

Research Using the New Jersey State Cancer Registry Data

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INTRODUCTION

This report presents summaries of past and present cancer research the Cancer Epidemiology Services (CES) of the New Jersey Department of Health and Senior Services has conducted and/or collaborated on. The primary purpose of this report is to provide researchers, health planners, and the public with information on the types of cancer research we have conducted and to present findings from our research. With each study, we advance our ability to understand, prevent, detect, and treat cancer.

Since its inception in 1979, the New Jersey State Cancer Registry (NJSCR) has been a rich resource for researchers, including case-control and cohort studies of cancer etiology, multi-center investigations, and collaborations with government and state agencies, universities, and private organizations. With a total of over a million cases, the NJSCR serves as a foundation for multidisciplinary cancer research in New Jersey.

The first six studies CES conducted were sole-source contracts with the National Cancer Institute (NCI) between the years 1976 and 1984. Since then, we have collaborated with various governmental agencies including the Centers for Disease Control and Prevention (CDC), the Agency for Toxic Substances and Disease Registry (ATSDR), the National Institute for Occupational Safety and Health (NIOSH), the Surveillance, Epidemiology, and End Results Program (SEER), the National Institute of Environmental Health Sciences (NIEHS) and NCI. We have also collaborated with universities and cancer centers including Columbia University School of Public Health, Yale University, the University of Medicine and Dentistry of New Jersey (UMDNJ), Mount Sinai School of Medicine, the American Cancer Society (ACS), the Fred Hutchinson Cancer Research Center, and Memorial Sloan Kettering Cancer Center.

We are pleased to have contributed to important research on the causes of cancer, cancer prevention and diagnosis, cancer treatment, and cancer survival, and will continue in the effort to control and prevent cancer. For more information about our research program, the NJSCR, our data, the data release policy and the Institutional Review Board, or for a list of publications, please contact us at (609) 588-3500 or visit the CES website at <http://nj.gov/health/ces/index.shtml>.

RESEARCH STUDIES

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TITLE: National Survey of Environment and Health (National Bladder Cancer Study)

PRINCIPAL INVESTIGATORS: Robert N. Hoover, MD, ScD
Patricia H. Strasser, ScD
Annette Stemhagen, DrPH¹

INSTITUTION: Environmental Epidemiology Branch, National Cancer Institute (NCI)

NJDHSS CES COLLABORATORS: Joanne Bill, RN, BSN
Ronald Altman, MD, MPH

STUDY PERIOD: 1978-1981

FUNDING SOURCE: U.S. Food and Drug Administration (USFDA)
National Cancer Institute (NCI)
U.S. Environmental Protection Agency (EPA)

NCI conducted a large case-control interview study to resolve some of the conflicts in the findings of previous epidemiological studies and to study the possible relationship of environmental and lifestyle factors to bladder cancer.

Cancer cases were identified from 10 areas of the U.S.: Atlanta, GA; Connecticut; Detroit, MI; Iowa; New Jersey; New Mexico; New Orleans, LA; San Francisco, CA; Seattle, WA; and Utah. The case group was composed of all residents who were aged 21-84 and newly diagnosed with a histologically confirmed bladder cancer in a one-year period. Cases were identified through the Surveillance, Epidemiology, and End Results (SEER) Program and the NJSCR. In each area, controls were randomly selected from the general population weighted by age (5-year groups), sex and geographic distribution of the cases. Controls under age 65 were selected by random digit dialing, while controls aged 65 and older were selected from randomly generated Medicare files maintained by the Health Care Financing Administration².

Of the risk factors examined, including coffee consumption, use of artificial sweeteners, and history of urinary tract infections, coffee drinkers were found to have a greater risk of bladder cancer than nondrinkers, but the data did not show any consistent relationship between the extent of exposure and the degree of risk. Men who drank more than 49 cups of coffee per week had an apparent excess in risk, but women who drank that much had an apparent deficit in risk. Artificial sweetener use showed no elevation in risk, however, positive associations between various measures of use of artificial sweeteners and risk of bladder cancer were seen in several subgroups. History of urinary tract infection significantly elevated the risk of bladder cancer, particularly in individuals who reported three or more infections. Significantly increased bladder cancer risk was also found for bladder stones, while kidney stones showed no relation.

