Cancer & Poverty

Colorado
1995-2006

Acknowledgements

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Appendix Tables can be found at: http://www.cdphe.state.co.us/pp/ccpc/PublicationsResources.html

Executive Summary

Poverty continues to be an important factor that increases the risk of getting cancer, of having cancer diagnosed at a later stage, and of dying due to cancer in Colorado. The relationships between poverty and cancer are unsurprising given the socioeconomic differences in tobacco use, the use of cancer screening tests, and the access to appropriate cancer treatment.

Many cancers can be prevented by avoiding tobacco use, eating healthy foods, avoiding becoming overweight, and staying physically active. Even when cancer does develop, risk of dying from it can be reduced by diagnosing cancer at an early stage and by applying effective treatments. However, poverty presents many barriers to cancer prevention, early diagnosis, and treatment. The purpose of this report is to examine the relationships between poverty, the known risk factors for cancer, incidence rates, early stage diagnosis, and survival from cancer in Colorado in order to help develop better cancer prevention and control strategies for everyone in the state.

The publication of *Cancer and Poverty in Colorado: 1995-2006*, prepared by the Comprehensive Cancer Program (CCP) of the Colorado Department of Public Health and Environment (CDPHE), is a continuation of a series of Colorado reports on cancer. This report provides updated information on the relationship between poverty and cancer by adding data from the years 2001-2006 to the analysis from a previous report on this topic that included the years 1995-2000.[1] The report may be useful to policy makers, healthcare professionals, and community groups to assist in developing and evaluating prevention and intervention strategies, identifying high

risk populations, and prioritizing resource allocations for cancer-related services.

As with the earlier study, this report uses information on cancer incidence, stage, and survival from the Colorado Central Cancer Registry (CCCR), information on cancer-related behaviors and screening from the 1995-2006 Colorado Behavioral Risk Factor Surveillance System (BRFSS) surveys, and information on

> **Poverty continues to be an important factor that increases the risk of getting cancer, of having cancer diagnosed at a later stage, and of dying due to cancer in Colorado.**

poverty and population counts from the U.S. Census Bureau. Information on insurance status of cancer cases is obtained from the CCCR in this report. Categories of poverty were defined in the BRFSS surveys data by self-report of household income, and in the cancer registry data by the 2000 US Census information about the percentage of households living in poverty in the neighborhoods in which cancer cases resided.[^]

Although there has been some overall improvement between the eras 1995-2000 and 2001-2006 in cancer rates and preventive behaviors in Colorado, the underlying relationship between poverty and cancer remains unchanged.

We found that:

- Coloradans with lower incomes were more likely to smoke tobacco, to be obese, to be less physically active, and to not participate in screening tests for breast, cervical, or colorectal cancer.

- Differences in utilization of screening examinations were less apparent after Medicare age (age 65).

[^]See Appendix section for details.

- For most cancers, Coloradans who lived in poorer neighborhoods and had no health insurance were more likely to have had a more advanced stage of cancer at the time of diagnosis

- For most cancers, Coloradans who lived in poorer neighborhoods were more likely to die within the first 5 years following cancer diagnosis.

These relationships were seen among both men and women and among people of different races and ethnicities. Importantly, though, the relationships between poverty and stage of cancer, as well as survival after cancer, were less apparent after age 65.

Solutions to the problems caused by poverty are, of course, complex. However, this analysis suggests that focusing efforts on reducing tobacco use, preventing obesity, encouraging physical activity, and increasing access to cancer screening and appropriate cancer treatment can help reduce suffering and death from cancer in Colorado.

We recommend that:

- Policymakers and public health agencies should focus on efforts to reduce health disparities caused by poverty.

- Efforts should be made to reduce health disparities in disadvantaged populations by ensuring that Colorado residents, regardless of income, have access to quality health education, cancer screening, and cancer treatment.

- Funding for programs should continue and be enhanced to encourage adoption of healthy behaviors, increase access to preventive health services for early detection of cancer, and increase access to timely initiation of effective cancer treatment right after cancer diagnosis.

- Surveillance of cancers based on routine reports on health statistics should, where possible, report data according to poverty levels rather than only by race/ethnicity.

Since 2004, cancer has been the leading cause of death in Colorado.[2]

Introduction

Since 2004, cancer has been the leading cause of death in Colorado.[2] Although significant progress has been made in reducing cancer mortality rates since 1990, inequalities remain among racial and ethnic populations in Colorado. Many types of cancer can be prevented. And once a cancer has developed, outcomes can be substantially improved through earlier detection and proper treatment. Factors important in reducing cancer risk and improving outcomes include:

1. Adopting healthy behaviors such as not smoking, eating a healthy diet, preventing obesity, and increasing physical activity

2. Obtaining recommended screening tests, such as mammography, Pap tests, and colorectal screening at recommended intervals

3. Initiating a complete course of the latest and most effective cancer treatments as soon as possible after diagnosis

As of 2006, cancer remains the leading cause of death (Figure I) in Colorado. However, in the past few years, better early detection and progress in cancer treatment have kept the number of cancer deaths down in Colorado by diagnosing cancers at an earlier stage. In this report, we chose to present the top seven cancer sites in Colorado that have beneficial preventive measures available to lower risk of cancer.

Figure I: Leading Causes of Death in Colorado, 2006

Source: Health Statistics Section, Colorado Department of Public Health and Environment, August 2008.

Two most commonly diagnosed cancers in Colorado are female breast cancer and prostate cancer. Because of preventive measures like tobacco cessation, early cancer stage diagnosis and early treatment, deaths due to cancer have remained low among the seven cancer sites mentioned in this report. Unfortunately, lung cancer as a cause of death still remains high (Figure II).

Figure II: Incidence and death counts of some of the most commonly diagnosed reportable cancers in Colorado residents, 2006

Cancer Site	Incidence Counts	Death Counts
Female Breast	3509	493
Prostate	2968	355
Lung	1997	1551
Colon/Rectum	1780	652
Melanoma	1286	128
Oral Cavity and Pharynx	407	97
Cervix-Invasive type	175	52

Source: Colorado Central Cancer Registry and Health Statistics Section, Colorado Department of Public Health and Environment, August 2008.

Poverty continues to be an important factor that increases the risk of getting cancer, of having cancer diagnosed at a later stage, and of dying after cancer in Colorado. The relationships between poverty and cancer are unsurprising given the socioeconomic differences in tobacco use, the use of cancer screening tests, and the access to appropriate cancer treatment.

Socioeconomic status, race/ethnicity, and gender are important factors in determining the relationship between cancer risk and outcomes,[3,4] and poverty is an important contributor to the racial/ethnic disparities evident in the burden of cancer. In 2005, 10.9 percent of Coloradans were living in poverty.[5] While that figure, as a whole, was lower than the overall U.S. poverty rate of 13.3 percent,[5] wide disparities still remain within the state. According to the 2000 U.S. Census,

poverty rates within Colorado census tracts ranged from no residents living in poverty to more than 40 percent of residents living in poverty.[6] Racial/ethnic minority groups in Colorado bear a disproportionate burden of poverty. Only 8.2 percent of non-Hispanic whites live in poverty, compared to 23.1 percent of Hispanics, 22.7 percent of blacks, 24.2 percent of American Indian/Alaska Natives, and 12.6 percent of Asian/Pacific Islanders.[7]

Factors important in reducing cancer risk and improving outcomes include:

1. Adopting healthy behaviors such as not smoking, eating a healthy diet, preventing obesity, and increasing physical activity;

2. Obtaining recommended screening tests, such as mammography, Pap tests, and colorectal screening at recommended intervals;

3. Initiating a complete course of the latest and most effective cancer treatments as soon as possible after diagnosis.

Lack of health insurance contributes to health disparities.

Lack of health insurance contributes to health disparities. Among uninsured Coloradans less than age 65, 32 percent are living at under 100 percent of the Federal Poverty Level[8] and are more likely to experience worse cancer outcomes due to diminished access to preventive care, delayed diagnosis, and less complete treatment.[9] The number of uninsured is growing in the United States as well as in Colorado. In 2006-2007, an estimated 17 percent of Coloradans, or more than 813,000 individuals, lacked health insurance.[8] In 2005-2006 in Colorado, 36 percent of Hispanics had no health insurance coverage, in comparison to 15 percent of blacks, and 12 percent of non-Hispanic whites.[10]

Measures used in this report

This analysis was based on information collected by the Colorado Central Cancer Registry (CCCR), the Colorado Behavioral Risk Factor Surveillance System (BRFSS), and the U.S. Census Bureau. Information on Colorado cancer cases on health insurance status, cancer incidence, cancer stage, and survival after cancer was provided by the CCCR. We then used information on household income and poverty, obtained through the 2000 U.S. Census on the state of Colorado, to define census block group areas based on three levels of poverty: 1) less than 10 percent poverty, 2) 10-19 percent poverty, 3) 20+ percent poverty.[B] The 2000 data was the most current available at the census block group level of geography. Because information on individual income was not reported to state cancer registries, the poverty level of the census block group area where each cancer case lived was used to assign socioeconomic poverty level for that cancer case. The Health Statistics Section of CDPHE provided information related to health behaviors drawn from the Colorado BRFSS.[B]

The individual insurance information for most cancer cases reported to the Cancer Registry became available starting in 1998. For this report, insurance categories were displayed with the 2001-2006 early detection data. Insurance status (based on the primary payer at diagnosis) was included with the cancer case information reported to the Cancer Registry by each facility in Colorado. Categories of insurance coverage presented were: not insured, private insurance (including TRICARE and Military coverage), Medicaid, and Medicare. Cancer case counts insufficient to display insurance category by poverty level were: federal (including Veteran's Affairs and Indian/Public Health Service), Medicare under age 65, Medicaid age 65 and older, and uninsured age 65 and older.[C]

[B] The detailed methods used in this analysis are presented in "Determining Poverty Levels" in the Appendix below.
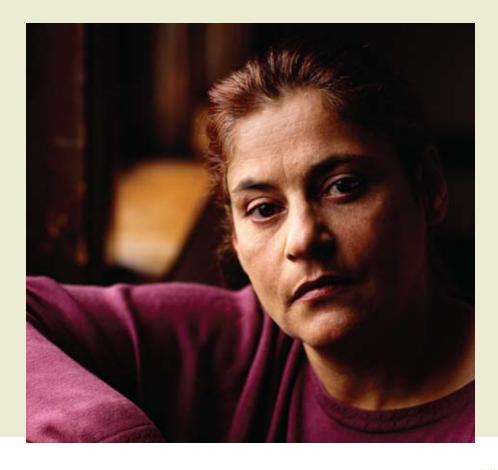[C] See "Insurance Status of Coloradans with Cancer" in the Appendix below.

