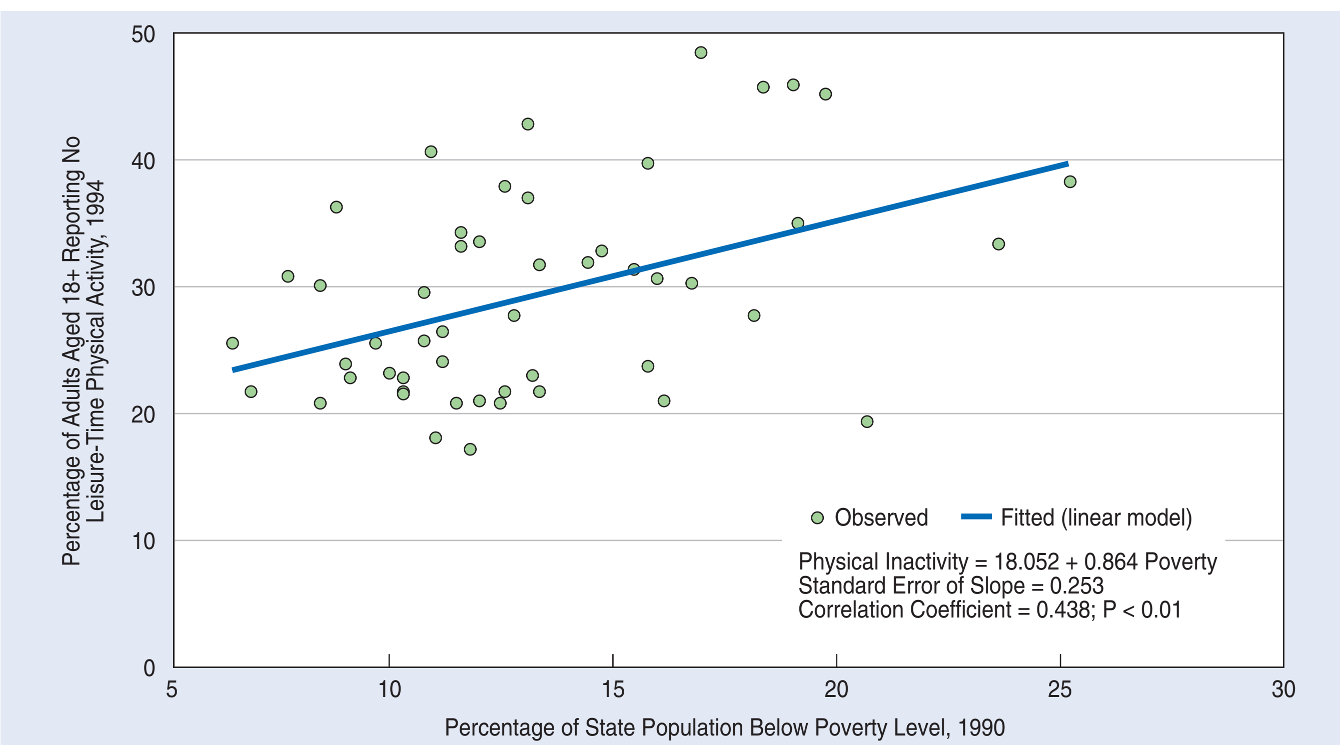


Figure 7.6. Relationship Between State-Specific Poverty Rates and Recent Mammography Use, United States, 1995 (N = 51)