Publications:

Hoover R, Strasser PH. Artificial sweeteners and human bladder cancer. *Lancet*. 1980;1(8173):837-840.

¹ Annette Stemhagen was the Principal investigator for the New Jersey extension of this study, see page 6.

² Centers for Medicare & Medicaid Services (CMS), formerly Health Care Financing Administration

Hartge P, Hoover R, West DW, Lyon JL. Coffee drinking and risk of bladder cancer. *J Natl Cancer Inst.* 1983;70(6):1021-6.

Kantor AF, Hartge P, Hoover RN, Narayana AS, Sullivan JW, et al. Urinary tract infection and risk of bladder cancer. *Am J Epidemiol.* 1984;119(4):510-5.

TITLE: Case-Control Study of Bladder Cancer in New Jersey
PRINCIPAL INVESTIGATOR: Annette Stemhagen, DrPH¹
INSTITUTION: Cancer Epidemiology Services (CES)
New Jersey Department of Health and Senior Services (NJDHSS)
NJDHSS CES COLLABORATORS: Janet B. Schoenberg, MPH
Alexander P. Mogielnicki, MA
Ronald Altman, MD, MPH
Toshi Abe, MSW
STUDY PERIOD: 2/01/78 – 1/31/79
FUNDING SOURCE: National Cancer Institute (NCI)

A NCI study of the geographic distribution of bladder cancer mortality in the U.S. for 1950-69 showed that the age-adjusted mortality rate for white males in New Jersey was the highest of all state rates. Of New Jersey's 21 counties, 18 had bladder cancer mortality rates in the highest 10 percent of all U.S. counties. The excess mortality was suspected to be related to New Jersey's high density of chemical manufacturing industries. This hypothesis was supported by other national studies that showed a correlation between bladder cancer mortality and concentrations of chemical industries.

CES conducted a case-control interview study with methodology similar to the National Survey of Environment and Health that assessed the role of artificial sweeteners in relation to incident bladder cancer. The purpose of this study was to determine the association of certain occupational exposures to present-day bladder cancer risk in New Jersey. Also under consideration were various temporal aspects of occupational exposure, including age at first exposure, latency, and duration. Subjects included New Jersey white males from the National Survey of Environment and Health.

The occupational bladder cancer risk for New Jersey white males was estimated with the use of both industry-job title-based and exposure-based analyses of data from 658 cases and 1,258 controls. The overall bladder cancer risk attributable to occupational exposures was estimated as 20 to 22 percent. Odds ratios were significantly high for employment as garage and gas station workers and food counter workers and/or cooks and for exposure to leather, rubber, paint, printing ink, and other organic compounds. There was significantly decreasing risk for bladder cancer with increasing age at first exposure for chemical workers and metal workers and for the a priori high-risk materials and metals. Drivers and/or deliverymen and miscellaneous laborers had significantly increasing bladder cancer risk with increasing duration of employment.

Publications:

Schoenberg JB, Stemhagen A, Mogielnicki AP, Altman R, Abe T, et al. A case-control study of bladder cancer in New Jersey. I. Occupational exposures in white males. *J Natl Cancer Inst.* 1984;72(5):973-81.

¹ Annette Stemhagen was a collaborator in the National Bladder Cancer Study. See page 4.

Kohler BA. (1982). Cigarette smoking and bladder cancer among white males in New Jersey. Unpublished masters thesis, University of Alabama in Birmingham, School of Public Health, Birmingham, Alabama.

Stemhagen A, Halperin W, Altman R, Iaci A, Abe T, Goldfield M. (1978). An epidemiologic study of bladder cancer in New Jersey. Unpublished dissertation. University of Pittsburgh Graduate School of Public Health, Pennsylvania.

