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Northeast Regional Cancer Institute's Cancer Surveillance and Risk Factor Program

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EXECUTIVE SUMMARY

The Northeast Regional Cancer Institute has conducted a program of epidemiologic research to address cancer disparities in northeast Pennsylvania. This program includes surveillance of common cancers, investigations of cancer risk factors and screening behaviors, and the development of resources to further cancer research in this community.

Cancer surveillance was conducted using data from the Northeast Regional Cancer Institute's population-based Regional Cancer Registry, the Pennsylvania Cancer Registry, and NCI's SEER program. For common cancers, incidence and mortality were examined by county within the region and compared to data for similar populations in the US. In addition, a population-based interview study of healthy adults was conducted to document the status of cancer screening and to estimate the prevalence of established cancer risk factors in this community.

Both incidence of and mortality from cancer at all sites combined were slightly (3 to 5 percent) but significantly elevated in northeast Pennsylvania. For cancers of the colon and rectum, urinary bladder and esophagus, both incidence and mortality were substantially elevated. For eight primary sites, incidence was elevated but mortality was not significantly different from US figures. For several cancers (breast, prostate, malignant melanoma, multiple myeloma, and liver), incidence rates were significantly lower than US figures. Over time, the incidence of colorectal cancer has decreased and the proportion of new cases diagnosed at local stage increased, but in 1999-2003, incidence and mortality rates for this cancer remained 26% and 25% higher, respectively, than the corresponding US figures.

The proportions of adults 50 years and older who were adequately screened for cancers of the colon and rectum, female breast, cervix, and prostate were 41.5%, 55.6%, 74.9%, and 47%, respectively. Colorectal cancer screening increased over time and reached 48.3% in 2006. However, mammography use decreased over time and was only 50% by 2006.

An analysis of cancer risk factors documented that cigarette smoking was significantly more common in this population (26.7% of adults were current smokers) than in Pennsylvania or the US. Further, lack of regular exercise, a high prevalence of obesity, and diets low in fiber and high in fat were also observed.

In summary, this project documents the patterns of cancer incidence and mortality in a six-county region of northeast Pennsylvania. Several cancers with unusually high incidence and mortality rates were identified. The prevalence of cancer screening practices and selected risk factors were also documented.

SUMMARY OF PROJECT ACTIVITIES

Background

Cancer is the second leading cause of death in US.[1] It is second only to heart disease overall, and is the leading cause of death among Americans younger than 80 years of age.[1] Among cancers, colorectal cancer is second only to lung cancer as a cause of death.[1] It has been estimated that in 2005, colorectal cancer was diagnosed in 145,000 Americans and approximately 56,000 died from this disease.[2] Both incidence and mortality rates are greater in men than women and in blacks compared to whites.[3]

Except for a brief increase between 1995 and 1998, the incidence of colorectal cancer in the United States has been decreasing since 1985.[3] Effective screening tests for colorectal cancer such as colonoscopy are available and recommended for populations at risk. The increase in incidence between 1995 and 1998 may have been due to increased case detection by screening, but this has not been documented.

If diagnosed early (as a pre-cancerous polyp or local stage disease), colorectal cancer is readily treated and the prognosis is very good. Regardless of the underlying etiology, most colorectal cancers develop from polyps. These abnormalities of the mucosal surface may begin as entirely benign lesions that over time develop carcinoma in situ and then progress to invasive carcinoma. The prevalence of adenomatous polyps in the U.S. is about 25% by age 50 and may increase to as high as 50% by age 70.[4] It has been estimated that approximately 15% of adenomas larger than 1cm will progress to cancer over 10 years.[5] Longitudinal studies have documented an increased risk of colorectal cancer in individuals with adenomatous polyps who do not have them removed and a lower risk among those who have had polypectomies.[6, 7]

Despite evidence that screening for colorectal cancer can reduce mortality from (and incidence of-) this cancer, the actual use of these screening tools remains low.[8-12] In 2002, 50% of American men and women aged 50 years and older reported that they had not been appropriately screened for colorectal cancer (having had a fecal occult blood test [FOBT] in the previous year or sigmoidoscopic or colonoscopic screening in the previous five years).[13] It has been estimated that 90% of colorectal cancer deaths could be prevented with early detection and aggressive treatment.

Colorectal cancer in northeast Pennsylvania: In the six-county area of northeast Pennsylvania (Lackawanna, Luzerne, Pike, Susquehanna, Wayne, and Wyoming counties), the incidence of cancer overall (all sites combined) is only slightly higher than the US average. For the years 1996-2000, the standardized incidence ratio (SIR), defined as the ratio of cases observed: to cases expected, was 102 (95% confidence interval [CI], 100.1-103.7). However during this same period, the SIR for colorectal cancer overall was 125 (95% CI, 120.8-129.4). Among men, the SIR was 134 (95% CI, 127.1-140.0), and among women, it was 117 (95% CI, 111.7-123.2). Historically, colorectal cancer mortality has also been higher in several northeast Pennsylvania counties than the U.S. as a whole. A 24-year review of age-adjusted colorectal cancer mortality rates was recently published by the National Cancer Institute.[14] This Atlas of

Cancer Mortality in the United States 1950-94, includes county-specific colorectal cancer mortality rates for each county in the US. Colorectal cancer mortality among white men living in Lackawanna, Luzerne, and Wayne counties between 1970 and 1994 were among the highest 10% of counties in the U.S. Pike and Wyoming counties had the lowest mortality rates in the area, which were near the US median. The distribution of county-specific colon cancer mortality rates for white women was similar. Mortality rates for women in Lackawanna and Luzerne counties were among the highest 10% of counties in the US, while Wayne County ranked in the 2nd highest decile. Mortality in the remaining counties is lower, but none was below the 60th percentile for US counties.

The higher mortality rates are likely influenced by a higher incidence of regional stage disease in this community. In Lackawanna County between 1994 and 1998, 53% of patients with colorectal cancer were diagnosed with regional stage disease, compared to 38% in the National Cancer Institute's Surveillance Epidemiology and End Results (SEER) program registries (Figure 1.). Compared to patients in the SEER registries, a significantly smaller proportion of patients in Lackawanna County were diagnosed at the local stage. The proportions of patients with distant stage colorectal cancer were similar in these two populations.

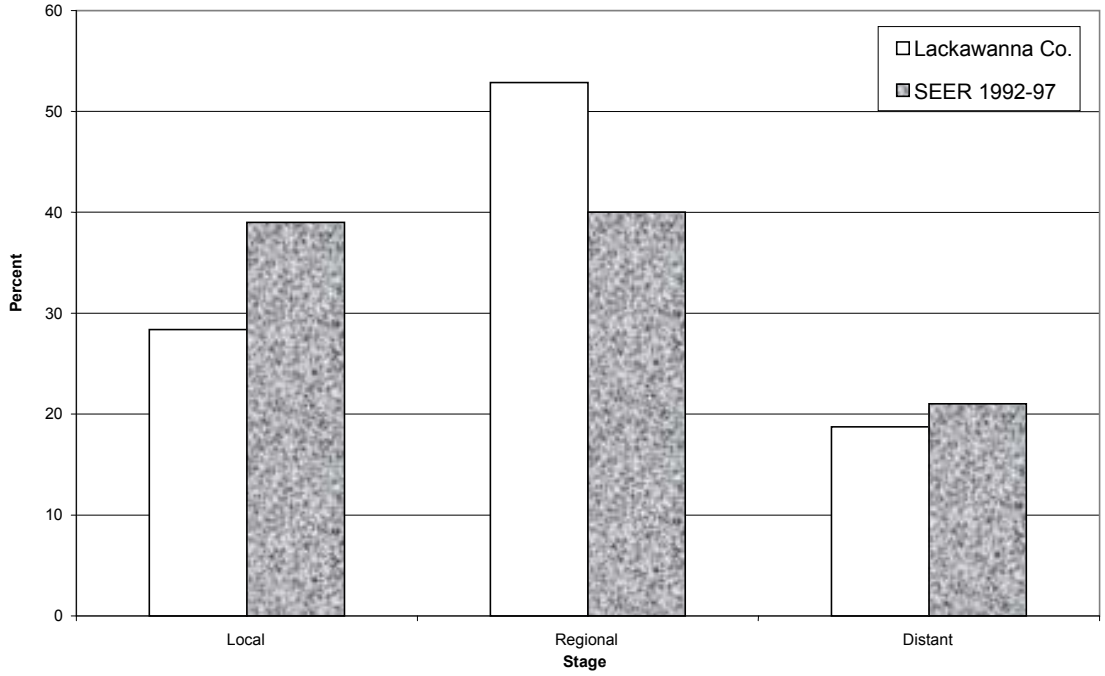

Figure 1. Colorectal cancer stage at diagnosis among whites of both sexes in Lackawanna County 1994-98 and NCI's SEER Registries 1992-97.