Language Use

The Comprehensive Cancer Program (CCP) recognizes the challenge of defining racial/ethnic groups. We acknowledge that not everyone identifies him or herself with these categories, and we respect the importance of cultural differences in how individuals and communities prefer to be defined. The program also recognizes that race and ethnicity are social categories representing distinct cultures and histories of groups within the United States, and are not categories based on specific biological or genetic differences.

In this report, terms used to describe the racial/ethnic background of groups of people are non-Hispanic white, black, Hispanic, Asian/Pacific Islander, and American Indian. Non-Hispanic white refers to the standard data collection category of white, but not Hispanic. Hispanic refers to the standard data collection category of white/Hispanic. The term "black" refers to black, regardless of Hispanic identification. Asian/Pacific Islander refers to the standard collection category of Asian or Pacific Islander. The term American Indian refers to the standard collection category of Native American not including Alaskan Native.

Poverty was defined differently in the Behavioral Risk Factor Surveillance System (BRFSS) survey data and the Colorado Central Cancer Registry (CCCR) data. For the BRFSS survey data, weighted average poverty thresholds published each year by the U.S. Census Bureau and household income data from BRFSS were used to define three poverty categories: "In Poverty" (less than 100 percent of poverty threshold), "At/Near Poverty" (100-199 percent of poverty threshold), and "Not in Poverty" (200 percent or above of poverty threshold). For the CCCR data, the poverty level of the census block group area, obtained through the 2000 U.S. Census, where each cancer case resided was used to assign the poverty level for that case: "less than 10 percent poverty" or wealthier areas, "10-19 percent poverty" or middle poverty areas, and "20+ percent poverty" or poorest areas.[B]

Out of over 100 different types of cancers, seven cancer types, which are known to be preventable or detectable at early stages of disease, are the focus of this report. These cancers are highlighted because they may be prevented in many persons by adopting healthy behaviors or detected at early, more survivable stages, by using recommended cancer screening tests. This section illustrates how poverty becomes a disadvantage when looking at the key behavioral factors and utilization of screening tests.

Tobacco and Alcohol Use:

Smoking has been linked to cancers of the lung, mouth, pharynx (throat), larynx (voicebox), esophagus, pancreas, cervix, colon/rectum, kidney, and bladder.[11,12] According to the National Cancer Institute, cigarette smoking causes 87 percent of lung cancer deaths.[11] The risk of developing lung cancer increases as the quantity and the duration of cigarette smoking increase.[12] Exposure to second-hand or "passive" tobacco smoke at home or the work place increases the risk of lung cancer in nonsmokers by 20-30 percent.[13] Avoiding tobacco smoke is the best way to prevent lung cancer and other types of associated cancers. Quitting early and persisting in smoking abstinence lessens an individual's lifetime risk of developing lung cancer among former smokers; risk declines the longer they stay smoke free and avoid the accumulating risks from continued smoking.[14]

Symptoms of lung cancer usually do not appear until the cancer is well advanced, making detection at an early stage difficult. The U.S. Preventive Services Task Force concludes that the evidence is insufficient to recommend either for or against screening asymptomatic persons

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for lung cancer with low dose computerized tomography, chest x-ray, sputum cytology, or a combination of these tests.[15] Currently, studies are underway to determine whether screening high-risk individuals with low-dose, computerized tomography before symptoms appear will reduce lung cancer deaths.

Poverty has been shown to be associated with higher likelihood of risk factors for cancer, such as smoking and consuming excessive alcohol.

Poverty has been shown to be associated with higher likelihood of risk factors for cancer, such as smoking and consuming excessive alcohol.[16] Among Colorado residents, those reporting lower incomes were more likely to be current smokers, and less likely to be current smokeless tobacco users. However, less smoking is reported in 2001-2006 than the earlier time period (1995-2000) while more smokeless tobacco use is reported in the later time period (2001-2006). Heavy alcohol use was not shown to be associated with poverty in Colorado in the 2001-2006 surveys. (Figure A)

Figure A: Percent of Colorado residents who currently use tobacco products or engage in heavy alcohol use, 1995-2000 and 2001-2006.

Source: Colorado Behavioral Risk Factor Surveillance System; Health Statistics Section, Colorado Department of Public Health and Environment, August, 2008. See Appendix, "Data, Methods, and Definitions" for specific survey years available with each time period.

*Comparable data on heavy alcohol use for 1995-2000 are not available.

Obesity, Physical Activity, and Diet:

Obesity is a risk factor for cancers of the colon, esophagus, kidney, uterus, and breast in postmenopausal women.[17] Evidence shows that physical activity reduces the risk of cancers of the breast, colon, lung, prostate, and uterus, and improves the quality of life among cancer patients and survivors.[18] Populations consuming diets high in fruits and vegetables tend to have a lower overall cancer risk; evidence of protection has been shown for cancers of the lung, colon and rectum, oral cavity, esophagus, and stomach.[19]

Obesity is a risk factor for cancers of the colon, esophagus, kidney, uterus, and breast in postmenopausal women.
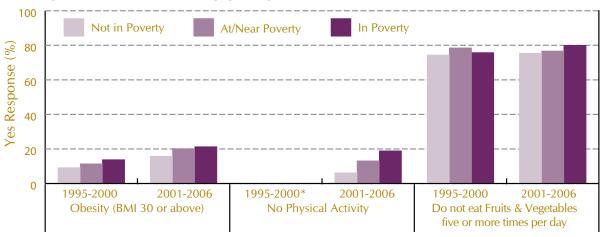
Physical activity reduces the risk of cancers of the breast, colon, lung, prostate, and uterus, and improves the quality of life among cancer patients and survivors.

For the areas with more poverty, more obesity was reported than in the other areas in Colorado.

Research has shown that poverty is associated with consuming diets low in fruits and vegetables.[20] In the 2001-2006 surveys, Coloradans in poverty were more likely to not eat five or more fruits and vegetables per day (Figure B). In addition, more obesity was reported in the 2001-2006 surveys than in the earlier 1995-2000 surveys. Those in poverty reported more obesity than in the other income groups. A higher percentage of those in poverty also tended to have no physical activity as reported in the 2001-2006 surveys. (Figure B)

Figure B: Percent of Colorado residents who are currently obese (BMI 30 or above), do not engage in physical activity, or do not eat fruits and vegetables five or more times per day by poverty level, 1995-2000 and 2001-2006.

Source: Colorado Behavioral Risk Factor Surveillance System; Health Statistics Section, Colorado Department of Public Health and Environment, August, 2008. See Appendix, "Data, Methods, and Definitions" for specific survey years available with each time period.

*Data on physical activity for 1995-2000 are not available.

Colorectal Cancer Prevention and Screening:

The most important risk factor for colorectal cancer is an individual's age, since more than 90 percent of colorectal cancers occur in persons over 50 years. Other risk factors include a family history of colorectal cancer and/or polyps, a personal history of colon polyps or inflammatory bowel disease, modifiable risk factors like smoking, obesity, physical inactivity, a diet high in red or processed meat, low consumption of fruits and vegetables, and heavy consumption of alcohol.[12] The U.S. Preventive Services Task Force recommends that colorectal cancer screening begin at age 50 for all adults at average risk. Screening options for colorectal cancer include

Coloradans reporting lower incomes were less likely to have undergone recommended colorectal screening.

fecal occult blood testing (FOBT) every year, flexible sigmoidoscopy every five years, double contrast barium enema every five years, or colonoscopy every 10 years.[15]

Endoscopic screening tests such as flexible sigmoidoscopy and colonoscopy can detect and remove colon polyps before they progress to cancer. Using these tests, colorectal cancer can also be detected at an early stage, when
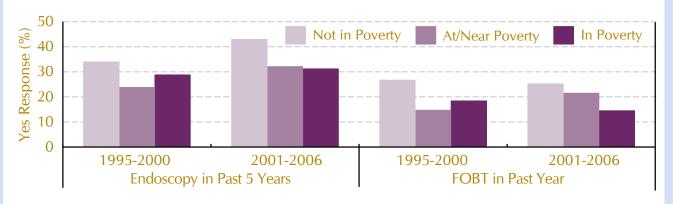
treatment is more successful. Coloradans reporting lower incomes were less likely to have undergone recommended colorectal screening. Figure C shows that Colorado residents from poorer areas were less likely to have had an endoscopy (either sigmoidoscopy or colonoscopy) in the past five years or fecal occult blood test in the past year. This remains true in both 1995-2000 and 2001-2006. A higher percentage of people reported to have endoscopy in the 2001-2006 surveys than the earlier 1995-2000 surveys. This increase is seen in all household income levels and is more obvious in the higher income level.

Since its inception in 2006, the Colorado Colorectal Screening Program (CCSP), coordinated by the University of Colorado Comprehensive Cancer Center at the University of Colorado Denver, has utilized awarded funding from the CDPHE's Cancer, Cardiovascular Disease and Chronic Pulmonary Disease (CCPD) Competitive Grants Program to screen eligible Coloradans for colorectal cancer. CCSP has helped to contribute to the state's overall goal of screening 75 percent of Colorado's total population eligible for screening, and to increase awareness in encouraging all Colorado residents to take part in colorectal cancer screening exams. As of July, 2008, CCSP has successfully screened 4900 patients and detected 46 cancers.[21]

Figure C: Percent of Colorado residents age 50 and older who have ever had a colon endoscopy in the past five years or fecal occult blood test (FOBT) in the past year by poverty level, 1995-2000 and 2001-2006.

Source: Colorado Behavioral Risk Factor Surveillance System; Health Statistics Section, Colorado Department of Public Health and Environment, August, 2008. See Appendix, "Data, Methods, and Definitions" for specific survey years available with each time period.

Breast Cancer Prevention and Screening

Age is an important risk factor for developing most cancers, including female breast cancer. Individual factors, other than age, that increase a woman's risk for developing breast cancer include: a family or personal history of breast cancer; biopsy-confirmed atypical hyperplasia (a type of non-cancerous breast condition); high breast tissue density; high dose radiation to the chest; having a first child after age 30; a long menstrual history; obesity; physical inactivity; intake of one or more alcoholic drinks per day; and taking hormone supplements after menopause.[12] The U.S. Preventive Services Task Force recommends screening mammography, with or without clinical breast examination, every one to two years for women aged 40 and older.[15] Mammography can detect an abnormality before a woman or her doctor can feel it. Detection of breast cancer at an early stage saves lives and increases treatment options.

In Colorado, females who report lower incomes were less likely to access mammography.