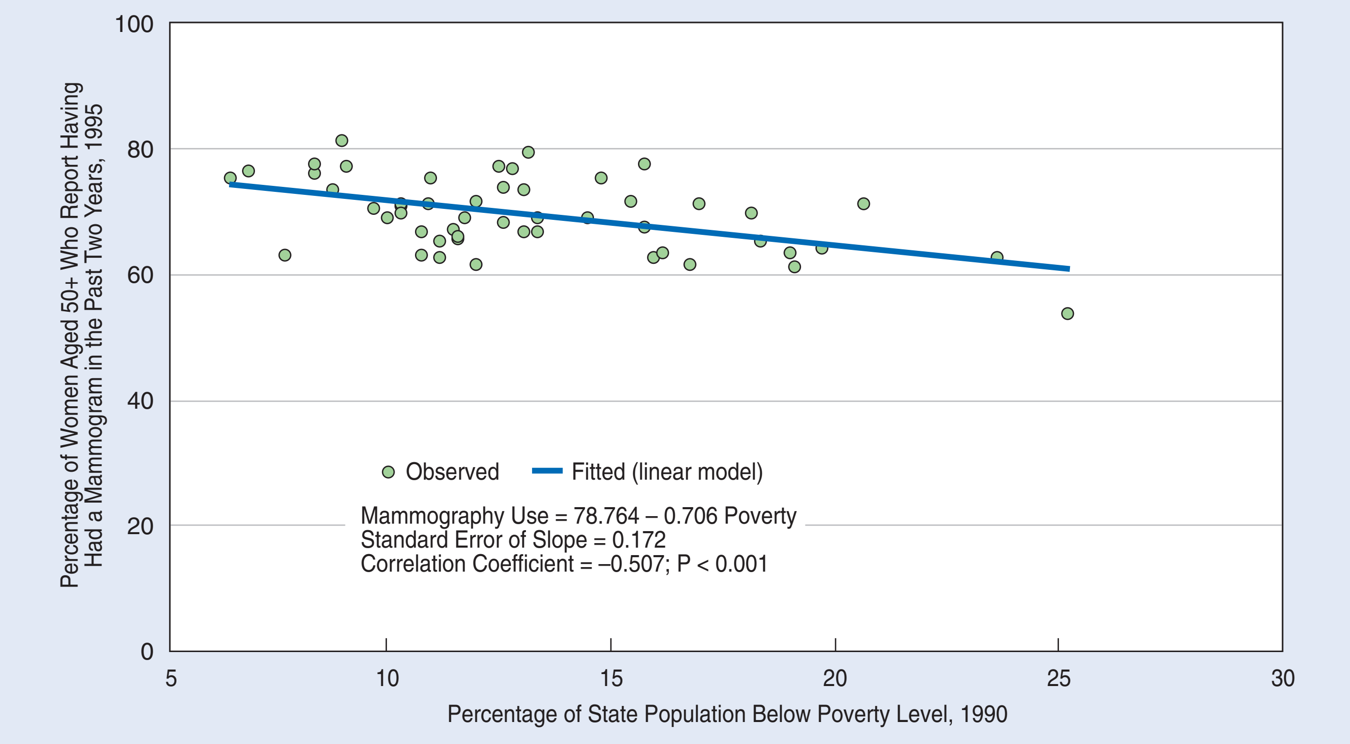
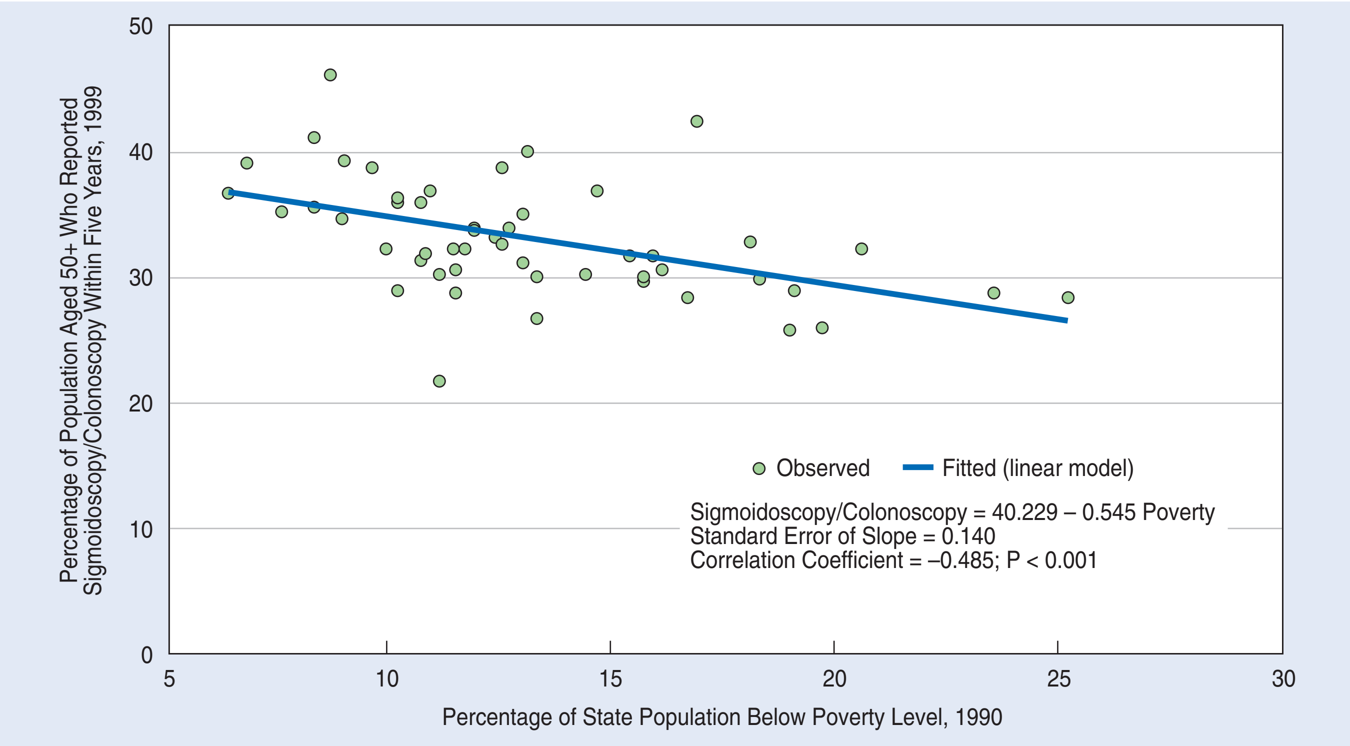