The reasons for the higher incidence of more advanced stage disease in northeast Pennsylvania are not yet clear, but screening practices most likely contribute to this disparity. Diminished access to early detection services or delayed diagnostic evaluation after an abnormal screening test might be the pathway to diagnosis of cancer at a late stage [15] Socioeconomic disadvantage may result in diminished access to early detection services or in delayed diagnostic evaluation after an abnormal screening test.

Among those who are socio-economically disadvantaged, cultural views and practices may inhibit health care seeking behavior in general and cancer screening in particular.[15] It is likely that attitudes toward screening, actual screening practices, and perceived barriers to screening contribute to stage at diagnosis of colorectal cancer.

An understanding of the factors that influence screening in an at-risk, underserved population as well as a more thorough understanding of risk factors for this common cancer could potentially illuminate those factors that contribute to colorectal mortality nationally.

Cancer Institute Objectives: The long-term goals of The Northeast Regional Cancer Institute are to reduce the burden of cancer (morbidity and mortality) among the residents of northeast Pennsylvania. In particular, we wish to address the disparities in incidence of- and mortality from colorectal cancer in this population. To this end, we have developed a two-pronged approach. We have established a program to increase awareness of colorectal cancer and the benefits of screening for this disease in both the professional and lay communities in northeast Pennsylvania. This Targeted Colorectal Cancer Awareness Program (TCCAP) was begun in 2004 and is supported by other funds. In addition, we wish to study risk factors for and the etiology of colorectal cancer in this high-risk community.

It is well established that currently available screening procedures can not only reduce colorectal cancer mortality, but can reduce incidence as well.[8-11] The Northeast Regional Cancer Institute's TCCAP program was designed to educate physicians (and other health care providers) about the unusually high incidence of colorectal cancer in northeast Pennsylvania, the low proportion of cases detected at an early stage, and the clear benefits of screening. In addition, a parallel effort is being conducted to directly educate the lay public about the need for and benefits of colorectal cancer screening. This program was begun in early 2004 and continued into early 2007.

A review of cancer surveillance data from the Cancer Institute's Regional Cancer Registry indicates that, over time, the proportion of colorectal cancer patients diagnosed at local stage is improving. During the years 1993-1997, 22% of new cases were diagnosed at the local stage, between 1998 and 2002, this proportion increased to 31%, and by 2004, it was 41%. The distribution of stage at diagnosis of colorectal cancer cases between 1998 and 2004 is shown in Figure 2. In addition, an analysis of cancer screening data has demonstrated a material improvement in colorectal cancer screening rates in the community. Between 2001 and 2002, the proportion of adults 50 years and older in northeast Pennsylvania who had had a screening colonoscopy or sigmoidoscopy in the previous five years was 33%; by 2003, this figure had increased to 42%, and in 2004, it was 39%. This increase in the prevalence of colorectal screening was statistically significant ($p < 0.05$). Both of these observations suggest that Cancer Institute's educational efforts are having the desired effect (increasing screening rates and the proportion of colorectal cancer patients diagnosed with early stage disease).

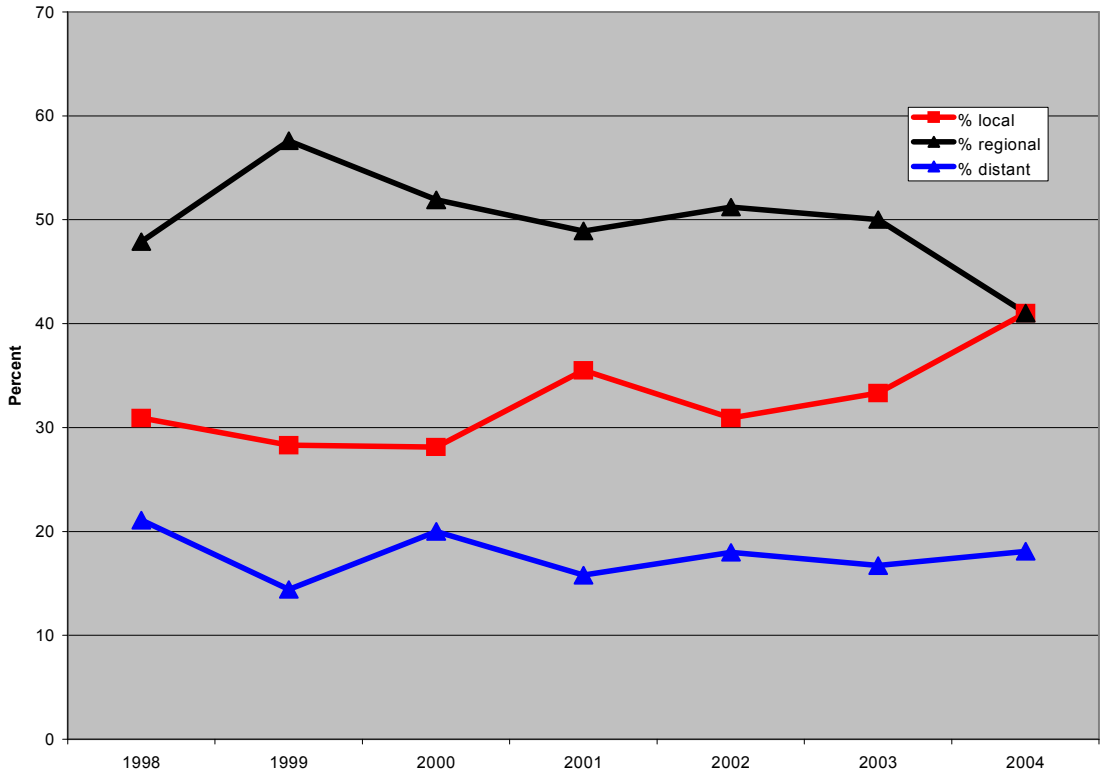

Figure 2. Stage at diagnosis of colorectal cancer cases diagnosed in Northeast Pennsylvania by year, 1998-2004.

Objectives of the current project: Under the current funding, we have continued our population-based surveillance of cancer in northeast Pennsylvania, have investigated cancer screening practices and examined the prevalence of cancer risk factors in this population.

This project had the following specific aims:

I. To conduct cancer surveillance in northeast Pennsylvania.
   a. To monitor incidence and mortality for all common cancers, and colorectal cancer, in particular, and
   b. To document changes in the stage at diagnosis of colorectal cancer in this high-risk, underserved community.

II. To conduct a population-based study of cancer risk factors and screening behavior in northeast Pennsylvania.
   a. To monitor and document changes in cancer screening rates, and
   b. To document the prevalence of cancer risk factors (especially factors that increase the risk of colorectal cancer) and to identify any risk factors that are unusually common in this community.

This report describes the results of these activities.

Methods

We conducted cancer surveillance using data from the Northeast Regional Cancer Institute's population-based regional cancer registry, the Pennsylvania Cancer Registry, and SEER program data. For the 23 most common cancers in northeast Pennsylvania, we examined incidence by county within the region and compared these figures to similar data for all of Pennsylvania and similar populations in the US. We used data from these same sources to compare mortality rates for the 23 most common cancers in northeast Pennsylvania. We examined cancer mortality by county within the region and compared these figures to corresponding figures for Pennsylvania and the US. These analyses of incidence and mortality data were not limited to colorectal cancer but included the other common cancers. For colorectal cancer, we compared the stage at diagnosis of recent cases to those diagnosed in prior years.

We also conducted a population-based study of healthy adults living in northeast Pennsylvania to document the current status of cancer screening in this community and to estimate the prevalence of established risk factors for a variety of cancers, including colorectal cancer. This study is similar in design to that used by the Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System (BRFSS). However, we gathered data exclusively from a large sample of adult residents of northeast Pennsylvania. We used these data to monitor the prevalence of colorectal cancer screening (ie, FOBT, and sigmoidoscopy or colonoscopy) and changes in the utilization of these procedures over time.

Experimental methods and procedures: This program included two distinct but related projects. The first project used existing data to conduct cancer surveillance in northeast Pennsylvania, and the second was a population-based study of cancer risk factors and cancer screening behaviors in this same population.

Objective I- Cancer Surveillance: Cancer is a reportable disease in Pennsylvania, and all hospitals and clinics must report each case of cancer diagnosed or treated in that facility to the Pennsylvania Cancer Registry. In northeast Pennsylvania, this reporting function is performed largely by a population-based regional cancer registry operated by The Northeast Regional Cancer Institute.