Those who live in poverty areas tend to be more susceptible to having risk factors like obesity, physical inactivity, intake of one or more alcoholic drinks per day,[16] as well as less access to preventive screening tests for breast cancer. In Colorado, females who report lower incomes were less likely to access mammography. In addition, fewer Colorado females reported using mammograms in the 2001-2006 surveys than the earlier 1995-2000 surveys. (Figure D)

Figure D: Percent of Colorado females age 40 and older who had a mammogram in the past two years or age 18 and older who had a pap smear in the past three years by poverty level, 1995-2000 and 2001-2006.

Source: Colorado Behavioral Risk Factor Surveillance System; Health Statistics Section, Colorado Department of Public Health and Environment, August, 2008. See Appendix, "Data, Methods, and Definitions" for specific survey years available with each time period.

Cervical Cancer Prevention and Screening

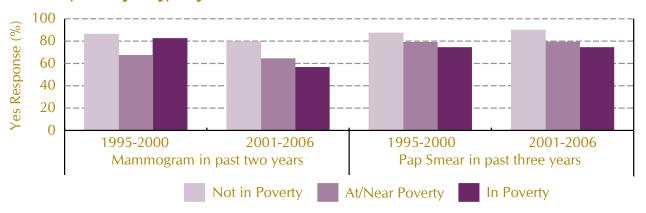Major risk factors for cervical cancer include unprotected sexual behaviors that increase exposure to the human papilloma virus (HPV), a common sexually transmitted infection that can cause cervical cancer. Cigarette smoking is also associated with increased cervical cancer risk.[12] In 2006, the U.S. Food and Drug Administration (FDA) approved the first vaccine developed to prevent some of the most common cancer-causing HPV infections for use in females aged 9-26.[12] However, females who were infected with HPV prior to vaccination may not be protected by the vaccine. In addition, the vaccine may not protect against cervical cancer or infections from the less common HPV types. So, routine and regular Pap tests to detect cervical precancerous changes are critical to early stage diagnosis and treatment.[22]

The U.S. Preventive Services Task Force strongly recommends screening for cervical cancer in women who have been sexually active and have a cervix. Annual screening for cervical

> **Women of lower incomes were less likely to use Pap tests for cervical cancer screening.**

cancer with a Pap test should begin within three years of becoming sexually active or at age 21, whichever comes first. Screening is advised annually, but at least every three years, and there is evidence that older women who had recent Pap tests with normal results can probably stop screening after age 65. Screening is recommended in older women with no previous Pap test screening, when previous screening information is unavailable, or when screening is unlikely to have occurred in the past.[15] Detection of cervical cancers through screening saves lives, by diagnosing cancers before they become invasive and less treatable. According to the American Cancer Society, most pre-cancers of the cervix develop slowly so that nearly all cases can be prevented from progressing to cancer if women are screened regularly.[12]

Access to preventive services like cervical cancer screening is more difficult for those in poverty. Women with a low household income tended to use cervical cancer screening less often than women with higher incomes.[23] Figure D shows the same tendencies in Colorado women. Women of lower incomes were less likely to use Pap tests for cervical cancer screening. The overall percentage of surveyed Colorado women accessing the Pap smear test did not change between the recent 2001-2006 surveys and the earlier 1995-2000 surveys.

In Colorado, the Colorado Women's Wellness Connection, administered by the Colorado Department of Public Health and Environment, has provided breast and/or cervical cancer screening for low-income and uninsured women aged 40 and older since 1991. However, only 27 percent of Colorado women who are eligible for the program have taken advantage of these preventive screening services. Of those women receiving program services, approximately 4.2 percent are black and 38 percent are Hispanic.
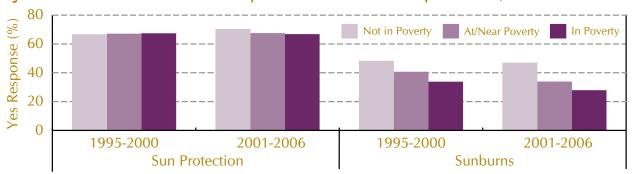
Skin Cancer Prevention

Overexposure to ultraviolet radiation in sunlight is believed to be a contributing factor to some cases of melanoma. Other risk factors include fair skin that burns easily, a personal or family history of melanoma, having many moles (more than 50) or atypical or unusual looking moles, use of tanning booths, having diseases that suppress the immune system, and occupational exposure to coal tar, pitch, creosote, arsenic compounds, or radiation.[12] The American Cancer Society and the U.S. Preventive Services Task Force encourage sun-protection behaviors to prevent skin cancer, such as limiting sun exposure especially during midday, avoiding tanning facilities, wearing protective clothing when outdoors, and applying sunscreen with a sun protection factor of SPF 15 or higher.[12,15] The U.S. Preventive Services Task Force has concluded that there is insufficient evidence to recommend for or against routine total-body skin examinations by clinicians for the early detection of skin melanoma, basal cell skin cancer, or squamous cell skin cancer.[15] However, any suspicious skin lesion should be checked by a physician.

Studies have shown that poverty or low income was less associated with increased risk of skin cancer. Instead, less educational achievement was more associated with risk of skin cancer.[24] Also, it was found that melanoma patients with low socioeconomic status were more likely to die from melanoma than patients of higher socioeconomic status;[24, 25] this was likely because melanoma was diagnosed more often in the later stage of disease in those with lower incomes. For both 1995-2000 and 2001-2006 surveys in Colorado, those in poverty have lower sunburn occurrences, and therefore are less at risk for developing melanoma than those not in poverty or at/near poverty. In addition, most Coloradans surveyed used sun protection and poverty was not shown to be associated with use of sun block. (Figure E)

Figure E: Percent of Colorado residents who use sun protection or have had sunburns the past 12 months, 1995-2000 and 2001-2006.

Source: Colorado Behavioral Risk Factor Surveillance System; Health Statistics Section, Colorado Department of Public Health and Environment, August, 2008. See Appendix, "Data, Methods, and Definitions" for specific survey years available with each time period.
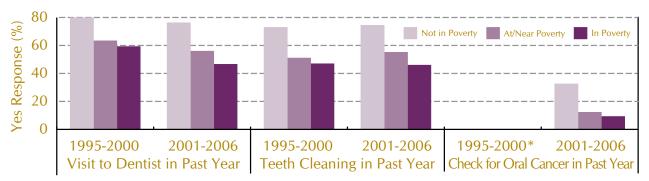
Oral Cavity/Pharynx Cancer Prevention and Screening

The known risk factors for cancers located in the oral cavity and pharynx are tobacco use (smoked and smokeless), excessive alcohol consumption, poor nutrition, and overexposure to ultraviolet radiation from sunlight (lip cancer).[12,26] The majority of early signs and symptoms of oral cavity and pharyngeal cancers are difficult to detect and are often painless. The U.S. Preventive Services Task Force has concluded that there is insufficient evidence to recommend for or against routine screening for oral cancer in adults.[15] However, tobacco cessation and

limiting alcohol use to reduce the risk of developing oral cancer are highly encouraged.

Those who live in poorer areas are more likely to have more tobacco use and alcohol use than those in more affluent areas. In addition, less access to preventive services like dental check-ups is more prevalent in those living in areas of poverty. Figure F shows that in Colorado, poverty is strongly linked to fewer dental visits, dental cleanings, and oral cancer check-ups. There is no major change between the recent 2001-2006 surveys and the earlier 1995-2000 surveys in dental visits or dental cleanings.

Figure F: Percent of Colorado residents who visit the dentist, had teeth cleaning, or check for oral cancer in the past year, 1995-2000 and 2001-2006.

Source: Colorado Behavioral Risk Factor Surveillance System; Health Statistics Section, Colorado Department of Public Health and Environment, August, 2008. See Appendix, "Data, Methods, and Definitions" for specific survey years available with each time period.

* Data on "check for oral cancer in the past year " for 1995-2000 are not available.

Prostate Cancer Prevention and Screening

The most important risk factor for prostate cancer is age. Approximately 64 percent of prostate cancers in the U.S. are diagnosed in men older than age 65.[12] Other risk factors include black race, eating a diet high in saturated fats, and family history of prostate cancer; five to ten percent of the prostate cancers may be due to strong familial predisposition.[12]

The U.S. Preventive Services Task Force concludes that the evidence is insufficient to recommend for or against routine screening for prostate cancer using prostate specific antigen (PSA) testing or digital rectal examination (DRE).[15]

Poverty is strongly linked to fewer dental visits, dental cleanings, and oral cancer check-ups.

Screening is associated with potential harms, including frequent false positive results and unnecessary anxiety, biopsies, and potential complications of treatment of some cancers that may never have affected a patient's health. Men should discuss all the potential benefits and harms of prostate cancer screening with their physicians to decide whether or not to be tested.

The lifetime risk of being diagnosed with cancer in Colorado is approximately one in two for males, and two in five for females.

The lifetime risk of being diagnosed with cancer in Colorado is approximately one in two for males, and two in five for females.[27] In the U.S., the majority of all cancer deaths are attributable to tobacco use, poor nutrition practices, obesity, physical inactivity, and failure to access existing screening tests for cancer.[12]

Poverty and Incidence of Cancer

An average of 18,400 malignant cancers are diagnosed annually in Colorado. The poorest areas of the state had higher incidence rates of cancers of the oral cavity and pharynx, colon/rectum, lung, and cervix and lower incidence rates of melanoma, breast cancer, and prostate cancer (see Appendix Tables 1-18). These relationships are explored in greater detail in the subsequent chapters.

An average of 18,400 malignant cancers are diagnosed annually in Colorado.

Poverty and Early Detection

Approximately 58 percent of cancer cases were diagnosed at an early stage in Colorado.[2] A smaller proportion of cancers were diagnosed early among Coloradans living in poorer areas, regardless of race/ethnicity, sex or age. These patterns were similar across the two time periods of 1995-2000 and 2001-2006. (Figure 1 and Appendix Tables 19A and 19B).

Figure 1: Early stage at diagnosis for all cancers by area poverty level, age, gender, and race in Colorado 1995-2000 and 2001-2006.

1995 - 2000

Early Stage at Diagnosis (%)

Total, ages <65, ages 65+, Male, Female, Non-Hispanic White, Hispanic, Black, Asian/Pacific Islander, American Indian

2001- 2006

Early Stage at Diagnosis (%)

Total, ages <65, ages 65+, Male, Female, Non-Hispanic White, Hispanic, Black, Asian/Pacific Islander, American Indian

■ <10% poverty   ■ 10-19% poverty   ■ 20+% poverty

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

Cancer was more likely to be diagnosed early among those with private insurance.

Insurance Status and Early Detection

Coloradans with greater healthcare access, because of their health insurance status, had their cancers diagnosed at an earlier stage. Among those aged less than 65, cancer was more likely to be diagnosed early among those with private insurance than among those who either had no insurance or had Medicaid; those from poorer areas who either had no insurance or had private insurance had lower rates of early detection than those from more affluent areas. (Figure 2)

Figure 2: Early stage at diagnosis for all cancers by area poverty level, age, and insurance status in Colorado; 2001-2006.