TITLE: Case-Control Study of Brain Cancer

PRINCIPAL INVESTIGATOR: Terry L. Thomas, PhD

INSTITUTION: Environmental Epidemiology Branch, National Cancer Institute
Department of Neurology, Francis Scott Key Medical Center
School of Medicine, Johns Hopkins University

NJDHSS CES COLLABORATORS: Annette Stemhagen, DrPH

STUDY PERIOD: 1979-1983

FUNDING SOURCE: National Cancer Institute (NCI)

Reports of brain tumors among workers in oil refineries and chemical plants in Texas prompted an epidemiologic investigation of brain tumor risk in other areas of the U.S. Earlier studies found a high risk of brain tumors among workers exposed to organic solvents, lubricating oils, polycyclic aromatic hydrocarbons, formaldehyde, vinyl chloride, microwave (MW) and radiofrequency (RF) electromagnetic radiation.

CES in collaboration with NCI conducted a retrospective case-control study in northern New Jersey. The study was also conducted in Philadelphia, Pennsylvania and the Gulf Coast of Louisiana. The purposes of the study were to investigate findings of earlier studies and to evaluate other risk factors for brain tumors. State vital records were used to review causes of death among residents of the study areas and information from death certificates of cases and controls was used to contact their next-of-kin. The study period for New Jersey was January 1, 1979 through December 31, 1981. Cases were white men, aged 30 years or older, who died of brain or other central nervous system tumors during a three-year period and who were residents of the study areas. Controls were selected for each case from men who died from causes other than brain tumor, cerebrovascular disease, epilepsy, suicide, and homicide. Controls were then frequency-matched to the cases by age and year of death. Subjects' next-of-kin were contacted and interviewed with a response rate of 70 percent (483 cases, 386 controls) from all three study areas.

No statistically significantly elevated odds ratios were associated with brain tumors and employment in the chemical industry. Astrocytic tumor risk was elevated among the subjects with production or maintenance jobs in petroleum refining; however, it decreased with duration employed. There were nonsignificant excess risks of astrocytic tumors among men exposed to cutting fluids or organic solvents, and also among men exposed for 20 or more years. Brain tumor risk was elevated for men who worked as electronic workers but had no exposure to MW/RF radiation. The risk for all brain tumors was elevated among electrical and electronic workers exposed to MW/RF radiation, especially among men exposed for 20 or more years. The excess risk for MW/RF radiation-exposed men was derived from jobs that involved the design, manufacture, repair, or installation of electrical or electronic equipment. Among electrical and electronics workers, cancer risk was highest for engineers, electronics teachers, technicians, repairers, and assemblers combined and was limited to excess risk from astrocytic tumors. Risk was not elevated among men who never worked in electrical or electronics jobs.

Publications:

Thomas TL, Stewart PA, Stemhagen A, Correa P, Norman SA, et al. Risk of astrocytic brain tumors associated with occupational chemical exposures. *Scand J Work Environ Health*. 1987;13(5):417-23.

Thomas TL, Stolley PD, Stemhagen A, Fontham ET, Bleecker ML, et al. Brain tumor mortality risk among men with electrical and electronics jobs: a case-control study. *J Natl Cancer Inst*. 1987;79(2):233-38.

TITLE: Race and Risk Factors for Early/Aggressive Breast Cancer
PRINCIPAL INVESTIGATOR: Christine Ambrosone, PhD
INSTITUTION: Mount Sinai School of Medicine
Cancer Institute of New Jersey (CINJ),
University of Medicine and Dentistry of New Jersey (UMDNJ)
NJDHSS CES COLLABORATORS: Lisa M. Roché, MPH, PhD
Karen Pawlish, MPH, ScD
STUDY PERIOD: 4/01/05 – 3/31/09
FUNDING SOURCE: National Cancer Institute (NCI)
U.S. Department of Defense's Breast Cancer Research Program

Breast cancer in black women occurs at an earlier age and is more likely to have aggressive features associated with poorer prognosis, regardless of age at diagnosis. The causes for these differences are as yet unknown. Socioeconomic status (SES) factors are unlikely to fully explain the earlier age at diagnosis or the more aggressive nature of breast cancer in black women.