Started in 1994, The Northeast Regional Cancer Institute's cancer registry, which serves all of Lackawanna County and portions of Luzerne and the other surrounding counties, is the first collaborative regional cancer registry in Pennsylvania. The registry provides cancer registry services to 9 hospitals. Certified cancer registrars employed by The Northeast Regional Cancer Institute review records at these clinical sites and abstract data on all incident cancer cases and collect follow-up data, including treatment, on all prevalent cancer cases. The registry records patient demographic information (age, race, sex), county of residence, and detailed clinical information about each incident cancer case, including primary site, histology, stage (both AJCC and SEER summary stage are recorded), and all cancer treatments (surgery, radiation,

chemotherapy, biologic response modifiers, and other new or novel therapies). The data are reviewed at the regional cancer registry office and cleaned prior to submission to the Pennsylvania Cancer Registry. All cancer data reported to the Pennsylvania Cancer Registry from participating hospitals are processed by The Northeast Regional Cancer Institute's registry. Since its inception, the Regional Cancer Registry has collected incidence and follow-up data on more than 73,000 cancer cases, including more than 9,870 cases of colorectal cancer. The Regional Cancer Registry has been population-based for Lackawanna County since 1998. Over the past five years, this registry has identified and gathered data on an average of more than 455 incident colorectal cancer cases per year.

The Pennsylvania Cancer Registry has been collecting population-based cancer incidence data from all counties in Pennsylvania since 1985. This resource includes all of the data on incident cancer cases described above but does not contain follow-up data on patients subsequent to diagnosis and initial treatment. County level (i.e., aggregate) data on cancer incidence by anatomic site for the most common cancers are made available for research purposes.

Incidence analyses: Using cancer registry data, we calculated standardized incidence ratios (with 95% confidence intervals) for the 23 most commonly diagnosed cancers in northeast Pennsylvania. Separate calculations were performed for men, women, and both sexes combined (where appropriate) and for each of the six counties in northeast Pennsylvania. The expected number of cases for these calculations was estimated by applying the age-specific cancer incidence rates from NCI's SEER program to the age distribution in each county. The results were summarized in tabular form and displayed on a series of maps showing the distribution of cancer incidence by county in northeast Pennsylvania. Counties for which cancer incidence is significantly different from the expected figure were indicated by a special color (dark red for significantly elevated, dark blue for significantly lower than expected). Separate maps were generated for each combination of cancer site and sex. These results were reviewed for evidence of higher than expected incidence of these common cancers or evidence of spatial patterns in cancer incidence within the region. In addition, the data were compared to previous calculations for evidence of any change in incidence.

Mortality analyses: Similar to the analysis described above, we also calculated standardized mortality ratios (with 95% confidence intervals) for the 23 most common cancers in northeast Pennsylvania. The expected number of deaths was calculated by applying age-specific death rates from the SEER program to the age distribution of the population in each county. The results were summarized in tabular form and displayed on maps. Separate maps were generated for each combination of cancer site and sex. These results were reviewed for evidence of higher than expected mortality of these common cancers or spatial patterns in cancer mortality within the region. In addition, the data were reviewed for evidence of a change in mortality from previous calculations.

Colorectal cancer analyses: For colorectal cancer, we performed the following additional calculations. We computed age-adjusted incidence rates (overall and by sex)

by year. These latter data were used to assess changes in colorectal cancer incidence over time. We also examined the distribution of stage-at-diagnosis of incident colorectal cancer cases by year of diagnosis.

Objective II- Population-based study of cancer risk factors and screening:
We conducted a study of cancer risk factors and screening behaviors in northeast Pennsylvania. The study uses an anonymous telephone survey using random digit dialing to contact a representative sample of adult residents of the area. Methods are similar to those used by the CDC's BRFSS. All English-speaking persons, age 18 and older, regardless of sex, race, ethnicity or income, have an equal chance of being included in the study. After a household is contacted, the resident whose next birthday is nearest the date of contact is selected as the study participant. When an eligible subject is reached, the study is explained, verbal consent is obtained, and a trained member of the research staff interviews the subject using a structured interview schedule. (This selection scheme is similar to that used by the BRFSS.) Data are collected by specially-trained interviewers who received extensive training in administration of the instrument, medical terminology, and screening practices. The interview is conducted using a computer-assisted interview system, and responses are recorded directly into computer files. We have conducted approximately 1,000 surveys annually among residents of northeast Pennsylvania.

Interview Data: The following data are collected as part of this study:

- **General data** – including age, sex, race, ethnicity, religion, marital status, education, employment status, occupation, and date of interview.
- **Place of residence** – subjects will be classified as residing in an "urban" community if their current place of residence (city, borough, or township) is in a community which has a population density greater than 500 people per square mile and a total population $\geq$ 2500. All other subjects will classified as residing in a "rural" community.
- **Source of health care -** the subject's usual source of medical care (private physician, nurse practitioner, emergency room/urgent care center, or none) will be recorded.
- **Medical history –** we will record the subject's self-reported history of diabetes, hypertension, hyperlipidemia, myocardial infarction, intestinal polyps, inflammatory bowel disease and familial andeomatous polyposis (including age at first diagnosis).
- **Reproductive history (women only) –** we will record the subject's parity and menopausal status.
- **Medication use –** we will gather data on the subject's life-time use of a limited category of medications (non-steroidal anti-inflammatory drugs [NSAIDs] and statins).
- **Diet –** we will gather data on usual dietary practices using a brief food frequency questionnaire (Block dietary screener). This tool permits estimation of total caloric intake, calories from fat, fiber intake and frequency of consumption of approximately 25 specific foods.

- **Colorectal cancer screening** – a history of fecal occult blood testing (FOBT) will be recorded as ever/never. Interval since most recent prior screening is available for those who report having ever been screened. Information on history of lower endoscopy (sigmoidoscopy or colonoscopy) is recorded as ever/never. Interval since most recent prior endoscopic screening is available for those who report have ever been screened by this method. Very few participants report screening by other methods (barium enema, "virtual colonoscopy", or fecal DNA testing).
- **Other cancer screening** - the subject's prior screening practices, including the interval since most recent mammography and PAP testing for women and prostate specific antigen (PSA) testing for men.
- **Other health-related screenings** – the subject's prior screening practices, including the interval since most recent diabetes and cholesterol screenings.
- **Family history of any cancer** – the occurrence of cancer at any site among first degree relatives.
- **Family history of colorectal cancer** – the occurrence of colorectal cancer in first-degree relatives.
- **Tobacco and alcohol use** – tobacco and alcohol use including present status (current, former, never), duration of use (in years), and amount (cigarettes and drinks per day).
- **Physical activity** – exercise activity including type, duration, and frequency.
- **Height and Weight** – information on current height and weight, which will be used to compute Body Mass Index (BMI).

Data Analysis: The specific aims of this study are largely descriptive, and the analysis were straight-forward.

Prior to any analysis, the data were examined for missing items, inconsistent data, and outliers. Individual data records identified during this process were examined, and any coding errors documented. Variables for which the data remain missing were coded as "Unknown." Descriptive statistics characterizing the subjects interviewed were generated. Descriptive statistics characterizing the population enrolled were generated. Continuous variables were summarized by calculating their means (and corresponding standard error of the mean); categorical variables were summarized as proportions (and their corresponding 95% confidence intervals). In comparisons between subgroups, continuous variables were assessed using Student's t-test for unpaired data, and categorical variables were assessed using the chi square test or Fisher's exact test, as appropriate.

Results

Cancer Surveillance: Standardized incidence ratios (SIRs) for 23 cancer sites overall and by sex for 1998-2002 and 1999-2003 are shown in tables 1 and 2. Color coded maps displaying the SIRs for each cancer by county in northeast Pennsylvania were produced and are shown at the Cancer Institute's website (http://www.cancernepa.org/web/professionals/search/home.asp). For 1998-2002, incidence for all cancer sites combined was slightly higher than predicted based on SEER program

rates ($SIR_{all\ sites}$ = 103 (95% confidence interval [CI], 102-105). Incidence was significantly elevated for eleven cancer sites (colon and rectum, bronchus and lung in men, esophagus, larynx, thyroid, urinary bladder, Hodgkin's Lymphoma, testis, ovary, uterine corpus and uterine cervix). Incidence rates were significantly lower than SEER rates for five sites (liver and intra-hepatic bile ducts, multiple myeloma, malignant melanoma, prostate and female breast), and not significantly different from expected for the remaining sites. These relationships were replicated when 1999-2003 data were analyzed.

Age-adjusted incidence rates for colorectal cancer have been calculated, and compared to rates for previous years. Incidence for this cancer site has decreased but remains significantly higher than the rate in the SEER program registries. The age-adjusted incidence rate for colorectal cancer in 2000 was 69.8 cases per 100,000; in 2005, the corresponding rate was 63.0 cases per 100,000. This decrease parallels the trend in U.S. colorectal cancer incidence as reflected in the SEER program registries.

The distribution of invasive colorectal cancers by stage at diagnosis has been monitored. The improvement in stage at diagnosis first seen in cases diagnosed in 2004 has continued among cases diagnosed in 2005. The prevalence of local stage disease among colorectal cancer cases diagnosed in the periods1998-2003 and 2004-2005 were 30.9% and 38%, respectively. This represents a statistically significant improvement in stage at the time of diagnosis ($p < 0.0001$). Data on stage at diagnosis for cases diagnosed during 2006 were not available at the end of the project period.