Figure 7.7. Relationship Between State-Specific Poverty Rates and Colorectal Cancer Screening, United States, 1999 (N = 51)



Legend for Variables in the Correlation Matrix (Table 7.1)

1. Poverty = Percentage of population below poverty level, 1990. Data source: 1990 Census.

2. Inactive = Percentage of adults aged 18 years or older who reported no leisure-time physical activity, 1994. Data source: 1994 Behavioral Risk Factor Surveillance Survey (BRFSS).

3. Overweight = Percentage of adults 18 years or older who reported being overweight, 1995. Data source: 1995 Behavioral Risk Factor Surveillance Survey (BRFSS).

4. Current Smoker, 1993 = Percentage of adults 18 years or older who reported cigarette smoking, 1993. Data source: 1992–1993 Current Population Survey—Tobacco Use Supplement.

5. Current Smoker, 1996 = Percentage of adults 18 years or older who reported cigarette smoking, 1996. Data source: 1995–1996 Current Population Survey—Tobacco Use Supplement.

6. Cigarette Sales/Capita = Per capita tax paid on sales of cigarette packs, 1997. Data source: The Tobacco Institute; *MMWR*, Vol. 47, No. 3, November 6, 1998.

7. Workplace Smoking Ban, 1993 = Percentage of indoor workers 18 years or older who reported being covered by a smoke-free workplace policy, 1993. Data source: 1992–1993 Current Population Survey—Tobacco Use Supplement.

8. Workplace Smoking Ban, 1996 = Percentage of indoor workers 18 years or older who reported being covered by a smoke-free workplace policy, 1996. Data source: 1995–1996 Current Population Survey—Tobacco Use Supplement.

9. Home Smoking Ban, 1993 = Percentage of adults 18 years or older who reported no smoking allowed anywhere in the home, 1993. Data source: 1992–1993 Current Population Survey—Tobacco Use Supplement.

10. Home Smoking Ban, 1996 = Percentage of adults 18 years or older who reported no smoking allowed anywhere in the home, 1996. Data source: 1995–1996 Current Population Survey—Tobacco Use Supplement.

11. Smoking Advertising Ban, 1993 = Percentage of adults 18 years or older who think advertising of tobacco products should not be allowed at all, 1993. Data source: 1992–1993 Current Population Survey—Tobacco Use Supplement.

12. Smoking Advertising Ban, 1996 = Percentage of adults 18 years or older who think advertising of tobacco products should not be allowed at all, 1996. Data source: 1995–1996 Current Population Survey—Tobacco Use Supplement.