The purpose of this multi-center case-control study is to investigate determinants of early age at onset, and of high grade, ER negative, breast cancer among black and white women. Additionally, the proportion of disparities in aggressive disease that can be accounted for by differential distribution of genetic and hormonally-related risk factors will be evaluated in both racial groups. The intention is to enroll 1200 black breast cancer cases and 1200 black women who have never been diagnosed with breast cancer (controls) and an equal number of white case and control women. Newly diagnosed women between the ages of 20 to 65 with incident breast cancer within the last nine months are being identified at hospitals in New York City with large referral patterns for blacks. Controls were identified through random digit dialing.

To increase enrollment, the study was expanded to seven counties in New Jersey (Essex, Bergen, Hudson, Mercer, Middlesex, Passaic, and Union) through collaboration with the Cancer Epidemiology Services (CES) and the Cancer Institute of New Jersey (CINJ). Cases in New Jersey will be identified by the New Jersey State Cancer Registry (NJSCR) through rapid case ascertainment. Black or white women 20-64 years old, diagnosed with breast cancer beginning June 1, 2005, with no prior cancer diagnosis (except non-melanoma skin cancer), who were residents of the seven counties at the time of diagnosis and have a landline phone are eligible for the study. Eligible women who agree to participate will be interviewed in their homes, including body measurements and a buccal sample. The goal is to enroll 700 black and 700 white cases among New Jersey women.

TITLE: Non-Clinical Factors in Disparate Treatment of Early Breast Cancer among Black and White Medicaid Patients

PRINCIPAL INVESTIGATOR: Kitaw Demissie, MD, PhD, Assistant Professor

INSTITUTION: Division of Epidemiology, School of Public Health
University of Medicine and Dentistry of New Jersey (UMDNJ)

NJDHSS CES COLLABORATORS: Karen Pawlish, MPH, ScD
Lisa M. Roché, MPH, PhD
Betsy A. Kohler, MPH, CTR

STUDY PERIOD: 1/01/05 – 1/20/07

FUNDING SOURCE: Cancer Institute of New Jersey (CINJ)

Cancer Epidemiology Services (CES) is collaborating with the UMDNJ School of Public Health to examine racial disparities in the treatment of early breast cancer between black and white women in New Jersey. While various clinical and non-clinical factors have been found to differ between the two groups of women, the reasons for much of the racial difference in treatment remain unexplored. It is hypothesized that black women are more likely not to receive standard treatment for early breast cancer.

The purpose of this study is to compare the receipt of standard initial treatment between black and white women who have clinically comparable breast cancer diagnoses and who are covered by Medicaid. By limiting the focus of the study to exclusively Medicaid recipients, all participants will have a somewhat similar socioeconomic status and will be subject to the same insurance coverages; these represent two known factors which can lead to differences in treatment.

The study will be conducted in two phases. In the first phase, CES linked the New Jersey State Cancer Registry (NJSCR) with New Jersey Medicaid data files to identify cases of women diagnosed with early breast cancer in 1997-2001. From the linkage, 354 cases were matched (236 white women, 118 black women). Using information from the Medicaid files, UMDNJ is analyzing the cohort for treatment disparities between black and white women. The second phase of the study will involve a medical records review of a sample of 50 patients (25 black, 25 white women) who did not receive the standard treatment and focus groups with a subset of 32 such patients. The objectives of this phase are to ascertain reasons that these women did not receive the standard treatment, and more detail on differences in treatment received between black and white women. CES will draw samples of the linked cases and obtain their consent to participate in the medical records review and focus groups.