Standardized mortality ratios (SMRs) for cancers at 23 sites and all sites combined are shown in tables 3 and 4. Color coded maps displaying the SMRs for each cancer by county in northeast Pennsylvania were produced and are shown at the Cancer Institute's website (http://www.cancernepa.org/web/professionals/search/home.asp). For the period 1998-2002, cancer mortality in northeast Pennsylvania was slightly higher than the U.S. cancer mortality rate for all cancer sites combined ($SMR_{all\ sites}$ = 103; 95% CI, 101-105). The excess in mortality was statistically significant only for men (SMR = 105; 95% CI, 102-108). Compared to U.S. cancer mortality rates, mortality in northeast Pennsylvania was significantly elevated for cancers of four sites (colorectum, urinary bladder, esophagus, and ovary) and significantly lower for only cancers of the lung and bronchus in women. Several minor differences are seen when the results of our analysis of 1999-2003 data are compared to these results. For this period, the overall SMR was 105 (95% CI 103–106), but was significantly elevated only among men (SMR = 108; 95% CI 105-111). The SMR for cancer of the ovary was not significantly elevated, but the SMR for cancers of the larynx in men was. In addition, SMRs for cancers of the liver and intra-hepatic bile ducts and multiple myeloma were significantly reduced.

When the surveillance data from both time periods and for both incidence and mortality are considered, cancers at three sites stand out. Both incidence and mortality are significantly and consistently elevated for cancers of the colon and rectum, urinary bladder, and esophagus in men. These three cancer sites may be considered for

further investigation as priority cancers in this community. The observation that breast cancer in women and prostate cancer in men are diagnosed significantly less often than expected, suggests that screening for these cancers may be less intense in this community than in the general US population. The change in colorectal cancer stage-at-diagnosis is compatible with an appropriate community response to the Cancer Institute's TCCAP program.

A manuscript describing the high incidence and mortality for colorectal cancer in Lackawanna County, Pennsylvania has been accepted for publication in the Journal of Registry Management. Publication is expected in the Fall of 2007.

Cancer Screening: The prevalence of colorectal cancer screening was examined for the years 2001 to 2006. During this period, the prevalence of screening endoscopy (colonoscopy or flexible sigmoidoscopy) has increased and the prevalence of screening using fecal occult blood testing (FOBT) does not appear to have changed significantly. In 2001-2002, 33% of the adult population 50 years and older reported having been screened by endoscopy in prior five years; for the period 2003-2006, the prevalence of use of this screening test had increased to 41.5%. This represents a statistically significant increase in the prevalence of screening endoscopy ($p < 0.0001$). In the most recent single year period for which data were available, 2006, the prevalence was 48.3%. The prevalence of screening by FOBT was also examined by year of interview. Because of changes in the methods used, data on FOBT use for the years 2001 and 2002 cannot be compared to that collected in more recent years. During 2003-2004, 28.2% of adults reported having been screened by FOBT in the prior two years. The corresponding figure for 2005-2006 was 26.8%.

Data have been analyzed to identify predictors of or barriers to colorectal cancer screening in this population; a manuscript describing the results is in preparation.

Prevalence estimates for breast, prostate, and cervical cancer screening have been calculated. For the period 2001-2006, 57.5% of women age 40 years and older reported having had a clinical breast exam in the prior year, and 55.6% reported having had a mammogram within the prior year. During this same period, 63% of men age 50 years and older reported having ever had a prostate-specific antigen (PSA) test, and 47% had this test within the prior year. Among women age 18 years and older, 97% reported having ever had a Pap test, and 74.9% reported having this test in the prior two years.

A more detailed analysis of breast cancer screening was conducted among women living in Luzerne County, the largest county in northeast Pennsylvania. This analysis, which included examination of screening practices in the city of Wilkes-Barre, the county seat, is included here. Data were available for 942 women 40 years and older living in Luzerne County. Of these women, 149 lived in Wilkes-Barre. BRFSS data were available for 11,031 women in Pennsylvania. The proportions of women who reported having a clinical breast exam or mammogram are shown in Table 5. Among Luzerne County women 40 and older, 60% had a clinical breast exam in the prior year.

This figure is significantly lower than the corresponding figure for women living in all of Pennsylvania (65%). The figure for women living in Wilkes-Barre was 58%, but this was not statistically different from either the figures for Luzerne County or Pennsylvania as a whole. The figures for mammogram use show a similar pattern. Among women 40 and older in Luzerne County, 58% reported having a mammogram in the prior year. This figure is significantly lower than the figure for mammogram use among all Pennsylvania women (62%). Among residents of Wilkes-Barre, 61% reported having a mammogram in the prior year. The proportion of women 50 years and older who had both a clinical breast exam and mammogram in the prior two years is also shown in Table 5. Seventy % of women in Luzerne County reported having both screening tests in the prior two years; the corresponding figure for Pennsylvania was also 70%, and for Wilkes-Barre it was 66%. Mammography use according to age and education level is shown in Table 6. Among Luzerne County women, mammography use was lowest among the youngest and oldest women. Only 45% of women 75 years and older and 50% of women 40-49 reported having a mammogram in the prior year. Among women between 50 and 74 years of age, approximately two-thirds had been screened. This pattern (low use among women in the youngest and oldest age categories) was also observed for Pennsylvania women, however use was lower in Luzerne County at both extremes of age. Among residents of Wilkes-Barre, mammography use was materially reduced only among women 75 and older. When the data were examined by level of education, mammography use was lowest among those with less than a high school education and increased with increasing education. Similar patterns were observed in Luzerne County, Wilkes-Barre and Pennsylvania. Mammography use was also examined by year among women 40 and older. In 2001, 64% of all women in Pennsylvania reported having a mammogram in the prior year. This figure fell to 55% by 2004. In Luzerne County, mammography use appeared to increase between 2001 and 2003 and then decrease. The proportions of women who reported having a mammogram in the prior year in 2001, 2002, 2003, 2004, 2005, 2006 were 56%, 54%, 64%, 59%, 56%, and 50%, respectively.

When all women 40 and older are considered, the proportions of women living in Luzerne County who have had either a screening mammogram or clinical exam in the previous year are significantly lower than state averages. Mammography use appears to be decreasing over time and is lowest among women younger than 50, older than 74, and those with less than a high school education. These data suggest there is substantial room for improvement in breast cancer screening rates in this community.

Cancer risk factor analysis: Population-based data on cancer risk factors among adults residing in the six NEPA counties have been examined. Among 5,154 subjects interviewed, 23.4% reported a family history of cancer, 26.7% were current cigarette smokers, 24.5% had a body mass index > 30 (obese), and 32.5% reported not participating in regular exercise. The prevalence of cigarette smoking in this population is significantly higher than in the general U.S. population, and the prevalence of regular exercise is lower. The proportion of residents of northeast Pennsylvania who reported not participating in regular exercise (32.5%) was substantially higher than the corresponding figure for the US (22.5%).[17] However, the proportions of adults in this

population who were overweight (61.1%) or obese (24.5%) were similar to the corresponding figures for Pennsylvania in (62% and 25%, respectively) and the US in 2005 (61% and 24%, respectively).[16,17] The mean intake of dietary fiber in this population (14.2 grams per day) was below current recommendations (20 grams per day or more), and only 12.5% of the population met or exceeded the recommendations. The mean percent of calories from fat in this population's diet was 33%, and 33.5% of the population had diets providing more than 35% of calories from fat. While the mean percent of calories from fat is similar to recent estimates for the general US population, these data indicate that a third of adults in northeast Pennsylvania consume a diet that excessively high in fat and relatively few meet the recommendations for fiber intake.[18,19]

Of the cancer risk factors examined here, cigarette smoking was the most noteworthy. In this population in 2005, 26.7% of adults were current cigarette smokers, a figure that was significantly higher than the corresponding figures for Pennsylvania (24%) and the US (20%).[16,17] While cigarette smoking has been associated with an increased risk of colorectal cancer, the increase in risk due to smoking is small. Among residents of northeast Pennsylvania, other risk factors such as sedentary lifestyles and diets rich in red meat low in fiber content may contribute more to the high incidence of colorectal cancer in this population.

PRODUCTS DEVELOPED

During this period of support, cancer institute staff completed a manuscript describing the incidence of and mortality from colorectal cancer in Lackawanna County, Pennsylvania. This manuscript, entitled "Colorectal Cancer Incidence and Mortality in Northeastern Pennsylvania" has been accepted for publication in the Journal of Registry Management. A pre-print copy of this manuscript has been forwarded to the department as a separate submission. In addition, Cancer Institute investigators have presented the results of research conducted under this support at a number of regional scientific conferences. Copies of abstracts presented at these meetings are included in the appendix to this report.

Maps showing cancer incidence (SIRs) and mortality (SMRs) by cancer site, sex and county for the six-county area in northeast Pennsylvania covered by this project have been produced and posted to the World Wide Web. These maps may be viewed at http://www.cancernepa.org/web/professionals/search/home.asp.

No inventions were created nor patents applied for or received during the term of this support.

