# Cancer in Rural *versus* Urban Populations: A Review

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Abstract

Rural-urban comparisons have identified higher age-, race-, and sex-adjusted cancer incidence and mortality rates in urban populations for most anatomic sites, suggesting that rural populations are at lower risk from cancer. Conversely, findings that rural cancer patients are diagnosed at later stages of disease, that higher proportions of rural cancer cases are unstaged at diagnosis, and that rural cancer patients are more ill at referral to home health care agencies, suggest that rural cancer patients are disadvantaged compared to their urban counterparts. This paper summarizes rural-urban patterns of cancer mortality, incidence, and survivorship since 1950, outlines rural-urban differences in utilization of health care services, questions the appropriateness of using rural-urban comparisons of cancer mortality and incidence to evaluate access to cancer care, and suggests potential approaches to exploring the question of whether rural residents have access to cancer care comparable to that available to urban residents.

Determining the health status of rural *versus* urban populations is important for the appropriate allocation of health care resources according to public need and because issues of equity are raised when large, identifiable population groups lag significantly behind others in health status and health care accessibility. Census data have been used as evidence that most rural populations are vulnerable to a higher incidence of modern chronic diseases because they are older, poorer, and less educated (Wright et al., 1985). This difference is reflected in higher crude mortality rates for all causes, cancer, and cardiovascular disease reported from rural areas (Miller, Stokes & Clifford, 1987). However, these rural-urban differences may be explained by age, race, and sex adjustment, essentially erasing any rural disadvantage. The finding that there is little rural-urban difference in adjusted mortality from chronic diseases conflicts with evidence that rural populations have lower geographic access to new and effective therapies and technologies to treat cancer and cardiovascular disease (U.S. Congress, 1990). There may be significant differences in mortality at selected age-strata, for different types of cancer; different patterns of cancer survival between urban and rural populations may exist and not be reflected in mortality rates. This raises the question of whether we can compare overall mortality rates, even after adjustment, to determine if rural residents are receiving care equal to urban residents. This paper summarizes rural-urban patterns of cancer mortality, incidence, and survivorship since 1950, outlines rural-urban differences in utilization of health care services, questions the appropriateness of using rural-urban comparisons of cancer mortality and incidence to evaluate access to cancer care, and suggests potential approaches to exploring the question of whether rural residents have access to cancer care comparable to that available to urban residents.

## CHARACTERISTICS OF RURAL COMMUNITIES

Residents of rural communities tend to have lower income and less education than urban residents (U.S. Congress, 1990), and the age distribution of rural communities is typically older compared to urban areas (Miller, Stokes & Clifford, 1987). Rural populations have more non elderly residents with no health insurance than urban populations (Summer, 1991).

Rural communities have been shown to have poor access to health care services (Aday, 1985; U.S. Congress, 1990), fewer cancer prevention activities (Battista & Spitzer, 1983), and decreased receptivity to health resources relative to urban communities (Williams & Dueker, 1985). Sparsely populated areas typically do not support specialized services (Summer, 1991; U.S. Congress, 1990); the physicians in rural communities are commonly family practitioners or other primary care specialists. Rural residents often must travel some distance to obtain medical services, and this has been proposed as a potential barrier to care (Summer, 1991; U.S. Congress, 1990). Distance was not a barrier to health service utilization for acute care by rural residents in two studies (Luft, Hershey & Morrell, 1976; Williams & Dueker, 1985). Those studies did not, however, show that follow-up care was unaffected by distance. Almost all cancer therapy is necessarily long-term and requires multiple visits to health care providers.

## METHODOLOGICAL ISSUES IN RURAL-URBAN STUDIES

Several methodological issues arise when studying rural-urban health differences. Areas may be inconsistently defined as either rural or urban based on population counts of geopolitical units such as towns, cities, or counties (Liff et al., 1991; Wright, Champagne, Dever & Clark, 1985), or a gradient of urbanization may be established using some measure of population density (Bako, Dewar, Hanson &