TITLE: Use of a GIS to Assess Distant Stage Breast Cancer

PRINCIPAL INVESTIGATORS: Lisa M. Roché, MPH, PhD
Ric Skinner, MS
Rachel B. Weinstein, PhD

INSTITUTION: Cancer Epidemiology Services (CES)
New Jersey Department of Health and Senior Services (NJDHSS)

STUDY PERIOD: 9/30/00 – 12/31/01

The study was performed by CES using a Geographic Information System (GIS) and spatial scan statistical software (SaTScan) to search for geographic areas with significantly elevated proportions of women diagnosed with distant stage breast cancer in New Jersey. Women diagnosed with breast cancer from 1995-1997 (n=20,703), were selected from the New Jersey State Cancer Registry (NJSCR). Their residences at the time of diagnosis were geocoded to the census tract level. SaTScan was used to identify estimated geographic areas with significantly high proportions of women diagnosed with distant stage breast cancer. ArcView 3.2 was used to map the most likely and secondary clusters. Demographic data from the 1990 U.S. Census and locations of mammography facilities were used to characterize the most likely clusters in comparison to the remainder of the state.

Two separate estimated geographic areas with statistically significantly high proportions of women with breast cancer diagnosed at the distant stage were identified, both in northeastern New Jersey. The demographic data showed that these two clusters contained a population with higher proportions of blacks, foreign-born persons, linguistically isolated households, and adults without a high school diploma and had a lower per capita income when compared to the remainder of the state. Seventeen of the 295 certified mammography facilities located throughout the state were located in the two clusters. One hundred percent and 91 percent of the women with breast cancer in the two clusters resided within two miles of a certified mammography facility compared with 59 percent of the women in the rest of the state.

This use of a GIS with spatial scan statistical software, U.S. Census data, and mammography facility locations to identify and characterize geographic areas with significantly high proportions of women diagnosed with distant stage breast cancer provides important information for targeted interventions. The results of this type of analysis, coupled with information from the literature, could be used by public health agencies to work with health and social service agencies, health care providers, local community groups, and others to effectively target breast cancer education and screening services.

Publication:

Roche LM, Skinner R, Weinstein RB. Use of a geographic information system to identify and characterize areas with high proportions of distant stage breast cancer. *J Public Health*. 2002;8(2):26-32.

TITLE: Case-Control Study of Breast Cancer among Women Younger than 45
PRINCIPAL INVESTIGATOR: Louise A. Brinton, PhD, MPH
INSTITUTION: Environmental Epidemiology Branch, Division of Cancer Etiology,
National Cancer Institute (NCI)
NJDHSS CES COLLABORATOR: Janet B. Schoenberg, MPH
STUDY PERIOD: 9/29/89 – 7/31/93
FUNDING SOURCE: National Cancer Institute

Breast cancer is the most frequently diagnosed cancer in women, other than skin cancer. Breast cancer incidence rates increased rapidly in the 1980s largely due to increased use of mammography, among other known risk factors, and have increased gradually since that time. Risk factors for breast cancer in women under the age of 45 have not been firmly established.

As a result, NCI conducted a case-control interview study of risk factors for breast cancer in women under the age of 45 in three geographic areas: the metropolitan areas of Atlanta, GA and Seattle/Puget Sound, Washington, and five counties of central New Jersey. In New Jersey, the study was confined to women who were less than 45 years of age. Cases included women who were newly diagnosed with *in situ* or invasive breast cancer during the period May 1990 through December 1992. Cases were identified through rapid case-ascertainment. Controls in all areas were frequency-matched by geographic area and age to the expected distribution of cases and were identified through a series of 13 waves of random-digit dialing.

For women under 45 years, linear body size, history of a prior induced abortion¹, family history especially in first-degree relatives, black race, early age at menarche, nulliparity, previous breast biopsy, body mass index, alcohol consumption, cigarette smoking, and chemotherapy were associated with increased risk of breast cancer. Use of oral contraceptives, breastfeeding, breast implants/enlargement, recreational activity, and dietary intake were not found to be associated with increased risk.

Publications:

Madigan MP, Troisi R, Potischman N, Brogan D, Gammon MD, et al. Characteristics of respondents and non-respondents from a case-control study of breast cancer in younger women. *Int J Epidemiol.* 2000;29(5):793-8.

Santella RM, Gammon MD, Zhang YJ, Motykiewicz G, Young TL, et al. Immunohistochemical analysis of polycyclic aromatic hydrocarbon-DNA adducts in breast tumor tissue. *Cancer Lett.* 2000;154(2):143-9.