Legend: <10% poverty, 10-19% poverty, 20+% poverty

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

Poverty and Survival

Those from poorer areas had worse survival for all cancers combined for most of the race/ethnicity, gender, and age groups. Five-year survival rates were 8-13 percent lower for persons living in poorer areas (Figure 3). The largest disparity in survival between poorer areas and more affluent areas was seen for cancers diagnosed at the regional stage, a stage at which more intensive treatment can have a substantial effect on survival.[D]

Figure 3: Five-year survival for all cancers by area poverty level, age, gender, race, and stage; 1999-2002, Colorado.

> Those from poorer areas had worse survival for all cancers combined.

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

[D] Staging of cancer is the process of finding out whether cancer has spread and its extent of spread. In-situ or localized stage is cancer confined to the organ where it started and has not spread to distant parts of the body. Regional stage is cancer spread from its original site to nearby areas such as lymph nodes, but not to distant areas. Distant stage is cancer spread far from the original location to distant organs or lymph nodes. (Source: American Cancer Society web site, http://www.cancer.org).

An average of 2,900 malignant breast cancers are diagnosed annually in Colorado women.

Breast cancer is the most common cancer diagnosed among women in Colorado and is the second leading cause of cancer-related death in women, after lung cancer.[12] The lifetime risk of breast cancer for females in Colorado is one in seven.[27]

Poverty and Incidence

An average of 2,900 malignant breast cancers are diagnosed annually in Colorado women. During 1996-2006, the yearly incidence rate of breast cancer was 138.7 cases per 100,000 women for areas of the state that had the least poverty (less than 10 percent poverty), 123.6 for the areas with 10-19 percent poverty, and 104.2 for the poorest areas with 20 percent or more poverty (Appendix Table 4). This difference in incidence may be due in part to the higher prevalence of screening found in the women not in poverty. With higher screening rates, more small cancers are likely to be diagnosed. Other factors affecting the incidence rates might include differences among the three groups in average age at first pregnancy and use of hormone replacement therapy.

Breast cancers were less likely to have been detected at an early stage in the poorer areas of the state.

Poverty and Early Detection

Nearly three in four breast cancers in Colorado females were detected at an early, more curable stage.[27] In general, there was no improvement in early detection between 1995-2000 and 2001-2006 regardless of poverty level with the exception of black women from the wealthier areas and Asian/Pacific Islanders from poorer areas. Breast cancers were less likely to have been detected at an early stage in the poorer areas of the state (Figure 4). The smaller differences seen between the poverty groups among women aged 65 and older may be attributable to Medicare mammography benefits.

Figure 4: Early stage at diagnosis for breast cancer by area poverty level, age, and race in Colorado, 1995-2000 and 2001-2006.
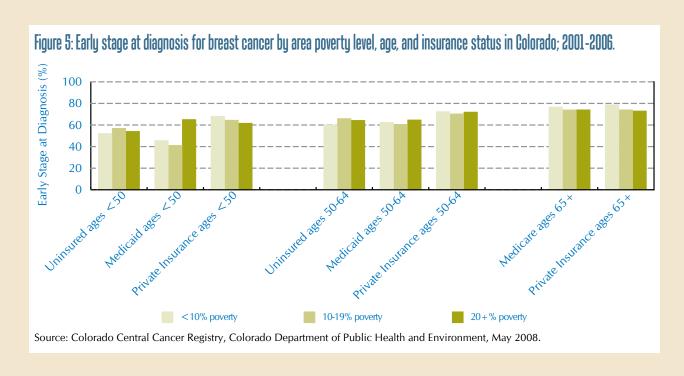

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May, 2008.

Insurance Status and Early Detection

In 2001-2006, among all women less than 50 years old, those with private insurance had better early stage diagnosis than did those with either Medicaid or no insurance. Medicaid enrollees under 50 from the poorest areas of the state had better early stage detection of breast cancer than did Medicaid enrollees from the middle income and wealthier areas. This finding may be due to better screening behavior in this group during this time period. Breast cancer early detection is one of the key outcomes of an adequately screened population. Comprehensive cancer efforts in breast cancer screening need to focus on including women with lower incomes all across the state.

Among women aged 50-64 years, those with private insurance were more likely to be diagnosed early regardless of which area they lived. For women aged 65 and older, although poorer areas showed somewhat later detection compared to wealthier areas, only slight differences in early detection were seen between those having Medicare and private insurance (Figure 5). This is partially due to Medicare providing screening mammography and treatment for beneficiaries, regardless of income.

Figure 5: Early stage at diagnosis for breast cancer by area poverty level, age, and insurance status in Colorado; 2001-2006.

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

Survival rates were found to be lower in poorer areas of the state.

Poverty and Survival

Approximately 87 percent of women with breast cancer in Colorado survive at least five years after diagnosis.[27] Survival rates were found to be lower in poorer areas of the state for women aged 50-64, but this difference was less apparent among women of Medicare age. Among non-Hispanic whites and blacks, survival rates were worse in poorer areas of the state. In contrast, more affluent Hispanics and those living in the poorest areas had better survival (Figure 6).

The association between poverty and survival was especially apparent with breast cancer diagnosed at the regional and distant stages. At these stages, completeness of adjuvant therapies has been shown to increase survival.[12] (Figure 6)

Figure 6: Five-year survival for breast cancer by area poverty level, age, race, and stage; 1999-2002, Colorado.

Five-Year Cause-Specific Survival(%)

■ <10% Poverty ■ 10-19% Poverty ■ 20+ % Poverty

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

EAdjuvant therapy is treatment added to the main treatment of cancer. This mainly refers to hormonal therapy, chemotherapy, radiation therapy, or immunotherapy (treatment promoting or supporting the immune system response to a disease) added after surgery to increase chances of curing or controlling the disease. (Source: American Cancer Society, http://www.cancer.org).

An average of 170 cases of invasive cervical cancer are diagnosed annually in Colorado.

In this report, cervical cancer refers to malignancies that have invaded the thin layer of cells covering the cervix (i.e., not including in-situ cancers). Before introduction of the Pap screening test more than 50 years ago, invasive cervical cancer was the most common cause of cancer death among U.S. women.[28] Due to advances in early diagnosis and treatments, the lifetime risk of invasive cervical cancer for a female in Colorado is now only one in 154,[27] but it remains the second most common cancer in women worldwide.[29]

Poverty and Incidence

An average of 170 cases of invasive cervical cancer are diagnosed annually in Colorado. In the wealthier areas of the state, the incidence rate was 6.4 cancers per 100,000 women per year, while the rate for the next lower poverty level was 8.7, and the rate for the poorest areas was 11.4. Similarly, strong disparities were seen across the three poverty levels between non-Hispanic whites, Hispanics, and blacks (Appendix Table 5). This difference is likely due to differences in the use of Pap smear screening among these populations.

Poverty and Early Detection

Early stage detection was not calculated for cervical cancer because in-situ cases are not reportable to state cancer registries. Cervical cancers detected at any invasive stage are considered failures of screening and are less treatable.

Poverty and Survival

Survival rates for Hispanic and black women with cervical cancer were lowest in the poorest areas of Colorado. Among women younger than 65, there was worsening cervical cancer survival with increasing poverty. In contrast, women of Medicare age (greater than 65 years) showed less of an association between poverty and survival (Figure 7). For all stages and races/ethnicities

combined, the worst survival rates for cervical cancer were seen in the poorest areas of the state. This association remained when each stage of diagnosis was looked at separately. The greatest difference was noted for women diagnosed at the localized stage, where survival in the poorest areas was 10.4 percentage points lower than survival in the wealthier areas (Figure 7). Aggressive treatment for cervical cancer can make a particular difference at the localized stage.
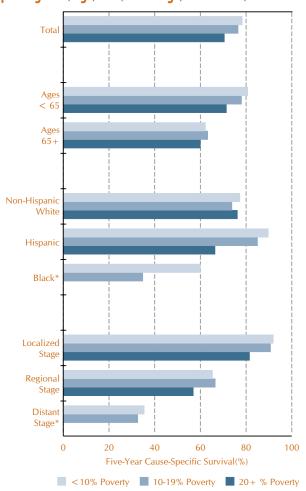
Figure 7: Five-year survival for cervical cancer by area poverty level, age, race, and stage; 1999-2002, Colorado.

Five-Year Cause-Specific Survival(%)

<10% Poverty   10-19% Poverty   20+ % Poverty

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

* Survival rate for black women and for distant stage in the 20+% poverty group not displayed due to insufficient numbers.

Approximately 1,800 malignant colorectal cancers are diagnosed annually in Colorado.

Colorectal cancer, located in the colon or rectum, is the second leading cause of death from cancer in Colorado and the third most common cancer in both men and women. The cumulative lifetime risk of colorectal cancer in Colorado is one in 14 for males, and one in 18 for females.[27]

Poverty and Incidence

Approximately 1,800 malignant colorectal cancers are diagnosed annually in Colorado. For the wealthier areas of the state, the incidence rate was 47.6 cancers per 100,000 persons per year, the middle poverty level areas had a rate of 47.6, while the poorest areas showed the highest rate, 49.8 (Appendix Table 6).
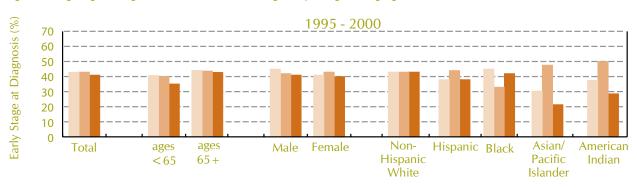
Poverty and Early Detection

In 1995-2000, less than 43 percent of colorectal cancers in the state were diagnosed at an early, more curable stage. Among persons younger than 65, the percentage of colorectal cancers diagnosed early was lowest in the poorest areas, while early stage detection did not vary much by poverty level among persons of Medicare age (greater than or equal to 65 years old) (Figure 8).

> The percentage of colorectal cancers diagnosed early was lowest in the poorest areas.

Figure 8: Early stage at diagnosis for colorectal cancer by area poverty level, age, gender, and race in Colorado, 1995-2000 & 2001-2006.

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May, 2008.

In 2001-2006, less than 47 percent of colorectal cancers in the state were diagnosed at an early, more curable stage. Among those younger th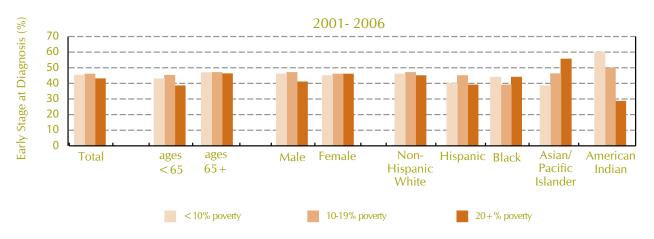an 65 years of age, the percent of colorectal cancers diagnosed early remained lowest in the poorest areas. Early stage detection did not vary considerably by poverty level among those 65 years and older (Figure 8).