Hill, 1984; Mahoney, Labrie, Nasca, Wolfgang & Burnett, 1990; Nasca, Burnett, Greenwald, Brennan, Wolfgang & Carolton, 1980). Rural America is not a homogeneous entity, the criteria used to define "rural" and "urban" will often determine the results of a study (Miller, Stokes & Clifford, 1987; Hewitt, 1989). Socioeconomic status of individual cases may be estimated directly by income, educational, or employment data, or indirectly using summary data for census tracts where cases reside or of specific census tracts where cases reside. Although this introduces some error, rural-urban studies using these techniques have produced reliable results (Farley & Flannery, 1989; Mandelblatt, Andrews, Kerner, Zauber & Burnett, 1991; Wilkinson & Wilson, 1983). Access to quality health care has been estimated by cancer stage and/or extent of disease at diagnosis (Farley & Flannery, 1989; Liff, Chow & Greenberg, 1991; Mandelblatt, Andrews, Kerner, Zauber & Burnett, 1991), physician-to-population ratio (Oleske, Hauck & Heide, 1983), and type of hospital—private *versus* public (Mandelblatt, Andrews, Kerner, Zauber & Burnett, 1991) but there is little work in the literature that examines the possible relationships between different payers and access to cancer care.

Rural and urban disease rate comparisons are also limited by data tabulations and aggregations that are constrained by geopolitical borders (Rothenberg, Steinberg & Thacker, 1990). Rural populations may exist within the boundaries of a metropolitan area and urban areas may overlap geopolitical boundaries and extend into what are classified as rural or nonmetropolitan geopolitical regions. Conventional analysis of data by political boundaries may mask or attenuate rural-urban differences (Hewitt, 1989). The migration patterns of the rural elderly may also have implications for mortality rates.

## CANCER MORTALITY, INCIDENCE, AND SURVIVORSHIP IN RURAL *VERSUS* URBAN POPULATIONS

### Mortality

The hypothesis that rural residents experience reduced access to cancer care is not reflected in overall cancer mortality rates. Higher overall mortality and incidence rates for malignant neoplasms among urban residents compared to rural residents have been documented (Blot & Fraumeni, 1982; Greenberg, Stevens & Whitaker, 1985; Lyon, Gardner & West, 1980; Morton, Baker & Fletcher, 1983; Wright, Champagne, Dever & Clark, 1985). Although cancer is a relatively rare disease, it has become a leading cause of death among men and women between the ages of 35 and 64 (U.S. National Center for Health Statistics, 1991) as the population age structure has matured. Rural populations, however defined, are located in more sparsely populated areas which will naturally have a lower absolute cancer incidence than more urban areas; but there is evidence that cancer mortality among rural populations may be increasing disproportionately compared to urban populations (Thind, Najem, Cohen, Levy & Louria, 1981). Factors that have been associated with rural-urban differences in cancer mortality and incidence include age distribution (Miller, Stokes & Clifford, 1987), socioeconomic status (Farley and Flannery, 1989; Freeman, 1989; Merrill, 1991), availability of quality health care (Farley & Flannery, 1989; Freeman, 1989), and ethnic differences (Horner & Chirikos, 1987). The greater proportional increase in cancer mortality in rural populations may reflect the economic problems of rural America over the past decade. An elevated risk of cancer mortality (Freeman, 1989; Merrill, 1991) and reduced survival (Berg, Ross & Latourette, 1977) are characteristic of groups with low socioeconomic status.

Table 1 summarizes rural-urban cancer mortality studies. Although a variety of rural-urban definitions are involved, a fairly consistent pattern of higher mortality associated with urbanization emerges for most anatomic sites. This is particularly true for colon cancer and for the major smoking-related sites: bronchus/lung, oropharynx, and larynx. The most notable exceptions are lip cancers and some skin cancers, which are associated with exposure to sunlight and exhibit a rural mortality excess in two studies.

### Incidence

Table 2 summarizes rural-urban cancer incidence patterns. For all anatomic sites combined, and for most individual sites, cancer incidence increases with increasing population density. A noteworthy exception is cancer incidence among Mormons, which shows remarkably few rural-urban differences. This lack of a rural-urban gradient suggests that rural-urban differences in lifestyle contribute substantially to rural-urban cancer incidence gradients.

### Survivorship

A study of white male cancer patients whose primary malignancies were reported to the Tumor Registry of the Ohio State University Hospitals between July 1977 and May 1981 showed a significant rural-urban survival difference *only* for cancers of the gastrointestinal tract (Horner & Chirikos, 1987). In this instance, rural patients were more likely to survive over time than their urban counterparts. The more favorable prognosis for rural residents was found to be independent of disease stage and severity, therapy, and income.