Coates RJ, Uhler RJ, Hall HI, Potischman N, Brinton LA, et al. Risk of breast cancer in young women in relation to body size and weight gain in adolescence and early adulthood. *Br J Cancer.* 1999;81(1):167-74.

¹ Subsequent studies have not confirmed this association when the other risk factors are controlled for.

- Gammon MD, Hibshoosh H, Terry MB, Bose S, Schoenberg JB, et al. Cigarette smoking and other risk factors in relation to p53 expression in breast cancer among young women. *Cancer Epidemiol Biomarkers Prev.* 1999;8(3):255-63.
- Gammon MD, Hibshoosh H, Terry MB, Bose S, Schoenberg JB, et al. Oral contraceptive use and other risk factors in relations to HER-2/neu overexpression in breast cancer among young women. *Cancer Epidemiol Biomarkers Prev.* 1999;8(5):413-9.
- Gammon MD, Schoenberg JB, Britton JA, Kelsey JL, Coates RJ, et al. Recreational physical activity and breast cancer risk among women under age 45 years. *Am J Epidemiol.* 1998;147(3):273-80.
- Gammon MD, Schoenberg JB, Britton JA, Kelsey JL, Stanford JL, et al. Electric blanket use and breast cancer risk among younger women. *Am J Epidemiol.* 1998;148(6):556-63.
- Potischman N, Weiss HA, Swanson CA, Coates RJ, Gammon MD, et al. Diet during adolescence and risk of breast cancer among young women. *J Natl Cancer Inst.* 1998;90(3):226-33.
- Brinton LA, Benichou J, Gammon MD, Brogan DR, Coates R, et al. Ethnicity and variation in breast cancer incidence. *Int J Cancer.* 1997;73(3):349-55.
- Potischman N, Swanson CA, Coates RJ, Weiss HA, Brogan DR, et al. Dietary relationships with early onset (under age 45) breast cancer in a case-control study in the United States: influence of chemotherapy treatment. *Cancer Causes Control.* 1997;8(5):713-21.
- Swanson CA, Coates RJ, Malone KE, Gammon MD, Schoenberg JB, et al. Alcohol consumption and breast cancer risk among women under age 45 years. *Epidemiology.* 1997;8(3):231-7.
- Weiss HA, Potishman NA, Brinton LA, Brogan D, Coates RJ, et al. Prenatal and perinatal risk factors for breast cancer in young women. *Epidemiology.* 1997;8(2):181-7.
- Brinton LA, Malone KE, Coates RJ, Schoenberg JB, Swanson CA, et al. Breast enlargement and reduction: results from a breast cancer case-control study. *Plast Reconstr Surg.* 1996;97(2):269-75.
- Daling JR, Brinton LA, Voight LF, Weiss NS, Coates RJ, et al. Risk of breast cancer among white women following induced abortion. *Am J Epidemiol.* 1996;144(4):373-80.
- Swanson CA, Coates RJ, Schoenberg JB, Malone KE, Gammon MD, et al. Body size and breast cancer risk among women under age 45 years. *Am J Epidemiol.* 1996;143(7):698-706.
- Weiss HA, Brinton LA, Brogan D, Coates RJ, Gammon MD, et al. Epidemiology of in situ and invasive breast cancer in women aged under 45. *Br J Cancer.* 1996;73(10):1298-1305.
- Brinton LA, Daling JR, Liff JM, Schoenberg JB, Malone KE, et al. Oral contraceptives and breast cancer risk among younger women. *J Natl Cancer Inst.* 1995;87(11):827-35.
- Brinton LA, Potischman NA, Swanson CA, Schoenberg JB, Coates RJ, et al. Breastfeeding and breast cancer risk. *Cancer Causes Control.* 1995;6(3):199-208.