When comparing the most current data (2001-2006) on early stage at diagnosis for colorectal cancer to the previous time period (1995-2000), there was a slight improvement in diagnosis at earlier stage among all the poverty groups. However, a gap still persists among the three poverty groups. One noted exception is seen in Asian/Pacific Islanders in which earlier detection improved among those living in the poorest areas (Figure 8).

The Colorado Colorectal Screening Program (CCSP),[21] a statewide program based in over sixty-five community health clinics across Colorado, provides free colon endoscopic screening to eligible Colorado residents having household incomes less than 250 percent of the federal poverty level. Since it began in January of 2006, CCSP aimed to screen over 12,500 Coloradans by 2010. To date, CCSP had screened approximately 4,900 patients and detected 46 colorectal cancers. CCSP is also accompanied by a campaign to increase awareness of colorectal cancer prevention and screening and encourage Colorado residents to participate in screening exams.[21]

> The percentage of colorectal cancer cases diagnosed early was much higher in those with private insurance.

Insurance Status and Early Detection

Insurance status is a key indicator to early detection. In 2001-2006, colorectal cancers were diagnosed at an earlier stage in those 65 years and older compared to those younger than 65. Among Coloradans ages 65 and older, the percentage of colorectal cancers diagnosed at an early stage was slightly higher among those with private insurance than those with Medicare. Early detection by poverty level did not vary as much in the Medicare group as in the private insurance group (Figure 9). Among those with Medicare, universal coverage for colorectal cancer screening tests has been in place since 2001 which may explain why there is only a small difference in early stage detection between Medicare and private insurance coverage among those 65 years and older.[30]

Among those less than age 65, the percentage of colorectal cancer cases diagnosed early was much higher in those with private insurance than those with Medicaid or no insurance. Early detection by poverty level showed a larger disparity for those with Medicaid than those with private insurance (Figure 9).
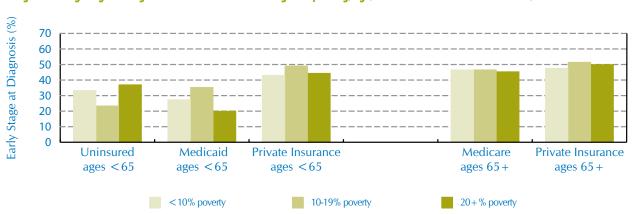
Figure 9: Early stage at diagnosis for colorectal cancer by area poverty, age, and insurance status in Colorado; 2001-2006
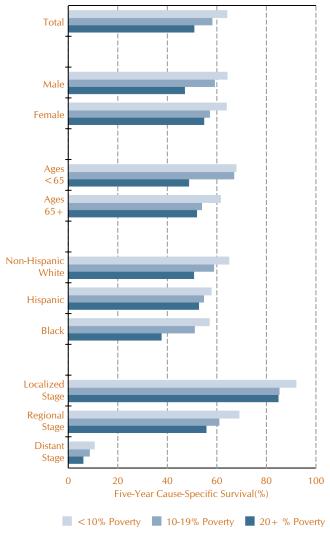

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May, 2008.

Persons with colorectal cancer from the poorest areas of the state showed the worst survival rates, regardless of race/ethnicity, sex, or age.

Poverty and Survival

Persons with colorectal cancer from the poorest areas of the state showed the worst survival rates, regardless of race/ethnicity, sex, or age. The greatest disparities were noted among males and persons younger than 65, where each group showed survival rates that were respectively, 17 and 19 percentage points lower in the poorest areas compared to the wealthier areas (Figure 10). The largest disparity among the three areas was seen for cases diagnosed at the regional stage, a stage where the completeness of chemotherapy has been shown to substantially increase survival.

Figure 10: Five-year survival for colorectal cancer by area poverty level, age, gender, race, and stage; 1999-2002, Colorado.

Five-Year Cause-Specific Survival(%)

<10% Poverty   10-19% Poverty   20+ % Poverty

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May, 2008.

Lung cancers for Hispanics and blacks from the poorest areas are detected much later.

Lung cancer is the leading cause of cancer mortality in both men and women in the United States and continues to be so in Colorado.[11] Each year, more men and women in Colorado die from lung cancer than any other type of cancer. The lifetime risk of developing lung cancer in Colorado is one in 10 for men, and one in 15 for women.[27] Tragically, most lung cancers remain preventable by avoiding the use of tobacco products and poverty plays an especially important role in understanding lung cancer in Colorado.
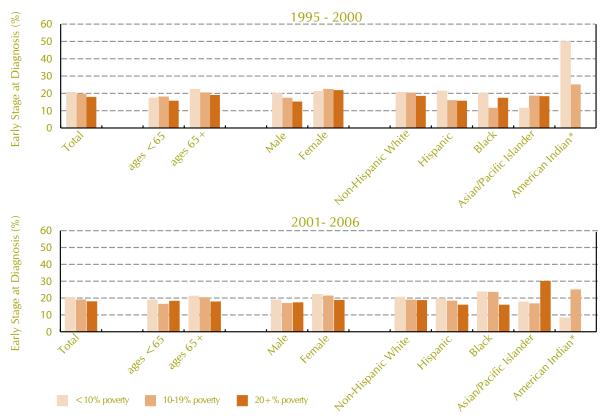
Poverty and Incidence

Almost 2,000 malignant lung cancers are diagnosed annually in Colorado. For the wealthier areas of the state, the incidence rate was 52.1 cases per 100,000 persons per year, while the rate for the middle poverty areas was 59.7, and the poorest areas had the highest rate of 60.1 (Appendix Table 9). This difference is almost certainly due to the differences in tobacco use by socioeconomic status shown in Figure A in the Cancer Prevention and Screening section above.

Poverty and Early Detection

Only about one in five lung cancers in Colorado (approximately 20 percent) were diagnosed at an early, more curable stage.[27] In both time periods, 1995-2000 and 2001-2006, the proportion of lung cancers diagnosed at an early stage was very small regardless of poverty level, race/ethnicity, sex, or age. In 2001-2006, the subgroups having the least early stage detection were Hispanics and blacks from the poorest areas, where only 15.9 percent or approximately one in six lung cancers were detected early (Figure 11 and Appendix Table 27B).

Figure 11: Early stage at diagnosis for lung cancer by area poverty level, age, gender, and race in Colorado, 1995-2000 and 2001-2006.*

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

* Early detection percentage for American Indians in the 20+% poverty group not displayed due to insufficient numbers.

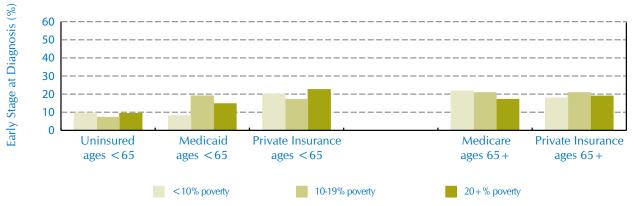Diagnosis of lung cancer at an early stage occurred more often for those who have some form of insurance coverage.

Insurance Status and Early Stage at Diagnosis

In 2001-2006, diagnosis of lung cancer at an early stage occurred more often for those who have some form of insurance coverage. However, lung cancer early stage percentages remained low regardless of insurance coverage and poverty level. The subgroup having the worst early stage detection was from the middle poverty group aged less than 65 years old with no insurance, where only 7.3 percent were detected early (Figure 12).

Figure 12: Early stage at diagnosis for lung cancer by area poverty level, age, and insurance status in Colorado; 2001-2006.

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

The middle and highest poverty areas showed the worst lung cancer survival rates.

Poverty and Survival

In part because lung cancer is usually not detected until an advanced stage, survival rates remain low regardless of race/ethnicity, sex, or age. For all stages combined for 1999-2002, only 14-18 percent of Coloradans with lung cancer survived five years after diagnosis. The middle and highest poverty areas showed the worst survival rates; only about 14 percent survived five years or longer with lung cancer (Figure 13).

The five-year survival among the different stages of cancer shows a more obvious disparity between the high poverty areas and the more affluent areas for lung cancer diagnosed at the localized stage. Among those with lung cancer diagnosed at the regional stage, the middle poverty areas showed the worst survival rates. No association between poverty level and survival was noted for lung cancers detected at the distant stage (Figure 13).

Figure 13: Five-year survival for lung cancer by area poverty level, age, gender, race, and stage; 1999-2002, Colorado.

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

About 930 malignant melanomas of the skin are diagnosed annually in Colorado.

Melanoma is the most deadly form of skin cancer. Basal cell and squamous cell carcinomas of the skin occur much more frequently, but most are curable. Nationally, and especially in Colorado, the incidence rate of melanoma is rising faster than most other cancers. The lifetime risk of being diagnosed with melanoma in Colorado is approximately one in 33 for males and one in 61 for females.[27] Since melanoma is primarily a disease of fair-skinned persons (rates of melanoma are ten to twenty times higher in whites than in blacks, and more than three to seven times higher in whites than in Hispanics, and one to four times higher in Hispanics than in blacks),[31] only statistics for non-Hispanic whites were displayed for this report.
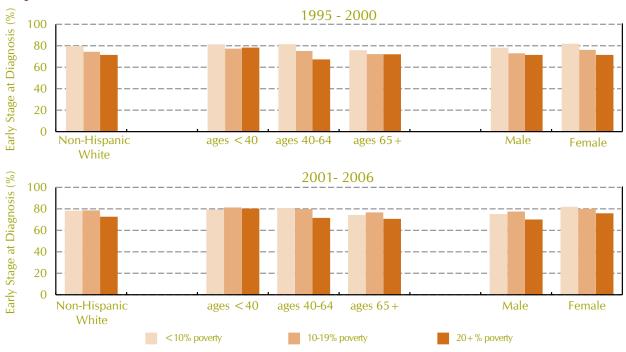
Poverty and Incidence

About 930 malignant melanomas of the skin are diagnosed annually in Colorado. Almost all of these cases occur in non-Hispanic whites. Among whites in the wealthier areas of the state, the incidence rate was 24.3 cancers per 100,000 persons per year, while the middle poverty areas had a rate of 20.7, and the rate in the poorest areas was 17.8 (Appendix Table 12). The higher melanoma rates in the wealthier areas of Colorado parallels that of higher sunburn occurrences that were reported by Coloradans who lived in areas not in poverty.[F]

Poverty and Early Detection

During 2001-2006 in Colorado, approximately 72-78 percent of melanomas in non-Hispanic whites were classified as detected "early" (in-situ stage or depth of invasion less than or equal to one mm) (Appendix Table 29B). Except for those less than 40 years old, those groups from the poorest areas had the lowest levels of early stage melanomas at diagnosis (Figure 14) among all the subgroups analyzed.