## STAGE AT DIAGNOSIS

Staging is the determination of tumor extension and metastases. Tumor staging at the time of diagnosis can be considered one component of state-of-the-art

cancer care. Staging tumors is important in planning treatment, because staging gives an indication of prognosis, assists evaluation of end results, facilitates the exchange of information between treatment centers, and assists in the continuing investigation of cancer (Williams, 1990). Cancer stage at diagnosis (Farley & Flannery, 1989; Liff, Chow & Greenberg, 1991; Mandelblatt, Andrews, Kerner, Zauber & Burnett, 1991) and proportion of tumors unstaged at diagnosis (Liff, Chow & Greenberg, 1991; Mandelblatt, Andrews, Kerner, Zauber & Burnett, 1991) have been used as indicators of the quality of medical care received by a group of patients. For many cancers, early-stage diagnosis improves prognosis.

In the only rural-urban stage-at-diagnosis study published to date, Liff, Chow & Greenberg (1991) found rural patients to have a higher proportion of unstaged tumors than urban patients. Staged tumors tended to be more advanced among rural residents, especially among Blacks. The study used incident cancer cases diagnosed between 1978 and 1985 and reported to the Georgia Center for Cancer Statistics, a population-based registry affiliated with the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute. The registry collects information on all incident cancer cases in the metropolitan Atlanta area (5 counties) and in a nearby rural area consisting of 10 contiguous counties. The study reported percent distribution by stage at diagnosis (local, regional, distant, and unstaged) for oropharynx, colon, rectum, lung/bronchus, breast, uterine corpus, uterine cervix, prostate, and all sites combined. *In situ* cases were excluded. For the same anatomic sites, odds ratios of non localized (regional and distant) to localized disease were reported for whites and Blacks. For whites, all odds ratios except uterine cervix exceeded 1.0, indicating an excess of non localized disease among rural patients; only the 95% confidence interval for all sites combined excluded 1.0

(i.e., reached statistical significance). For Blacks, the odds ratios for colon, rectum, breast, lung/bronchus, prostate, and all sites combined were greater than 1.0, but only the odds ratios for lung/bronchus, prostate, and all sites combined excluded 1.0.

Lower socioeconomic status has been associated with later stage of diagnosis (Farley & Flannery, 1989; Liff, Chow & Greenberg, 1991; Mandelblatt, Andrews, Kerner, Zauber & Burnett, 1991) and a higher risk of more advanced disease (Farley & Flannery, 1989; Mandelblatt, Andrews, Kerner, Zauber & Burnett, 1991). In an urban population, postmenopausal age, Black race, low education, and public hospital use were associated with late-stage diagnosis of breast cancer; age and public hospital use were associated with late-stage invasive cervical cancer (Mandelblatt, Andrews, Kerner, Zauber & Burnett, 1991). The same study found an increased risk of distant breast disease was associated with age, public hospital use, marital status, and low education. Distant invasive cervical disease (*versus in situ* disease) was related to age, race, hospital setting, income, and education. In short, elderly, Black women of lower socioeconomic status who used public hospitals were at extremely high risk of having breast and cervical cancers diagnosed at late stages (Mandelblatt et al., 1991).

Women of lower socioeconomic status may present with later-stage disease because of decreased access to medical care and/or a decreased awareness of or belief in the importance of early cancer detection (Farley & Flannery, 1989). In Georgia, which has provided free Papanicolaou (Pap) smears through local health departments for resident women since 1967, the stage at cervical cancer diagnosis distribution was similar between rural and urban populations (Liff, Chow & Greenberg, 1991). Conversely, urban women, who reside in closer proximity to

more mammography facilities, were diagnosed at earlier stages of breast cancer than rural women.