ACTUAL ACCOMPLISHMENTS COMPARED TO ORIGINAL GOALS AND OBJECTIVES

In our application, we planned to examine incidence and mortality data for the 10 most common cancers occurring in northeast Pennsylvania. During the course of this project,

we obtained and analyzed data for the 23 most common cancer sites. The desire to not overlook less common cancers, which may contribute substantially to the overall cancer mortality in this population, and the ready availability of the necessary data allowed us to expand the surveillance activity.

Our analysis of cancer risk factors was more limited than anticipated. The dietary data collected in the population-based study was not sufficient to permit more detailed examination of dietary factors that may be related to the risk of colorectal cancer. As one consequence, investigators at the Cancer Institute have determined that further examination of dietary risk factors for colorectal cancer is warranted. Further, we have agreed to collaborate with investigators at the Pennsylvania State University College of Medicine in Hershey, Pennsylvania to conduct further studies of these relationships. At this time, funding has been obtained to conduct a detailed study of diet, smoking, and their interactions with genetic factors in the etiology of colorectal cancer in northeast Pennsylvania.

Table 1. Standardized incidence ratios† by primary cancer site and sex, northeast Pennsylvania, 1998-2002.

Primary site	Total Cases	Both sexes	Men	Women
All sites	22,301	103*	103*	104*
Brain	270	102	104	98
Breast, female	3,076	-	-	94*
Bronchus & lung	3,016	101	115*	85*
Colon & rectum	3,247	126*	132*	122*
Esophagus	253	117*	131*	80
Hodgkin's disease	133	136*	137*	135*
Kidney	560	108	108	107
Larynx	221	133*	133*	134
Leukemia	566	103	101	104
Liver/intra-hepatic bile duct	174	70*	75*	62*
Malignant melanoma	536	71*	73*	69*
Multiple myeloma	233	89*	84*	94
Non-hodgkin's lymphoma	864	100	99	100
Oral cavity	474	102	110	86
Ovary	421	-	-	122*
Pancreas	512	95	91	99
Prostate	2,782	-	80*	-
Stomach	394	103	101	105
Testis	113	-	127*	-
Thyroid	451	158*	128*	165*
Urinary bladder	1,255	126*	126*	124*
Uterine cervix	210	-	-	140*
Uterine corpus	810	-	-	131*

† Standardized incidence ratio = (observed cases/ expected cases) X 100. SEER published rates were used to compute expected numbers.
* Significantly different from 100, $p < 0.05$.

Table 2. Standardized incidence ratios† by primary cancer site and sex, northeast Pennsylvania, 1999-2003.

Primary site	Total Cases	Both sexes	Men	Women
All sites	22,169	103*	102*	103*
Brain	289	109	106	112
Breast, female	2,974	-	-	92*
Bronchus & lung	3,017	101	117*	82*
Colon & rectum	3,169	126*	131*	122*
Esophagus	269	123*	137*	86
Hodgkin's disease	133	136*	140*	131
Kidney / renal pelvis	574	105	108	100
Larynx	208	128*	122*	147*
Leukemia	573	103	99	106
Liver/intra-hepatic bile duct	170	66*	72*	56*
Malignant melanoma	539	70*	72*	67*
Multiple myeloma	216	82*	77*	88
Non-hodgkin's lymphoma	836	95	93	97
Oral cavity	473	102	112	85*
Ovary	406	-	-	118*
Pancreas	534	99	98	100
Prostate	2,738	-	78*	-
Stomach	384	102	102	102
Testis	109	-	124*	-
Thyroid	477	155*	132*	163*
Urinary bladder	1,252	125*	125*	127*
Uterine cervix	186	-	-	122*
Uterine corpus	825	-	-	135*

† Standardized incidence ratio = (observed cases/ expected cases) X 100. SEER published rates were used to compute expected numbers.
* Significantly different from 100, $p < 0.05$.

Table 3. Standardized mortality ratios[†] by primary cancer site and sex, northeast Pennsylvania, 1998-2002.

Primary site	Total Deaths	Both sexes	Men	Women
All sites	9,766	103*	105*	101
Brain	185	93	96	89
Breast, female	739	-	-	104
Bronchus & lung	2,381	90*	98	79*
Colon & rectum	1,237	123*	123*	122*
Esophagus	237	115*	117	111
Hodgkin's disease	29	126	100	155
Kidney / renal pelvis	195	98	102	94
Larynx	73	114	118	100
Leukemia	393	109	109	109
Liver/intra-hepatic bile duct	192	88	89	87
Malignant melanoma	128	108	107	109
Multiple myeloma	165	88	88	88
Non-hodgkin's lymphoma	421	107	109	106
Oral cavity	112	91	100	77
Ovary	280	-	-	114*
Pancreas	491	95	93	97
Prostate	544	-	100	-
Stomach	242	110	104	110
Testis	5	-	-[¶]	-
Thyroid	19	86	-	107
Urinary bladder	240	111	119*	96
Uterine cervix	62	-	-	97
Uterine corpus	144	-	-	118

[†] Standardized mortality ratio = (observed deaths/ expected deaths) X 100. Published US rates were used to compute expected numbers.
* Significantly different from 100, $p < 0.05$.
[¶] Sample includes five or fewer deaths.

Table 4. Standardized mortality ratios† by primary cancer site and sex, northeast Pennsylvania, 1999-2003.

Primary site	Total Deaths	Both sexes	Men	Women
All sites	9,807	105*	108*	103
Brain	188	95	97	93
Breast, female	725	-	-	105
Bronchus & lung	2,385	91*	100	79*
Colon & rectum	1,220	125*	126*	124*
Esophagus	250	121*	126*	107
Hodgkin's disease	31	129	117	142
Kidney / renal pelvis	201	100	103	94
Larynx	82	128*	142*	88
Leukemia	393	109	105	113
Liver/intra-hepatic bile duct	191	84*	84*	85
Malignant melanoma	118	96	95	98
Multiple myeloma	153	81*	75*	86
Non-hodgkin's lymphoma	435	115*	115	116*
Oral cavity	116	91	106	65*
Ovary	264	-	-	105
Pancreas	502	97	95	99
Prostate	522	-	102	-
Stomach	230	110	101	120
Testis	5	-	-¶	-
Thyroid	23	85	55*	106
Urinary bladder	254	118*	120*	114
Uterine cervix	61	-	-	98
Uterine corpus	145	-	-	119

† Standardized mortality ratio = (observed deaths/ expected deaths) X 100. Published US rates were used to compute expected numbers.
* Significantly different from 100, $p < 0.05$.
¶ Sample includes five or fewer deaths.

Table 5. Breast cancer screening practices among women 40 years and older in Pennsylvania, Luzerne County and Wilkes-Barre, 2001-2006.

Screening Exam	Pennsylvania* (n=11,031)	Luzerne County (n=942)	Wilkes-Barre (n=149)
Clinical Breast Exam in Prior Year	65%	60%†	58%
Mammogram in Prior Year	62%	58%†	61%
Clinical Breast Exam + Mammogram in Prior 2 Years. (Age 50+)	70%	70%	66%

* Pennsylvania figures are for 2001-2004 only.

† Statistically different from the figure for Pennsylvania.

Table 6. Mammography use* among women 40 and older in Pennsylvania, Luzerne County and Wilkes-Barre by age and education, 2001-2006.

	Pennsylvania† %	Luzerne County %	Wilkes-Barre %
Age, 40-49	56	50	64
50-64	67	65	67
65-74	68	68	72
75+	54	45	44
Education,			
Less than High School	50	46	36
High School	59	57	62
Some College	62	58	65
College Graduate	66	65	69

* Percent of women in each category who reported having a mammogram in the past year.

† Pennsylvania figures are for 2001-2004 only.

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APPENDIX

Presentations at scientific meetings

During this period of funding, Cancer Institute investigators have made a number of presentations at regional and international scientific meetings. Abstracts for these presentations are included in this appendix.

Do spiritual practices influence colorectal cancer screening? I. Prokup and S. Lesko (Northeast Regional Cancer Institute, Scranton, Pennsylvania, 18510)

Colorectal cancer (CRC) is the second leading cause of cancer death in the US. Despite evidence that CRC screening reduces mortality, US screening rates remain low. The prevalence of CRC screening in northeast Pennsylvania is lower than in Pennsylvania as a whole or the US. It is not clear why screening rates are low in this region. One hypothesis that has not been extensively studied is whether CRC screening is associated with religion or spiritual practices. We conducted a cross-sectional analysis of CRC screening in a population-based study of 782 adults 50+ years of age with no personal history of CRC. Self-reported history of CRC screening was obtained by telephone interview using random digit dialing. Subjects who reported having had screening sigmoidoscopy or colonoscopy (endoscopy) within 5 years (n = 256) were compared to subjects who reported having never been screened or only more than 5 years previously. Subjects were classified by religion (Catholic, Protestant, Jewish, or other/none), and The Duke University Religion Index was used to measure spiritual beliefs and practices. Logistic regression analysis was used to study the relationship between endoscopy screening and religion and spirituality, while controlling for age. Intrinsic spirituality was not associated with having been screened in the previous five years. Compared to Catholics, Jews were more likely to have been screened (adjusted odds ratio [OR] 4.7, 95% Confidence Interval [CI]1.5,14.7); men and women who engaged in private spiritual activities (prayer/meditation/bible study) at least once a day (compared to those who rarely did so), and men who participated in organized worship at least once a week (compared to those who worshiped once a year or less) were less likely to have been screened (OR 0.59, 95%CI 0.38,0.91) and (OR 0.51, 95%CI 0.25,1.0), respectively. These data suggest that spiritual practices may help identify subjects who could benefit from efforts designed to increase colorectal cancer screening.