13. Alcohol Consumption = Average alcohol consumption per drinker in gallons, 1991 (based on annual alcoholic beverage sales data). Data source: Alcohol Epidemiologic Data System; the National Institute on Alcohol Abuse and Alcoholism (NIAAA).

14. Recent Pap Test = Percentage of women 18 years or older with an intact uterine cervix who reported having had a Pap smear in the past three years, 1995. Data source: 1995 Behavioral Risk Factor Surveillance Survey (BRFSS).

15. Pap Test Ever = Percentage of women 18 years or older with an intact uterine cervix who reported ever having had a Pap smear, 1995. Data source: 1995 Behavioral Risk Factor Surveillance Survey (BRFSS).

16. Recent Mammography Use = Percentage of women aged 50 years or older who reported having had a mammogram in the past 2 years, 1995. Data source: 1995 Behavioral Risk Factor Surveillance Survey (BRFSS).

17. Mammography Ever Use = Percentage of women aged 40 years or older who reported ever having had a mammogram, 1995. Data source: 1995 Behavioral Risk Factor Surveillance Survey (BRFSS).

18. Colonoscopy/Sigmoidoscopy = Percentage of population aged 50 years or older who reported having colonoscopy/sigmoidoscopy within the past 5 years, 1999. Data source: 1999 Behavioral Risk Factor Surveillance Survey (BRFSS).

19. FOBT = Percentage of population aged 50 years or older who reported having a fecal occult blood test (FOBT) within the past 1 year, 1999. Data source: 1999 Behavioral Risk Factor Surveillance Survey (BRFSS).

20. No Health Insurance = Percentage of population without health insurance, 1994. Data source: 1994 Current Population Survey—March Supplement.

21. Total Cancer Mortality = Average annual age-adjusted death rate for all cancers and both sexes combined per 100,000 2000 U.S. standard population, 1995–1999.

22. Male Cancer Mortality = Average annual age-adjusted death rate for men from all cancers combined per 100,000 2000 U.S. standard population, 1995–1999.

23. Female Cancer Mortality = Average annual age-adjusted death rate for women from all cancers combined per 100,000 2000 U.S. standard population, 1995–1999.

24. Total Lung Cancer Mortality = Average annual age-adjusted death rate for lung cancer (both sexes combined) per 100,000 2000 U.S. standard population, 1995–1999.

25. Male Lung Cancer Mortality = Average annual age-adjusted death rate for male lung cancer per 100,000 2000 U.S. standard population, 1995–1999.

26. Female Lung Cancer Mortality = Average annual age-adjusted death rate for female lung cancer per 100,000 2000 U.S. standard population, 1995–1999.

27. Total Colorectal Cancer Mortality = Average annual age-adjusted death rate for colorectal cancer (both sexes combined) per 100,000 2000 U.S. standard population, 1995–1999.

28. Male Colorectal Cancer Mortality = Average annual age-adjusted death rate for male colorectal cancer per 100,000 2000 U.S. standard population, 1995–1999.

29. Female Colorectal Cancer Mortality = Average annual age-adjusted death rate for female colorectal cancer per 100,000 2000 U.S. standard population, 1995–1999.

30. Total Mortality from Melanoma of the Skin = Average annual age-adjusted death rate for melanoma of the skin (both sexes combined) per 100,000 2000 U.S. standard population, 1995–1999.

31. Male Mortality from Melanoma of the Skin = Average annual age-adjusted death rate for men from melanoma of the skin per 100,000 2000 U.S. standard population, 1995–1999.

32. Female Mortality from Melanoma of the Skin = Average annual age-adjusted death rate for women from melanoma of the skin per 100,000 2000 U.S. standard population, 1995–1999.

33. Prostate Cancer Mortality = Average annual age-adjusted death rate for prostate cancer per 100,000 2000 U.S. standard population, 1995–1999.

34. Female Breast Cancer Mortality = Average annual age-adjusted death rate for female breast cancer per 100,000 2000 U.S. standard population, 1995–1999.

35. Cervical Cancer Mortality = Average annual age-adjusted death rate for cervical cancer per 100,000 2000 U.S. standard population, 1995–1999. Data source for Variables 21 through 35: National Mortality Database, 1995–1999.

See “Page 129.pdf” for Table 7.1.