## UTILIZATION OF CANCER CARE OR INFORMATION SERVICES

Rural-urban differences in utilization of health care services are a consequence of rural-urban differences in the factors that influence utilization of health care. Such factors include age (Cockerham, Lueschen, Kunz & Spaeth, 1986; Hayward, Shapiro, Freeman & Corey, 1988; Steiner, 1991; Zapka, Stoddard, Costanza & Greene, 1989), socioeconomic status (Cockerham, Lueschen, Kunz & Spaeth, 1986; Hayward, Shapiro, Freeman & Corey, 1988; MacLean, Sinfield, Klein & Harnden, 1984; Steiner, 1991; Williams & Dueker, 1895; Zapka, Stoddard, Costanza & Greene, 1989), ethnic background (Cockerham, Lueschen, Kunz & Spaeth, 1986; Hayward, Shapiro, Freeman & Corey, 1988; Vernon, Tilley, Neale & Steinfeldt, 1985), employment status (Hayward, Shapiro, Freeman & Corey, 1988), health status (Berkanovic, 1982; Cockerham, Lueschen, Kunz & Spaeth, 1986; Luft, Hershey & Morrell, 1976), and physician referral for screening procedures (Fox, Klos & Tsou, 1988; NCI, 1990; Rutledge, Hartmann, Kinman & Winfield, 1988; Zapka, Stoddard, Costanza & Greene, 1989).

An Illinois study of cancer patients referred to Medicare-certified home health care agencies during 1979 compared referral patterns in a rural region with those of an urban region (Oleske, Hauck & Heide, 1983). Referral rates adjusted for age and for age and sex simultaneously were similar in the two regions. Only three percent of the referrals in both regions were nonwhite, a factor attributed to the small percentage of nonwhites in these areas. Despite similar age, sex, and race characteristics, several of the referral characteristics studied suggested that rural patients were more ill at referral than urban patients. Significantly more rural

patients had metastatic disease, greater disability, and more concurrent medical conditions on referral compared to their urban counterparts. On a site-specific basis, these relationships held true for patients with breast, colorectal, and prostate cancers, but lung cancer patients in both regions experienced uniformly poor health at referral. Although physicians were the primary referral source overall, significantly more referrals were initiated by lay persons than by professionals in the urban region compared to the rural region. In both regions, the number of referrals from specialists was approximately twice that from general practitioners and family practitioners. Compared to the urban study area, the rural region had a lower physician-to-population ratio (106 *versus* 152 per 100,000), which suggested to the investigators less availability of medical services, and could have explained more advanced disease at referral, less hospitalization, and delayed referral to home care.

Screening for early detection of cervical and breast cancers can reduce mortality (Guzick, 1978; Chu, Smart & Tarone, 1988; Tabar, Fagerberg, Gad, Bladentorp, Holmberg, Grontoft, Ljunquist, Lundstrom, Månson, Eklund, Day & Pettersson, 1985), but evidence is mixed regarding whether rural women are screened less than their urban counterparts. Data from the 1973 National Health Interview Survey revealed that women in nonmetropolitan areas, compared to metropolitan areas, were more likely to report never having had a Pap smear; this was especially true for Blacks (Kleinman & Kopstein, 1981). On the other hand, a 1986 survey of Pennsylvania Medical Society general or family practitioners, internists, and obstetrician gynecologists—physicians most likely to be involved in screening. (Albanes, Weinberg, Boss & Taylor, 1988) reported no significant rural-urban difference in breast physical examination or screening mammography practices. The Pennsylvania study revealed that obstetrician-gynecologists used

mammography for non diagnostic purposes substantially more than did family practitioners and general practitioners. A 1989 American Cancer Society survey (American Cancer Society [ACS], 1990) of physicians indicated that internists and obstetrician-gynecologists order more mammograms in asymptomatic patients for baseline data purposes than do general and family practitioners. The latter two studies are important because of the much greater reliance of rural women on family physicians for prenatal and obstetrical care (Cullen, 1991).

In 1974, the Roswell Park Memorial Institute in Buffalo, New York opened a toll-free telephone cancer information service to the public that operated 16 hours a day, 7 days a week (Wilkinson, Mirand & Graham, 1976a & 1976b). The original library of 12 topics was expanded to 36 tapes recorded in English and 28 in Spanish. Publicity regarding the service was in the form of brochures distributed in numerous public places, a listing in the "White Directory"—a classified directory similar to the telephone book's yellow pages, public service announcements on radio and television, and public service ads in local newspapers and newsletters. Evaluation of service utilization after 2 years revealed that approximately twice as many women as men called, use was highest among teenagers and steadily declined with increasing age, students and housewives were the most frequent callers by occupation (51.8 and 21.6 percent, respectively), and response declined with increasing distance of residence from the Institute's downtown location (Wilkinson, Mirand & Graham, 1977). Relative under utilization of the service by rural residents was probably not a function of access to telephone service because experimental promotional campaigns in rural communities succeeded in temporarily increasing rural utilization rates to levels comparable to urban areas. In

all target areas throughout the study period, utilization of the service was related to promotional activities.