Presented at the annual meeting of the Society for Epidemiologic Research, Toronto, Canada, June 2005.

Factors associated with cigarette smoking in Northeast Pennsylvania

T. Coleman and S.M. Lesko (Northeast Regional Cancer Institute, Scranton, PA 18510)

Tobacco use, particularly cigarette smoking, remains the number one cause of preventable disease and death in the U.S. In the six-county area of Northeast Pennsylvania, the prevalence of current cigarette smoking in 2003 (28.7%) was significantly higher than in Pennsylvania as a whole and the U.S. We sought to identify factors associated with current smoking in this high-risk population. We conducted a cross-sectional analysis of current cigarette smoking in a population-based study of adults aged 18 and older. Self-reported history of tobacco use was obtained by telephone interview using random digit dialing. Current smokers (defined as those who had smoked at least 100 cigarettes in their lifetime and continue to smoke, n=337) were compared to subjects who smoked fewer than 100 cigarettes in their lifetimes (n=670). We used logistic regression to study the relationship between smoking status and the following variables: age, sex, race, educational attainment, marital and employment status, place of residence (urban v. rural), and usual source of health care. The odds of smoking decreased with increasing age (adjusted odds ratio [OR] for one-year increment of age = 0.96, 95% Confidence Interval [CI] 0.95-0.97). The following were also associated with current smoking: male sex (OR 1.5, 95% CI 1.1-2.0), non-white race (OR 0.3, 95%CI 0.15-0.76), college education (OR 0.37, 95%CI 0.25-0.54), not having a private physician as usual source of healthcare (OR 1.9, 95%CI 1.2-3.1), and being divorced/separated (OR 3.2, 95%CI 2.1-5.0). Employment status and place of residence were not associated with current smoking. The data suggest that not having a private physician and being divorced/separated, male, and less-well educated increase one's risk for cigarette smoking in this community, while non-whites are at a significantly lower risk than the majority white population. These characteristics may assist tobacco control specialists deliver more targeted interventions.

Presented at the annual meeting of the Society for Epidemiologic Research, Toronto, Canada, June 2005.

Presented at the Pennsylvania Cancer Control Consortium Research Summit, Harrisburg, PA, November 2005.

Presented at Health Sciences Research 2006, Scranton, PA, April 2006.

Barriers to the use of adjuvant chemotherapy in stage III colorectal cancer

Samuel M Lesko, MD, MPH and Trudy Coleman, PhD, Northeast Regional Cancer Institute, Scranton, PA, USA

Background: Colorectal cancer is the second leading cause of cancer death in the US. Despite clinical guidelines recommending adjuvant chemotherapy for all patients with stage III colorectal cancer, many patients do not receive this treatment.

Objectives: The authors sought to identify barriers to the use of adjuvant chemotherapy in patients with this common stage of colorectal cancer.

Methods: Cross-sectional analysis of colorectal cancer case data from a population-based cancer registry in Northeast Pennsylvania. All cases with stage III adenocarcinoma of the colon or rectum diagnosed in 1998 through 2002 were included. The chi-squared test was used to evaluate relationships between age, sex, health insurance coverage, place of residence (urban v. rural), year of diagnosis, and anatomic site within the bowel and adjuvant chemotherapy use. Multiple logistic regression was used to control for confounding in multivariable models.

Results: A total of 512 patients with stage III colorectal cancer (mean age 70.2 yrs) were studied. Of these, 302 (59%) received chemotherapy in addition to surgery as first-course therapy. In bivariate analyses, patient age, year of diagnosis, and anatomic site within the colon were associated with the use of adjuvant therapy. Compared to patients younger than 70 years of age, the odds ratio (OR) for those 70+ was 0.2 (95% Confidence Interval [CI], 0.13 - 0.29); compared to patients diagnosed in 1998, the OR for the use of adjuvant therapy in 2002 was 0.54 (95% CI, 0.32 - 0.93); and compared to patients with cancer of the rectum/rectosigmoid, the OR for cancers of the colon was 0.6 (95% CI, 0.39 - 0.91). Patient sex, insurance coverage, and place of residence were not associated with the use of this treatment. In a multivariable model including all of these factors, only patient age was associated with the use of adjuvant chemotherapy; compared to patients less than 70 years of age, the OR for the use of adjuvant therapy among those 70+ was 0.2 (95 % confidence interval, 0.13 - 0.30).

Conclusions: Despite clinical guidelines supporting the routine use of adjuvant chemotherapy for all patients with stage III colorectal cancer, only about 60% receive this treatment. Advancing age is the only significant barrier to the use of adjuvant chemotherapy in these data. Further research is needed to determine the extent to which other factors (patient preference, co-morbidity, and physician recommendation) influence the use of adjuvant chemotherapy in stage III colorectal cancer.

Presented at the International Conference in Pharmacoepidemiology, Nashville, TN, August 2005.

Use of adjuvant chemotherapy in stage III colorectal cancer in Northeast Pennsylvania

Samuel M Lesko, MD, MPH and Trudy Coleman, PhD, Northeast Regional Cancer Institute, Scranton, PA, USA

Program purpose and need: Colorectal cancer is the second leading cause of cancer death in the US. According to clinical guidelines, all patients with stage III colorectal cancer should receive adjuvant chemotherapy (ACT). However, many do not.

Objectives: The authors sought to identify factors associated with the use of ACT in patients with stage III colorectal cancer.

Methods: Cross-sectional analysis of data from a population-based cancer registry in Northeast Pennsylvania. All cases with stage III adenocarcinoma of the colon or rectum diagnosed in 1998 through 2002 were included. Multiple logistic regression was used to control for confounding and to evaluate relationships between age, sex, health insurance coverage, place of residence (urban v. rural), year of diagnosis, and anatomic site within the bowel and ACT use.

Results: Of 512 patients with stage III colorectal cancer, 302 (59%) received chemotherapy in addition to surgery as first-course therapy. Patient age and year of diagnosis were associated with the use of ACT. Compared to patients younger than 70 years of age, the odds ratio (OR) for those 70+ was 0.2 (95% Confidence Interval [CI], 0.13 - 0.30); compared to patients diagnosed in 1998, the OR for those diagnosed in 2002 was 0.50 (95% CI, 0.27 - 0.94); and compared to patients with insurance, the OR for those with none was 0.61 (95% CI, 0.34 – 1.1). Sex, anatomic site, and place of residence were not associated with ACT use.

Conclusions: Despite clinical guidelines supporting the routine use of ACT for all patients with stage III colorectal cancer, only about 60% receive this treatment. Advancing age is the most important barrier to the use of ACT in these data. Further research is needed to determine the extent to which other factors (patient preference, co-morbidity, and physician recommendation) influence the use of ACT in stage III colorectal cancer.

Presented at the Pennsylvania Cancer Control Consortium Research Summit, Harrisburg, PA, November 2005.

A population-based study of predictors of colorectal cancer screening in a high-risk population.

Ilene Prokup, MS, APRN,BC, Samuel Lesko, MD, MPH. Northeast Regional Cancer Institute, University of Scranton Campus, Scranton PA 18510, 570-941-7984, prokupi2@uofs.edu

Colorectal cancer (CRC) is the second leading cause of cancer death in the U.S. Despite evidence that CRC screening can reduce mortality, screening rates remain low. In the 6-county area of Northeast Pennsylvania, incidence and mortality are significantly higher than state and national rates. We sought to identify factors associated with screening in this high-risk population. We conducted a case-control analysis of CRC screening in a population-based study of 819 adults 50+ years of age with no personal history of CRC. Self-reported history of CRC screening was obtained by telephone interview using random digit dialing. Cases were defined as those having had an endoscopy (sigmoidoscopy or colonoscopy) within 5 years (N=261). Controls were subjects who reported endoscopy more than 5 years previously or never. We used logistic regression to study the relationship between endoscopy and the following variables: age, sex, marital status, education, place of residence, occupation, body mass index, exercise, smoking, alcohol use, personal history of cancer, family history of cancer, other cancer screenings, and other health screenings. The following were associated with recent endoscopy screening: male sex (adjusted Odds Ratio 1.7, 95% Confidence Interval 1.2-2.4), personal history of cancer (OR 1.8, 95%CI 1.2-2.7), family history of cancer (OR1.7, 95%CI 1.2-2.4), other cancer screenings (OR 2.2, 95%CI 1.4-3.3), and other screenings (OR 2.5, 95%CI 1.2-5.3). The data suggest that being male, having a personal and family history of cancer, and being current with cancer and other health screenings predict screening for colorectal cancer with endoscopy in a population-based study.