Figure 14: Early stage at diagnosis for melanoma in non-Hispanic whites by area poverty level, age, and gender in Colorado 1995-2000 and 2001-2006.
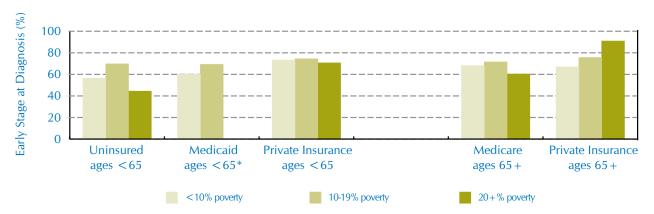

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

[F]Please see figure E in the "Cancer Prevention and Screening" section shown above.

Melanoma patients with low socioeconomic status were more likely to die from melanoma because of later stage at diagnosis.

Insurance Status and Early Detection

In 2001-2006, in non-Hispanic whites, the percentage of diagnosis for melanomas detected at an early stage was worst among those less than 65 year olds from the poorest areas with no insurance (44.4 percent). (Figure 15) Previous studies show that melanoma patients with low socioeconomic status were more likely to die from melanoma because of later stage at diagnosis than those from a higher socioeconomic status.[G]

Figure 15 also shows that the percentage of diagnosis for melanomas detected early was best among the 65 and older age group from the poorest areas with private insurance (90.9 percent).

Figure 15: Early stage at diagnosis for melanoma in non-Hispanic whites by area poverty level, age, and insurance status in Colorado, 2001-2006.

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

*Early stage percentage for ages <65 with Medicaid in the 20+% poverty group not displayed due to insufficient numbers.

[G]Please see "Skin Cancer Prevention" in the "Cancer Prevention and Screening" section shown above.

Melanoma and Poverty

Poverty and Survival

For melanoma in non-Hispanic whites, survival declined as the levels of poverty increased. Survival rates were lowest for individuals from the poorest areas regardless of gender (Figure 16). Among those aged less than 40, the poorest areas showed the highest survival rates.

Differences in cancer survival are mainly due to melanoma diagnosis at an early stage and access to state-of-the-art treatment. For melanoma diagnosed at an early or localized stage, the survival rate was lower for the poorest areas of the state (85.3 percent) compared to the wealthier areas (93 percent) (Figure 16 and Appendix Table 30). For melanoma diagnosed at later or regional/distant stages combined, the survival rate was lower for the wealthier areas of the state compared to the poorest areas (Figure 16).
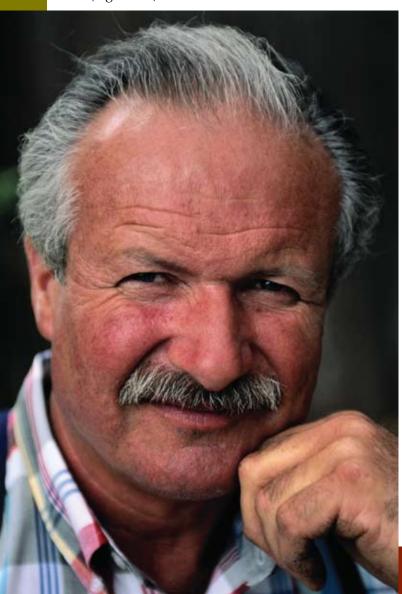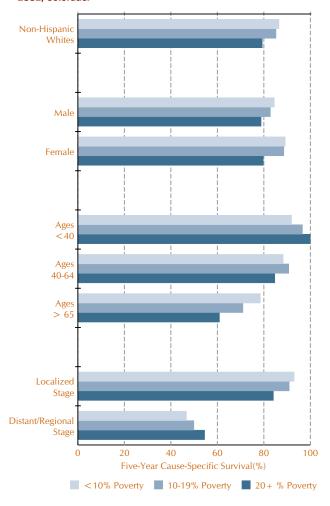

Figure 16: Five-year survival for melanoma in non-Hispanic whites by area poverty level, age, gender, and stage; 1999-2002, Colorado.*

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

*Regional and distant stages were combined to achieve sufficient numbers to display five-year survival.

About 400 cancers of the oral cavity and pharynx are diagnosed annually in Colorado.

Cancers of the oral cavity and pharynx occur more than two times more often in males than in females.[12] Avoiding high-risk behaviors, such as tobacco use, is crucial in preventing these types of cancers.[26] Nationally, more than 30,000 cases of cancers located in the oral cavity and pharynx are diagnosed each year.[26] In Colorado, the lifetime risk of being diagnosed with oral cavity or pharyngeal cancer is approximately one in 64 for males and one in 137 for females.[27] Treatment of oral cavity cancers (surgery, radiation, and chemotherapy) can be disfiguring and expensive.

Poverty and Incidence

An average of about 400 cancers of the oral cavity and pharynx are diagnosed annually in Colorado. For the wealthier areas of the state,

the incidence rate was 8.9 cancers per 100,000 persons per year, the middle poverty level areas had a rate of 9.5, while the poorest areas showed the highest rate, 10.4 (Appendix Table 15).

Poverty and Early Detection

In 1995-2000, less than 50 percent of oral cavity and pharyngeal cancers in Colorado were diagnosed at early stages. As poverty level increases, early stage detection decreases among both genders and Hispanic and black ethnicity/race. Among those younger than 65, the percentage of cancers in the oral cavity and pharynx diagnosed early was lowest in the poorest areas, while early stage detection among those of Medicare age was worst in the middle poverty areas (Figure 17).

Figure 17: Early stage at diagnosis for cancers of the oral cavity and pharynx by area poverty level, age, gender, and race in Colorado 1995-2000 and 2001-2006.*

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

* Early stage percentage for blacks in 2001-2006 in the 20+% poverty group not displayed due to insufficient numbers.

As poverty level increases, early stage detection of oral cavity cancers decreases.
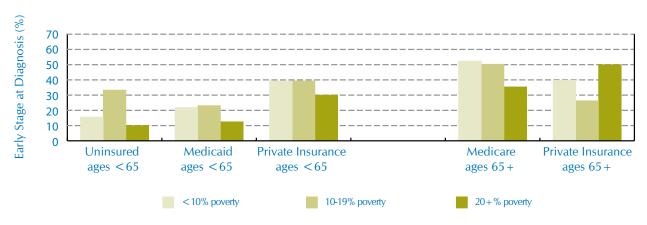
In 2001-2006, less than 45 percent of oral cavity and pharyngeal cancers in the state were diagnosed at an early, more curable stage of disease. Among the ethnic/racial subgroups and both age groups, as poverty level goes up, early stage detection goes down. Females from the poorest areas had the worst rates of early stage detection while the middle poverty group among the males had the lowest levels of early stage at diagnosis.

When comparing the most current data (2001-2006) on early stage detection for cancers of the oral cavity and pharynx to the previous time period (1995-2000), early stage detection worsened among each of the three poverty level groups (Figure 17). Although the BRFSS data are limited on routine preventive screening for oral cavity cancers, worsening of early detection is likely due to less access to oral health services and to the fact that most oral cavity cancers are asymptomatic.[H]

Insurance Status and Early Detection

In 2001-2006, cancers of the oral cavity and pharynx were generally diagnosed earlier in Coloradans aged 65 and older than those younger than 65. Among those younger than 65, the percentage of cases diagnosed at an early stage was less in the poorest areas especially among those individuals who had no health insurance. Among those 65 years and older with Medicare coverage, early stage detection was worst in those from the poorest areas. For older adults with private insurance as primary payer during cancer diagnosis, the middle poverty group had the worst percentage of early stage detection (Figure 18).

Figure 18: Early stage at diagnosis for cancers of the oral cavity and pharynx by area poverty level, age, and insurance status in Colorado; 2001-2006.
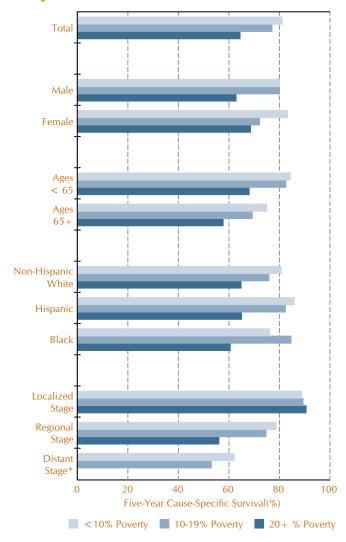

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

Poverty and Survival

The survival rate for Coloradans with cancers of the oral cavity and pharynx was lowest in the poorest areas of the state regardless of gender, age, or race/ethnicity. The greatest disparity by poverty level was noted among Hispanics, where the survival rate was 20.8 percentage points lower in the poorest areas compared to the wealthier areas (Figure 19). Among the high poverty areas, the survival rate was worst among blacks compared to non-Hispanic whites and Hispanics. Also, a large disparity was seen between high poverty areas and low poverty areas for cases diagnosed at the regional stage, a stage where the completeness of chemotherapy and other treatments could improve survival (Figure 19).

> The survival rate for Coloradans with cancers of the oral cavity and pharynx was lowest in the poorest areas of the state.

Figure 19: Five-year survival for cancers of the oral cavity and pharynx by area poverty level, age, gender, race, and stage; 1999-2002, Colorado.

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

*Survival rate for distant stage in the 20+% poverty group is not displayed due to insufficient numbers.

In Colorado, an average of 2,900 malignant prostate cancers are diagnosed annually.