## DISCUSSION

Differences in cancer mortality and incidence among rural *versus* urban populations have been described for many, but not all, cancer types by a variety of researchers. With few exceptions, age-, race-, and sex-adjusted cancer mortality and incidence rates are higher in urban populations than in rural populations. Two potential explanations for lower overall cancer mortality and incidence rates in rural compared to urban areas are that risk-enhancing lifestyle factors, such as smoking, may be more prevalent in urban areas (Lyon, Garner & West, 1980; Mahoney, Labrie, Nasca, Wolfgang & Burnett, 1990; Nasca, Burnett, Greenwald, Brennan, Wolfgang & Carlton, 1980) and urban populations are exposed to higher levels of environmental pollutants.

If cancer mortality and incidence are used to measure health care system performance, rural populations appear to be at an advantage compared to their urban counterparts. This conclusion is contradicted by evidence that rural populations have fewer total physicians and fewer specialists per population unit. Also, there is preliminary evidence that cancer is diagnosed at more advanced and more disseminated stages of disease in rural populations compared to urban populations. This suggests that rural populations, which are typically older, less educated, and poorer, have less access to or utilization of early cancer detection programs than their urban counterparts.

What remains to be established is that access to or utilization of health care services influences cancer outcomes. For cancers with a high case fatality rate and those for which there are no effective screening tests, degree of access to or

utilization of health care is unlikely to affect outcome. To address this access-to-care/cancer outcome hypothesis, rural-urban comparison studies need to focus on cancer types for which effective screening and/or treatment protocols reduce mortality or improve survivorship. Components of health care to be measured include community cancer prevention activities; availability of medical specialists (e.g., oncologists, internists, obstetrician-gynecologists); and ethnic, cultural, educational, and socioeconomic barriers to health care utilization. Outcome measures to be compared include stage at diagnosis, proportion unstaged at diagnosis, case fatality rate, survival time, and quality of life following diagnosis. In rural-urban comparison studies, socioeconomic status of individual patients is a potential source of confounding that should be evaluated if at all possible. Researchers also need to improve and if possible standardize rural-suburban-urban definitions to produce more uniform and reliable classifications of residence. Whereas rural populations apparently experience less overall cancer incidence and mortality, the prognosis for rural cancer patients may be inferior. The distribution of cancer therapists clearly favors urban residents, and, except for programs such as the Community Clinical Oncology Program (CCOP) sponsored by the National Cancer Institute to encourage the diffusion of state-of-the-art care to rural areas, incentives to provide this kind of specialized care to sparsely populated areas are nonexistent. Researchers should attempt to unravel the relationship between geographic access to specialized cancer care, including cancer prevention activities, and cancer outcome in order to detect emerging differences in health status of rural populations that may be associated with inferior access. Policy makers should be prepared to make decisions about providing complex therapies requiring specialist

attention in rural areas if interventions are found to significantly influence outcomes.

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**Table 1**
**Summary of Rural-Urban Cancer Mortality Patterns, by Study**

| Study | Outcome Measure | Cancer Site | Rural-Urban Pattern | Source of Data | Rural-Urban Definition |
|---|---|---|---|---|---|
| Mahoney et al (1990) | Sex-specific standardized mortality rates | All sites<br>*Men*: colon, esophagus, gallbladder, kidney, lung, oral cavity, pharynx, pancreas, prostate, stomach<br>*Women*: breast, colon, liver, stomach | Increasing mortality with increasing population density | New York State, excluding New York City (1978-1982) | Population density quintiles |
| | | *Men and Women*: rectum<br>*Women*: cervix | Higher mortality in most and least dense quintiles than in intermediate density quintiles | | |
| | | Malignant melanoma | Highest mortality in intermediate density quintile | | |
| | | *Women*: Lung | Significant mortality deficit in more rural quintile | | |

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| Miller at al, (1987) | Age-sex-race adjusted mortality rates | All sites | Urban > Rural | National Center for Health Statistics (rates from three year averages centered at 1970 and 1975; average of 1979-1980) | U.S. Counties classified along a rural-urban continuum with 9 levels |
| Wright et al., (1985) | Age-race-standardized mortality rations | Whites and Blacks 65 years and older, all sites | Urban>Rural | Georgia Department of Human Resources (1979) | *Urban*: Standard Metropolitan Statistical Area counties<br>*Rural*: All others<br>Alternative: Eight groups by county population. |
| Thind,et al., (1981) | Age-adjusted annual mortality rates | *White & Black, Men & Women*: all sites | Urban: no change or decreased mortality. Rural & coastal counties: upward trend, especially for whites | National Center for Health Statistics (1950-1969 and 1969-1975) | Urban: Northeast counties—high population density & heavily industrialized. |