Presented at the Pennsylvania Cancer Control Consortium Research Summit, Harrisburg, PA, November 2005.

Adjuvant chemotherapy in stage III colorectal cancer: barriers and predictors of use

Samuel M Lesko and Trudy Coleman (Northeast Regional Cancer Institute)

Colorectal cancer is the second leading cause of cancer death in the US. Despite guidelines recommending the use of adjuvant chemotherapy for patients with stage III colorectal cancer, many patients do not receive this treatment. The authors sought to identify barriers to the use of adjuvant chemotherapy in patients with stage III colorectal cancer. A cross-sectional analysis of data from a population-based cancer registry in Northeast Pennsylvania was conducted. Cases with stage III adenocarcinoma of the colon or rectum diagnosed in 1998 - 2002 were studied. Multiple logistic regression was used to evaluate relationships between age, sex, health insurance coverage, place of residence (urban v. rural), year of diagnosis, and anatomic site within the bowel and adjuvant chemotherapy use. Of 512 patients with stage III colorectal cancer (mean age 70.2 yrs), 302 (59%) received adjuvant chemotherapy. In the multivariable model, patient age was associated with the use of adjuvant chemotherapy; compared to patients less than 70 years of age, the odds ratio (OR) for the use of adjuvant therapy among those 70+ was 0.2 (95 % confidence interval [CI], 0.13 - 0.30). Adjuvant chemotherapy use was marginally lower among those with no health insurance (OR = 0.61; 95% CI, 0.43 – 1.1). Despite clinical guidelines supporting the routine use of adjuvant chemotherapy for all patients with stage III colorectal cancer, only about 60% receive this treatment. Advancing age was the greatest barrier to the use of adjuvant chemotherapy in these data. Further research is needed to determine the extent to which other factors (patient preference, co-morbidity, and physician recommendation) influence the use of adjuvant chemotherapy in stage III colorectal cancer.
Health Sciences Research 2006, Scranton, PA, April 2006.

Presented at Health Sciences Research 2006, Scranton, PA, April 2006.

Religion, spiritual practices and colorectal cancer screening

I. Prokup and S. Lesko (Northeast Regional Cancer Institute)

Colorectal cancer (CRC) is the second leading cause of cancer death in the US. Despite evidence that CRC screening reduces mortality, US screening rates remain low. The prevalence of CRC screening in Northeast Pennsylvania is lower than in Pennsylvania as a whole or the US. It is not clear why screening rates are low in this region. One hypothesis that has not been extensively studied is whether CRC screening is associated with religion or spiritual practices. We conducted a cross-sectional analysis of CRC screening in a population-based study of 782 adults 50+ years of age with no personal history of CRC. Self-reported history of CRC screening was obtained by telephone interview using random digit dialing. Subjects who reported having had screening sigmoidoscopy or colonoscopy (endoscopy) within 5 years (n = 256) were compared to subjects who reported having never been screened or only more than 5 years previously. Subjects were classified by religion (Catholic, Protestant, Jewish, or other/none), and The Duke University Religion Index was used to measure spiritual beliefs and practices. Logistic regression analysis was used to study the relationship between endoscopy screening and religion and spirituality, while controlling for age. Intrinsic spirituality was not associated with having been screened in the previous five years. Compared to Catholics, Jews were more likely to have been screened (adjusted odds ratio [OR] 4.7, 95% Confidence Interval [CI]1.5,14.7); men and women who engaged in private spiritual activities (prayer/meditation/bible study) at least once a day (compared to those who rarely did so), and men who participated in organized worship at least once a week (compared to those who worshiped once a year or less) were less likely to have been screened (OR 0.59, 95%CI 0.38,0.91) and (OR 0.51, 95%CI 0.25,1.0), respectively. These data suggest that spiritual practices may help identify subjects who could benefit from efforts designed to increase colorectal cancer screening.

Presented at Health Sciences Research 2006, Scranton, PA, April 2006.

The effect of age on the treatment of stage III colorectal cancer

Samuel M Lesko and Trudy Coleman (Northeast Regional Cancer Institute, Scranton, PA, 18510) leskos2@scranton.edu

Colorectal cancer is the second leading cause of cancer death in the US. Despite guidelines recommending the use of adjuvant chemotherapy for patients with stage III colorectal cancer, many patients do not receive this treatment. The authors sought to identify barriers to the use of adjuvant chemotherapy in patients with stage III colorectal cancer. A cross-sectional analysis of data from a population-based cancer registry in Northeast Pennsylvania was conducted. Cases with stage III adenocarcinoma of the colon or rectum diagnosed in 1998 - 2002 were studied. Multiple logistic regression was used to evaluate relationships between age, sex, health insurance coverage, place of residence (urban v. rural), year of diagnosis, and anatomic site within the bowel and adjuvant chemotherapy use. Of 512 patients with stage III colorectal cancer (mean age 70.2 yrs), 302 (59%) received adjuvant chemotherapy. In the multivariable model, patient age was associated with the use of adjuvant chemotherapy; compared to patients less than 70 years of age, the odds ratio (OR) for the use of adjuvant therapy among those 70+ was 0.2 (95 % confidence interval [CI], 0.13 - 0.30). Adjuvant chemotherapy use was marginally lower among those with no health insurance (OR = 0.61; 95% CI, 0.43 – 1.1). Despite clinical guidelines supporting the routine use of adjuvant chemotherapy for all patients with stage III colorectal cancer, only about 60% receive this treatment. Advancing age was the greatest barrier to the use of adjuvant chemotherapy in these data. Further research is needed to determine the extent to which other factors (patient preference, co-morbidity, and physician recommendation) influence the use of adjuvant chemotherapy in stage III colorectal cancer.

Presented at the 2006 Congress of Epidemiology, Seattle, WA, June 2006.

Screening among advanced stage cervical cancer cases in Pennsylvania, 2000-2001: screening failure or failure to screen.

Samuel M. Lesko, MD, MPH and Trudy Coleman, PhD. Northeast Regional Cancer Institute, Scranton/Wilkes-Barre, PA.

Background: Screening for cervical cancer saves lives by causing the diagnosis of early stage lesions (pre-invasive lesions and early invasive cancers) in asymptomatic women. Despite the wide availability of the PAP test with proven effectiveness, women are diagnosed with advanced stage cervical cancer in Pennsylvania each year. The extent to which these diagnoses represent failures of the screening test is unknown.
Objectives: The investigators sought to determine the number of women diagnosed with advanced stage cervical cancer in Pennsylvania each year, despite having been previously screened and to identify the reason(s) their cancers were not diagnosed earlier.
Methods: Follow-back study of invasive cervical cancer cases reported to the Pennsylvania cancer registry in 2000 and 2001. Data were obtained from the cancer registry, by personal interview, and medical record review. Multiple logistic regression was used to examine the relationship between the risk of advanced (regional and distant) stage cancer and screening history while controlling for potential confounders.
Results: Of 116 cases of cervical cancer diagnosed in 2000-2001 (mean age 50.2 years, 49.1% advanced stage), 75.9% reported having a prior PAP test. Among advanced stage cases, 66.7% reported a prior PAP. This is the equivalent of 163 (95% CI 129-192) cases of advanced stage cervical cancer diagnosed each year in Pennsylvania, despite prior screening. Compared to patients never screened, the odds ratios for early stage cancer were 2.3 (95% CI 0.88-6.1), 3.5 (95% CI 1.2-10), and 2.9 (95% CI 0.88-9.5) among women who had been screened ever, screened regularly, and screened within the prior year, respectively. Among all cases with advanced stage disease, 33.3% reported never having been screened, 40.4% reported only episodic screening or screening in the distant past, and 26.3% reported having annual PAP tests. Of this latter group, 2/3 (17.5% of all advanced stage cases) reported having a prior abnormal PAP, and 1/3 (8.8% of all advanced stage cases) reported all prior tests were normal.
Conclusions: These data confirm that, as currently practiced in Pennsylvania, regular PAP testing increases the odds of detecting cervical cancer at an early, treatable stage by more than three-fold. Failure to screen regularly, or at all, was the greatest contributor to the risk of advanced stage cancer, accounting for nearly ¾ of all advanced cases. Fewer than 9% of advanced stage cancers were missed by a prior normal test. These data also suggest that better follow-up of abnormal PAP results could reduce the number of advanced stage cases by as much as 17.5%. The number of Pennsylvania women diagnosed each year with advanced stage cervical cancer despite prior screening (~160) is not large but could be reduced by more consistent use of existing technology.

Presented at the Penn State Cancer Institute Annual Research Retreat, Hershey, PA, September 2006.