Prostate cancer is the most common cancer diagnosed in Colorado males[27] and the third most common cause of cancer death, after lung and colorectal cancers.[32] In Colorado, the lifetime risk of being diagnosed with prostate cancer is about one in five, although the chance of dying from prostate cancer is much smaller.[27]

Poverty and Incidence

Prostate cancer incidence rates increased considerably in the late 1980s and early 1990s in the U.S. and Colorado due in large part to an increase in the number of men getting screened with the prostate specific antigen (PSA) test. As a result of the wide adoption of the PSA test, this led to many more prostate cancers being detected at an earlier stage than before screening was available.[12] Since 1995, incidence rates have leveled off and become more stable. In Colorado, an average of 2,900 malignant prostate cancers are diagnosed annually. For the wealthier areas of the state, the incidence

rate was 168.6 per 100,000 men, for the middle poverty areas it was 150.1, and the poorest areas had a rate of 129.9.[27] Much of this difference is likely due to differences in PSA screening rates. Men should discuss all the potential risks and benefits of prostate cancer screening with their physicians prior to getting tested.
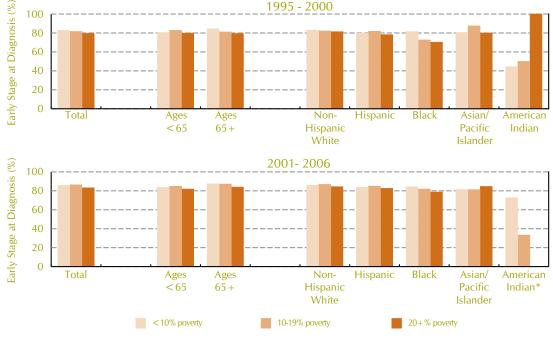
Poverty and Early Detection

During 1995-2000 in Colorado, more than eight in 10 prostate cancers were diagnosed at an early, more curable stage. In this report, the percent of prostate cancers diagnosed early among non-Hispanic whites was very similar regardless of poverty level. Early stage detection for Hispanics and blacks did, however, vary by poverty level. Among black men in Colorado, the greatest disparity of prostate cancers diagnosed early by poverty level was noted to be in the poorest areas, 11.2 percentage points worse than in the wealthier areas of the state (Figure 20).

Figure 20: Early stage at diagnosis for prostate cancer by area poverty level, age, and race in Colorado 1995-2000 and 2001-2006.*

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

* Early stage percentage for American Indians in 2001-2006 in the 20+ % poverty group not displayed due to insufficient numbers.
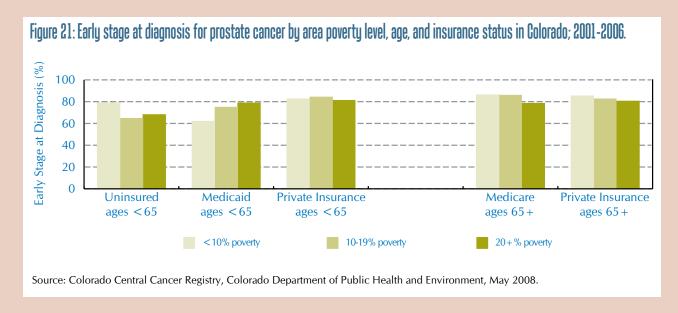
For the later time period 2001-2006, there was a slight increase in early stage detection of prostate cancers for all poverty levels compared to 1995-2000. However, diagnosis at an early stage still varied by poverty level. Among black men in Colorado, the greatest disparity of prostate cancer early stage diagnosis by poverty level was noted to be 5.6 percentage points lower in the poorest areas compared to the wealthier areas of the state. Among American Indians, a disparity in early detection between high poverty areas and low poverty areas was more prominent in the later time period (Figure 20).

Insurance Status and Early Detection

In 2001-2006, prostate cancers were diagnosed earlier in men with Medicare or private insurance. However, poverty remained a barrier to earlier stage diagnosis of prostate cancers.

Among Colorado males less than 65 years old, those from the poorest areas with no insurance had low early detection rates. In addition, those from low poverty areas with Medicaid coverage had the lower early stage detection rates. (Figure 21)

Among those aged 65 and older, those from the poorest areas with Medicare had the lower early stage detection rates. (Figure 21)

Figure 21: Early stage at diagnosis for prostate cancer by area poverty level, age, and insurance status in Colorado; 2001-2006.

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May 2008.

For all prostate cancers, there was declining survival with worsening poverty.

Poverty and Survival

For all prostate cancers, there was declining survival with worsening poverty. Men in poorer areas of the state, regardless of race/ethnicity, had lower survival rates than men in wealthier areas. The survival disparity by poverty level was worst among black men, whose survival rates were an absolute 6-18 percentage points lower in the two poorer areas of the state compared to the wealthier areas. In addition, black men from the poorer areas had the worst survival rate in comparison to Hispanic and non-Hispanic men from the poorer areas (Figure 22). Survival rates by poverty level did not vary much among younger men (less than 65 years). Men of Medicare age (equal to or greater than 65 years) in the two poorer areas of the state had lower survival rates compared to the wealthier areas (Figure 22). Survival rates with early stage or localized prostate cancer were similar regardless of poverty level, with over 96 percent surviving at least five years after diagnosis. Survival rates for prostate cancers diagnosed at the regional and distant stages were lowest in the poorest areas of the state (Figure 22).
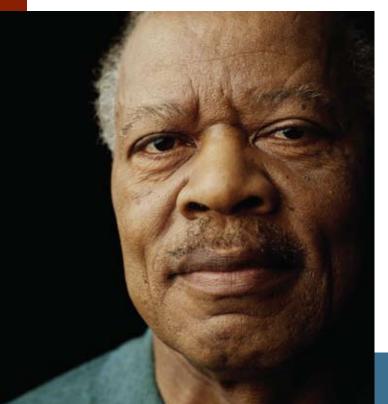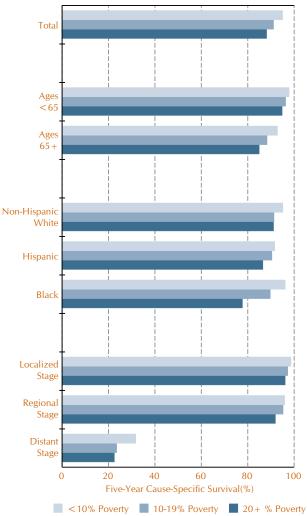
Figure 22: Five-year survival for prostate cancer by area poverty level, age, race, and stage; 1999-2002, Colorado.

Five-Year Cause-Specific Survival(%)

■ <10% Poverty ■ 10-19% Poverty ■ 20+ % Poverty

Source: Colorado Central Cancer Registry, Colorado Department of Public Health and Environment, May, 2008.

Data, Methods, and Definitions

Data Sources

The Colorado Central Cancer Registry of the Colorado Department of Public Health and Environment provided data on cancer incidence, staging, and survival, while the Department's Health Statistics Section provided data from the Behavioral Risk Factor Surveillance System. The U.S. Census Bureau was the data source for federal poverty levels, the proportion of census block group and zip code populations living in poverty, poverty thresholds, and year 2000 population figures for Colorado. Because individual income data are not reported to state cancer registries, this report uses the poverty level of the area in which each cancer case resided as an indicator of socioeconomic poverty level for that cancer case. This is the same method used in both our earlier report[1] and in a report on poverty and cancer by the National Cancer Institute.[33]

Race/ethnicity varied significantly by poverty level. Based on the 2000 Census for Colorado, the poorest areas had the most diverse composition (8 percent black, 40 percent Hispanic, 48 percent non-Hispanic white), compared to the wealthier areas, which were 82 percent non-Hispanic white. [34]

Measures of cancer outcomes used in the report include age-adjusted incidence rates, the proportion of cancers diagnosed at an early stage, and cause-specific five-year survival rates. Where appropriate, outcome measures by poverty level are also described within specific groups categorized by race/ethnicity, age, sex, or health insurance status.

The resource for cancer screening recommendations was the Guide to Clinical Preventive Services 2007, released by the U.S. Preventive Services Task Force (USPSTF).[15] The task force was organized by the U.S. Public Health Service to make evidence-based recommendations on preventive measures such as screening tests, counseling, immunizations, and preventive medications.

The Colorado Central Cancer Registry

Seven cancer sites were selected for this report: oral cavity and pharynx, colon/rectum, cervix, female breast, lung, melanoma, and prostate. These cancers were included because they represent some of the most commonly diagnosed reportable cancers in Colorado. Invasive cervical cancer was also studied because it is a highly preventable cancer. Cancer cases for this study were drawn from the Colorado Central Cancer Registry for the years 1995-2006. From among the 1995-2000 cancer cases, 100,129 were included in stage analyses, while 117,565 from among the 2001-2006 cancer cases were included in stage analyses. For survival analyses a cohort of 51,744 cases diagnosed during 1999-2002 was used, ensuring a five-year follow-up time period to calculate five-year, cause-specific survival rates. Incidence rates were reported using cases from 1996 to 2006, with 2000 Colorado census figures by age, sex, and race/ethnicity providing the average population for this time period.

The Behavioral Risk Factor Surveillance System

The Behavioral Risk Factor Surveillance System (BRFSS) surveys Colorado adults 18 years or older randomly by telephone each year. Approximately 1,800 people participated in the survey during 1996. Sample sizes have increased every year and 6,100 people were surveyed in 2006. Data on characteristics such as household income and education are collected, as well as participation in cancer screening, engagement in risk behaviors and preventive health practices associated with leading causes of death in the state. In this report, the following indicators were analyzed for the years 1995-2006:

1. Pap tests, mammograms, and colorectal cancer screening tests;

2. Current smoking;

3. Sunburn;

4. Heavy drinking or heavy alcohol use;

5. Spit tobacco or smokeless tobacco use;

6. Obesity;

7. Protection from sun exposure;

8. Physical inactivity;

9. Fruit and vegetable consumption less than five times per day;

10. Visits to the dentist;

11. Teeth cleaning;

12. Check for oral cancer.

Methods

Measuring Socioeconomic Status

Because socioeconomic data such as income and education are not available for individual patients in most state cancer registries, a neighborhood or area indicator of socioeconomic status was used in this analysis. This is the same approach used by the National Cancer Institute and CDC in their report on poverty and cancer.[33] Although the U.S. Census Bureau reports many different socioeconomic measures by census block group, poverty rate (the percentage of the population living below the defined federal poverty line) was chosen as the area measure for this study. Poverty lines, the income below which an individual or family is considered to be living in poverty, are updated each year by the U.S. Census Bureau. In 2006, for example, the poverty threshold for one person was $10,294 while a family of four had a poverty threshold of $20,614. Poverty rates (percentage of persons or households in poverty in an area) correlate highly with other

measures of socioeconomic status, such as educational attainment, unemployment rate, and occupational composition. For example, increases in the unemployment rate are highly correlated with increases in the county poverty rate, while decreases in median family income are highly correlated with increases in the poverty rate.[33]

The BRFSS asks respondents about their annual household income using the following categories: less than $10K; $10K to less than $15K; $15K to less than $20K; $20K to less than $25K; $25K to less than $35K; $35K to less than $50K; $50K to less than $75K; and greater than or equal to $75K.