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| Hoover et al., (1975) | Age-adjusted mortality rates, standardized mortality ratios | *Whites, Men & Women*: All malignant neoplasms, colon, larynx, rectum, nasopharynx<br>*Women*: breast, Hodgkin's<br><br>*Men & Women*: eye, lip, other skin<br>*Men*: Prostate, testis<br>*Women*: Melanoma of skin, bone | Urban>Rural<br><br>Rural>Urban | U.S. Cancer Mortality by County. DHEW Pub. No. (NIH) 74-615, 1973 | *Urban*: 13 U.S. counties listed as 100% urban in 1960 census<br>*Rural*: 957 U.S. counties listed as 100% rural. |
| Blot & Fraumeni (1982) | Age-adjusted mortality rates, standardized mortality rations | *Whites, Men & Women*: mouth/throat, esophagus, lung, pancreas, rectum, bladder<br>*Men*: colon, kidney, stomach<br>*Women*: breast ovary, lymphoma<br><br>*Men & Women*: lymphoma | Increases with urbanization<br><br>No association with urbanization | Cancer mortality for U.S. counties, 1950-1969 (15 most common anatomic sites) | *Urban*: county population 250,000 or more<br>*Rural*: county population less than 25,000 |

**Table 2**
**Summary of Rural-Urban Cancer Incidence Patterns, by Study**

| Study | Outcome Measure | Cancer Site | Rural-Urban Pattern | Source of Data | Rural-Urban Definition |
|---|---|---|---|---|---|
| Greenberg et al., (1985) | Age-adjusted incidence rate ratios | Blacks, Men & Women: buccal cavity/pharynx, all sites<br>Men: lung, prostate<br>Women: pancreas | Urban>Rural | Atlanta Cancer Surveillance Center (SEER affiliate) (1978-1982) | Urban: Metropolitan Atlanta (5 counties)<br>Rural: 10 contiguous rural counties in Georgia |
| Bako et al., (1985) | Age-standardized incidence ratios | *Men & Women*: stomach, colon, rectum, pancreas, bronchus/lung, bladder, malignant melanoma, kidney, Hodgkin's, brain/nervous system, leukemia<br>*Men*: oral cavity/pharynx, esophagus, prostate, testis, larynx, multiple myeloma, lymphosarcoma<br>*Women*: breast, cervix, uterine body, ovary | Incidence increased with increasing population density | Provincial Cancer Registry, Alberta, Canada (1969-1973) | 2 metropolitan cities plus 3 population density groups |

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|---|---|---|---|---|---|
| Nasca et al., (1980) | Age-sex-standardized incidence ratios | *Men & Women*: colon, oral cavity/pharynx, esophagus, stomach, bronchus/lung | Incidence increased with increasing population density | New York State Cancer Registry (1968-1972) New York State excluding New York City | Population density quintiles |
| | | *Men*: liver, gallbladder, pancreas, bladder, larynx, rectum<br>*Women*: brain & nervous system, ovary, breast, cervix (invasive) | Standardized incidence ratios greatest for most sparsely and most densely populated quintiles. | | |
| | | *Men*: prostate, testis, kidney<br>*Women*: endometrium<br>*Men & Women*: leukemia's, malignant melanomas-skin, lymphosarcoma, reticulum cell sarcomas, Hodgkin's, multiple myelomas | No evidence that incidence is related to population density | | |

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|---|---|---|---|---|---|
| Lyon et al., (1980) | Age standardized incidence ratios by religion | *Mormon Men & Women*: colon<br>*Mormon Women*: breast, tobacco-related sites<br>*Non-Mormon Men*: tobacco-related sites, bladder, stomach, colon, prostate | Urban>Rural | Utah Cancer Registry (1967-1975) | *Urban*: 3 Metropolitan Statistical Areas in Utah(4 contiguous counties)<br>*Rural*: remainder of the State of Utah |
| | | *Mormon Men*: prostate | No urban-rural gradient | | |
| | | *All Groups*: lip | Rural>Urban | | |