Presented at the Pennsylvania Cancer Control Consortium Research Summit, Harrisburg, PA, November 2006.

Screening among advanced stage colorectal cancer cases in Pennsylvania, 2000-2001.

Samuel M. Lesko, MD, MPH and Trudy Coleman, PhD. Northeast Regional Cancer Institute, Scranton/Wilkes-Barre, PA.

Background: Screening for colorectal cancer saves lives by detecting cancer when the disease is highly curable. Despite the wide availability of effective screening procedures, a substantial proportion of incident colorectal cancers are diagnosed at advanced stages in Pennsylvania each year. The extent to which these diagnoses represent failures of the screening test is unknown.
Objectives: The investigators sought to determine the number of patients diagnosed with advanced stage colorectal cancer in Pennsylvania each year despite having been previously screened and to identify the reason(s) these cancers were not diagnosed earlier.
Methods: Follow-back study of colorectal cancer cases reported to the Pennsylvania cancer registry in 2000 and 2001. Data were obtained from the cancer registry, by interview, and medical record review. Logistic regression was used to examine the relationship between the risk of advanced (regional and distant) stage cancer and screening history while controlling for confounding.
Results: Of 795 cases of colorectal cancer (mean age 66.4 years, 55.1% male, 94.1% white, 57.7% advanced stage), 54% (95% Confidence Interval [CI] 50.2%-57.9%) reported having ever been screened. Among advanced stage cases, 48.4% (an average of 2,416 cases per year in Pennsylvania) reported prior screening. Compared to patients never screened, the odds ratios for early stage cancer were 1.6 (95% CI 1.1-2.2), 2.3 (95% CI 1.3-4.2), and 1.5 (95% CI 0.67-3.5) among patients who had ever been screened, screened first before age 55 and repeated at the correct interval, and screened first before age 55 but repeated at incorrect intervals, respectively. The corresponding odds ratios were 2.0 (95% CI 1.2-3.2), 1.8 (95% CI 0.84-3.6), and 1.6 (95% CI 1.0-2.4) among those screened by colonoscopy, sigmoidoscopy and FOBT, respectively. The majority of advanced stage cases (74.3%) had not been screened according to a currently recommended protocol, but 11.8%, 6.8% and 8.0% had been previously screened within the recommended interval by colonoscopy, sigmoidoscopy or FOBT, respectively.
Discussion: In Pennsylvania, screening for colorectal cancer according to recommended protocols increases the odds of detecting this cancer at an early, treatable stage by more than two-fold. Failure to screen properly accounted for 74% of all advanced cases, but 26% of advanced stage cases were missed by one or more screening test. The number of Pennsylvanians diagnosed each year with advanced stage colorectal cancer despite prior screening (~2,400) is large but could be reduced substantially by increasing compliance with existing screening guidelines.

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Predictors of adjuvant chemotherapy in stage III colorectal cancer
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Background: Colorectal cancer is the second leading cause of cancer death in the US. Despite guidelines recommending the use of adjuvant chemotherapy for patients with stage III colorectal cancer, many patients do not receive this treatment.
Objectives: The authors sought to identify barriers to the use of adjuvant chemotherapy in patients with stage III colorectal cancer.
Methods: A cross-sectional analysis of data from a population-based cancer registry in Northeast Pennsylvania was conducted. Cases with stage III adenocarcinoma of the colon or rectum diagnosed in 2003-2005 were studied; patients receiving chemotherapy were compared to those who did not. The student's t-test was used to compare continuous variables, chi-square test was used to compare categorical variables, and multiple logistic regression was used to evaluate relationships between adjuvant chemotherapy use and multiple risk factors, while controlling for confounding. The following factors were examined: age, sex, health insurance coverage, county of residence (urban v. rural), year of diagnosis, co-morbid conditions, and anatomic site within the bowel.
Results: Of 252 patients with stage III colorectal cancer (mean age 71.6 yrs), 126 (50%) received adjuvant chemotherapy. Patients receiving adjuvant chemotherapy were younger (mean age 66.3 yrs) than those not treated (mean age 76.9 yrs; $p < 0.001$). In bivariate analyses, adjuvant chemotherapy use was significantly more common in men (odds ratio [OR] 1.8; 95% confidence interval [CI] 1.1-3.0) and patients with private insurance (OR = 2.6; 95% CI 1.4-4.6) and less common in patients with congestive heart failure (OR = 0.38; 95% CI 0.15-0.94) or non-ischemic heart disease (OR = 0.4; 95% CI 0.2-0.82). In a multivariable model controlling for co-morbid conditions, patient age remained significantly associated with the use of adjuvant chemotherapy; compared to patients less than 75 years of age, the OR for the use of adjuvant therapy among those 75+ was 0.28 (95 % CI, 0.14 - 0.54). In this model, the ORs for congestive heart failure and non-ischemic heart disease were 0.49 (95% CI, 0.18-1.3) and 0.62 (95% CI, 0.28-1.3), respectively.
Conclusions: Despite clinical guidelines supporting the routine use of adjuvant chemotherapy for all patients with stage III colorectal cancer, only about half receive this treatment. After controlling for co-morbid conditions, advanced age remained a significant barrier to the use of adjuvant chemotherapy in these data. Further research is needed to determine whether other factors (patient preference and physician recommendation) influence the use of adjuvant chemotherapy in stage III colorectal cancer.

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Factors associated with the intention to continue cigarette smoking in Northeast Pennsylvania

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Background: Tobacco use, particularly cigarette smoking, remains the number one cause of preventable disease and death in the U.S. The prevalence of cigarette smoking in Northeast Pennsylvania (26.7% in 2005) is significantly higher than in PA and the U.S. Among current smokers in this region, 23.3% (95% Confidence Interval [CI] 17.1%, 29.5%) had no plans to quit. This proportion did not change significantly between 2003 and 2005.

Objective: We sought to identify factors associated with the intention to continue smoking in this high-risk population.

Methods: We conducted a cross-sectional analysis of quitting intentions in a population-based study of 714 current smokers. Between January 2003 and December 2005, self-reported history of tobacco use and quitting intention was obtained by telephone interview using random digit dialing. Smokers who did not intend to quit (n=179) were compared to those who did (n=535). We used logistic regression to study the relationship between intention to quit and the following: age, sex, religion, marital and employment status, age started smoking, healthcare professionals' screening for smoking and advice to quit, prior attempts at quitting, alcohol use, use of other tobacco products, and change in body mass index (BMI) since age 18.

Results: The following were associated with the intention to continue smoking: age (compared to those younger than 30, the odds ratios (OR) for smokers 45-64 and 65+ were 2.3 (95% CI 1.2-4.5) and 3.8 (95% CI, 1.6-8.9), respectively; prior quit attempts (compared to those who tried quitting 1-3 times, the OR for those with no prior quit attempts was 4.0 (95% CI 2.5-6.3); advice to quit by a health professional (compared to those who had been advised to quit, the OR among those not advised to quit was 2.3 (95% CI 1.5-3,6) and BMI (compared to those with a stable BMI, the ORs for smokers whose BMI decreased or increased by 2.5-7.4 units were 3.0 (95% CI 1.5-5.9) and 1.8 (95% CI 1.1-3.0), respectively). Results in men and women were similar.

Conclusions: These data suggest that age $\geq$45, never having tried to quit for at least one day, and not having been advised to quit by a healthcare professional increase risk of continued smoking. The relation between BMI and smoking intention is complex and non-linear. These observations may assist health professionals deliver more targeted interventions to help current smokers quit.

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TCCAP: a Targeted Awareness Program to Address Colorectal Cancer Disparities in Northeast Pennsylvania

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Purpose: Because of high colorectal cancer (CRC) incidence and mortality in their northern Appalachian community, the authors developed a Targeted Colorectal Cancer Awareness Program (TCCAP), a multi-faceted education program designed to improve detection of and reduce mortality from CRC by increasing awareness and screening.
Methods: TCCAP is a three-year program delivering information on CRC (risk and screening strategies) to community residents and primary healthcare providers. It uses the media, written materials and educational programs for the public, and academic detailing and didactic presentations for healthcare providers. Post-intervention questionnaires were used to assess community members' screening intentions and healthcare professionals' screening plans/practices. Population surveys and cancer registry data were used to document screening prevalence and stage at diagnosis.
Results: Following an education program, 63% of community residents reported an intention to be screened. Among healthcare professionals, 93% planned to modify professional behavior after attending a lecture, and 69% reported increased screening following a detailing session. Since the start of the program, the prevalence of screening colonoscopy increased from 33% to 41% ($p < .001$), and the proportion of patients diagnosed with local stage CRC increased from 31% to 38% ($p < 0.0001$).
Implications: The change in stage at diagnosis suggests that the disparity in CRC mortality is decreasing; this change means that each year, 13 fewer incident CRC cases can expect to die of their disease.
Sustainability: How long benefits will persist after the program ends is unknown, however, its modest cost ($4,102/year of life saved) suggests the program is sustainable.

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