Determining Poverty Levels

For the cancer registry data, to assign a poverty level to each cancer case, the patient's address at diagnosis was linked to its respective census block group as defined by the 2000 U.S. census-designated boundaries. Cancer cases were then categorized into three poverty levels by the proportion of residents in a census block group who were living in poverty in 2000 per U.S. Census data for Colorado: less than 10 percent, 10-19 percent, or greater than or equal to 20 percent. Areas with a less than 10 percent poverty rate are referred to as "wealthier" areas in this report. Areas with a poverty rate of greater than or equal to 20 percent have high poverty and are considered federal poverty areas; these areas are referred to as the "poorest" areas in this report. Areas with poverty rates of 10-19 percent are considered to have a middle level of poverty. In this report, areas of Colorado having middle level poverty rates are called "poorer" areas. If an address was not sufficient to code a cancer case to a particular block group, the zip code area was used, if available. For these cancer cases, poverty rates of the zip code area from the 2000 U.S. Census for Colorado were categorized in the same manner described for block groups. Approximately 90 percent of 1995-2000 cases and 94 percent of 2001-06 cases in the Cancer Registry could be linked to a census block

group, while eight percent of the 1995-2000 cases and four percent of the 2001-06 cases could only be linked to a zip code. Only two percent of the 1995-2000 cases and one percent of the 2001-2006 cases could not be linked to either a block group or to a zip code, so those cases were not included in this analysis. For the years of this report, 1995-2006, the "wealthier" areas of Colorado accounted for 67 percent of the cancer cases; the "poorer" or middle level poverty areas had 24 percent of the cancer cases; and the "poorest" areas had 9 percent of the cancer cases.

For the BRFSS survey data, weighted average poverty thresholds, which are published each year by the U.S. Census Bureau, and household income data from the BRFSS, were used to define three poverty categories. Using the BRFSS data the size of family unit was determined by summing the number of children living in a household and the number of adults living in the household. The size of the family unit determined which of the weighted average thresholds applied. In 2006, for example, the poverty threshold for one person was $10,294 while a family of four had a poverty threshold of $20,614. An average of each BRFSS annual household income category was used since income ranges are collected rather than specific amounts of income. For example, a value of $12,500 was used as the average of the income category $10K to less than $15K. To conduct the analyses of cancer screening, risk behaviors, and preventive health practices by poverty level, respondents were coded as "In Poverty" (less than 100% of threshold), "At/Near Poverty" (100% to 199% of threshold), or "Not in Poverty" (200% or above the threshold) as determined by poverty thresholds, the size of the family unit, and the average household income reported in the BRFSS.

Insurance Status of Coloradans with Cancer

Individual insurance information was available for most cancer cases reported to the Cancer Registry (about 85 percent) starting in 1998,

and insurance categories are displayed with the 2001-2006 early detection tables. The data item for insurance status (called primary payer at diagnosis) is included with case information reported to the Cancer Registry by each facility in the state. For this report, categories of insurance coverage evaluated were: not insured, private insurance (including TRICARE and Military coverage), Medicaid, Medicare, and federal (including Veteran's Affairs and Indian/Public Health Service). Cancer case counts were insufficient to display the federal category by poverty level. Cancer cases with unknown insurance or insurance reported from multiple facilities that did not agree among these categories were excluded from analyses.

Cancer Outcomes

The cancer outcomes studied for this report include age-adjusted incidence rates, the proportion of cancers detected at an early stage, and five-year cause-specific survival rates. Incidence rates measure the number of newly diagnosed primary, malignant cancers for a given period of time per 100,000 persons; early stage detection was defined as the percent of all cancers that were diagnosed at early stages (in-situ or localized stage for most cancers); and five-year cause-specific survival rates measure the proportion of patients surviving at least five years with a specific cancer (calculated using the National Cancer Institute's (NCI) SEER*STAT software package). In the survival analyses, cases lost to follow-up, those alive at the end of the five-year follow-up period, and those dying of causes other than the underlying cancers, were treated as censored observations. Those dying of unknown causes were excluded from the analysis. Additional details regarding cause-specific survival are available.[33] Incidence and survival tables include standard errors.

For the incidence tables available in the CDPHE web site, http://www.cdphe.state.co.us/pp/ccpc/PublicationsResources.html, a z-test was used for comparing rates of the two higher poverty areas to the wealthier areas.[35] All cancer

outcome analyses were by poverty level, race/ethnicity, sex, age, and/or insurance status. Race/ethnicity groups for every cancer site analysis included non-Hispanic whites, blacks, and Hispanics. For specific cancer sites where adequate numbers of cases allowed, data for both Asian/Pacific Islander and American Indian groups were also displayed. For melanoma of the skin, only cases among non-Hispanic whites were analyzed due to the rare occurrence of melanoma among other races/ethnicities. Age was classified as less than 65 years or greater than or equal to 65 years for five of the seven cancer sites because most persons aged 65 and older, regardless of income, are eligible for screening and treatment through Medicare. Breast cancer analyses included three categories so that cancers diagnosed in the pre-menopausal years (age less than 50) could be analyzed separately, while the post-menopausal age groups consisted of women aged 50-64 years, and women aged greater than or equal to 65 years. Melanoma analyses included three age categories so that melanoma diagnosed at an earlier age (age less than 40) could be analyzed separately from the older non-Medicare (age 50-64) and Medicare (age greater than or equal to 65 years) age groups.

Data Limitations

The numbers of cancer cases were not equal in each of the three poverty levels and each racial/ethnic group. Some of the subgroups were therefore small, such that the differences between groups could have occurred by chance alone. Due to small case counts for some cancer sites, data for blacks, Asian/Pacific Islander and/or American Indian groups could not be separately displayed. Consensus does not currently exist on the best measure(s) of socioeconomic status for an individual or population. Individual socioeconomic measures such as income or education were not available for each cancer case in the Cancer Registry. However, the use of area poverty level to characterize individual socioeconomic status has been validated in previous research and

used by the National Cancer Institute.[33] An advantage of this study is that poverty status was determined at the census block group level, whereas the National Cancer Institute study used counties and census tracts, which are larger and generally less representative of socioeconomic status. The majority of cancer cases (90-94 percent) were assigned a poverty level based on census block group. Approximately four to eight percent of cases could only be coded to zip code, which is usually a less precise indicator of a person's socioeconomic status.[3] Less than two percent of cases were excluded for study due to lack of sufficient address detail for geo-coding to zip code or census block group.

While the BRFSS survey provides reliable estimates of cancer-related behaviors for the state as a whole, it is not a survey of Coloradans in the Cancer Registry. The BRFSS survey used household income to represent poverty status, which is different than the area poverty level used in reporting cancer outcomes, and self-reported estimates of income may be less dependable due to the sensitive nature of questions on income. Surveys cannot reach persons living in households without telephone service, and households without telephones generally have lower incomes than those with telephones. Analyzed BRFSS survey data grouped in time periods 1995-2000 and 2001-2006 for the following cancer-related behavior indicators were averaged according to years of data available for the respective time period: current smoking (all years 1995-2006), current smokeless tobacco use (1999, 2000, 2001), heavy alcohol use (all years 2001-2006), obesity (1997-2006), no physical activity (2003, 2005), consume fruit/vegetable less than five per day (1996, 1998, 2000, 2002, 2003, 2005), endoscopy in past five years (1997, 1999, 2000-2002, 2004, 2006), FOBT in past year (1997, 1999-2002, 2004, 2006), mammogram in past two years (1995-2002, 2004, 2006), Pap smear in past three years (1995-2002, 2004, 2006), sun protection (1999-2000, 2002, 2004, 2006), and sun burns (1999, 2004, 2006).

Appendix Tables

Appendix Tables can be found at the following URL: http://www.cdphe.state.co.us/pp/ccpc/PublicationsResources.html.

Definitions

AGE ADJUSTMENT allows rates from one geographic area to be compared with rates from another geographic area that may have differences in age distribution. This adjustment is important because cancer rates vary with age, and age structure differs across different geographic areas. The age-adjusted incidence rate for cancer is the number of new cancer cases per year per 100,000 persons, adjusted to the 2000 U.S. standard population.

THE BEHAVIORAL RISK FACTOR SURVEILLANCE SYSTEM (BRFSS) is an ongoing statewide telephone survey conducted by the Department of Public Health and Environment's Health Statistics Section. The survey is designed to monitor the prevalence of health behaviors and preventive health practices associated with the leading causes of death in Colorado.

BRFSS POVERTY LEVELS are determined by the size of the family unit, the average household income, and poverty thresholds determined every year by the U.S. Census Bureau. For this report, BRFSS poverty levels are categorized as "In Poverty" (<100% of threshold), "At/Near Poverty" (100% to 199% of threshold), or "Not in Poverty" (>=200% of threshold).

CAUSE-SPECIFIC SURVIVAL is also known as disease-specific survival, and is the percentage of patients who have survived a specific disease for a certain period of time. This report uses five-year cause specific survival to report survival with cancer.

CENSUS BLOCK GROUPS are smaller units of a census tract, and average approximately 1,000 residents. Several census blocks in turn make up each census block group. About 85 residents belong to each census block.

CENSUS TRACTS are relatively permanent statistical subdivisions of a county, designed to be fairly homogeneous in terms of population characteristics, economic position, and living conditions. Census tracts average around 4,000 residents.

HEALTH DISPARITIES are differences or inequalities in health between different populations. Health disparities have often been reported for different races or ethnicities.

POVERTY LEVEL or *POVERTY RATE* refers to the percentage of families or individuals in a neighborhood area living below the designated official poverty line. The federal poverty line for one adult in 2006 was $10,294 while a family of four had a poverty threshold of $20,614.

POVERTY AREAS have 20 percent or more of the population living below the federal poverty line, and are thought of as poor. For this report, poverty rates were categorized into three poverty groups: less than 10 percent living in poverty, 10-19 percent living in poverty, or greater than or equal to 20 percent living in poverty. Areas with the lowest poverty rate (less than 10 percent) are not considered to be poor, and are referred to as "wealthier areas" in this report. Areas with middle (10-19 percent) to high (greater than or equal to 20 percent) poverty are called "poorer" areas in this report, while areas with high poverty are referred to as the "poorest" areas.

SAMPLE SIZE is the number of persons in a study group. In general, a larger sample size yields a more reliable estimate than does a smaller sample size.

SOCIOECONOMIC STATUS is a term used to classify an individual or population based on one or more indicators, such as income, assets, employment, occupation, and education.

STAGING is the process of determining how far a cancer has spread at the time of diagnosis. Knowing the stage is important to determine treatment options, and to predict the chance

of survival. The National Cancer Institute and the Colorado Central Cancer Registry often report cancers according to four stages: in-situ, localized, regional, and distant. In the in-situ stage, cancer cells have not yet invaded tissues; localized stage means that cancer cells remain confined to the organ of origin; regional stage means that cancer cells have spread to nearby organs or lymph nodes; and distant stage means that cancer cells have spread to distant organs or lymph nodes.

A *STATISTICALLY SIGNIFICANT DIFFERENCE* means that the observed difference is not likely a result of chance alone. In this report, statistical significance means that the probability that an observed difference is due to chance is less than five percent.

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