TITLE: Male Breast Cancer Study
PRINCIPAL INVESTIGATOR: David B. Thomas, MD, DrPH
INSTITUTION: Program in Epidemiology, Fred Hutchinson Cancer Research Center (FHCRC)
NJDHSS CES COLLABORATOR: Annette Stemhagen, DrPH
STUDY PERIOD: 1982-1988
FUNDING SOURCE: National Cancer Institute (NCI)

As with breast cancer in women, risk of this disease in men has been associated with a family history of breast cancer in both male and female first-degree relatives, exposure of the chest to ionizing radiation, a history of benign breast disease, and possibly obesity. Because breast cancer in men is rare, previous investigations in males had been of the descriptive type or were individual clinical reports, uncontrolled case series, or case-control studies of relatively small size.

We participated in a case-control interview study of risk factors for breast cancer in men. Cases (n = 227) included non-institutionalized male residents of 10 geographic areas with population-based registries in NCI's Surveillance, Epidemiology, and End Results (SEER) Program, who were diagnosed with breast cancer from October 1983 through September 1986. The 10 areas included the states of Connecticut, Hawaii, Iowa, New Jersey, New Mexico, and Utah and the metropolitan areas and nearby counties surrounding San Francisco, California; Detroit, Michigan; Atlanta, Georgia; and Seattle, Washington. Twenty-five percent of the cases were from New Jersey. Controls (n = 300) were matched with cases on the basis of age (5-year groups) and study site. Controls under age 65 were selected by random digit dialing, while controls aged 65 and older were selected from randomly generated Medicare files maintained by the Health Care Financing Administration (HCFA)¹.

An increased risk of breast cancer in men was strongly associated with undescended testes and was also related to orchiectomy, orchitis, testicular injury, late puberty, and infertility. Cancer risk was elevated among men with a history of high blood cholesterol, rapid weight gain, benign breast conditions, amphetamine use, diabetes, cigar smoking, possibly obesity, and any job with exposure to electromagnetic fields, with the highest risk among electricians, telephone linemen, electric power workers, and radio and communications workers. Men with a large number of children and men with prior head trauma had a reduced risk of breast cancer.

Publications:

Stalsberg H, Thomas DB, Rosenblatt KA, Jimenez LM, McTiernan A, et al. Histologic types and hormone receptors in breast cancer in men: a population based study in 282 United States men. *Cancer Causes Control*. 1993;4(2):143-51.

Thomas DB, Jimenez LM, McTiernan A, Rosenblatt K, Stalsberg H, et al. Breast cancer in men: risk factors with hormonal implications. *Am J Epidemiol*. 1992;135(7):734-48.

Demers PA, Thomas DB, Rosenblatt KA, Jimenez LM, McTiernan A, et al. Occupational exposure to electromagnetic fields and breast cancer in men. *Am J Epidemiol*. 1991;134(4):140-7.

¹ Centers for Medicare & Medicaid Services (CMS), formerly Health Care Financing Administration

TITLE: Population-based retrieval of newborn dried blood spots for researching pediatric cancer susceptibility genes

PRINCIPAL INVESTIGATOR: Judith B. Klotz, MS, DrPH

INSTITUTION: Cancer Epidemiology Services (CES)
New Jersey Department of Health and Senior Services (NJDHSS)

NJDHSS COLLABORATORS: Homer B. Wilcox, MS
Patricia Bryant, MT
Mary Dillon, BS
Bruce Wolf, MS
Jerald A. Fagliano, MPH, PhD

STUDY PERIOD: 2000-2004

Pediatric acute lymphocytic leukemia (ALL) has been investigated regarding susceptibility genes and environmental exposures with some results indicating positive gene-environment interaction. Associations of ALL with exposure to environmental contaminants, particularly those in public groundwater systems, have been suggested.

Cancer Epidemiology Services (CES) in collaboration with the NJDHSS Division of Public Health and Environmental Laboratories and Consumer and Environmental Health Services (CEHS) used archived newborn dried blood spots, originally collected by the Public Health and Environmental Laboratories to screen for inborn errors of metabolism, to investigate the relationships among polymorphisms of GSTM1 and GSTT1, water contamination, and the risk of pediatric ALL.

Incident cases of ALL before their sixth birthday born in New Jersey during 1979-1985 were ascertained from the New Jersey State Cancer Registry (NJSCR). Controls were randomly selected from approximately 280 birth certificates and matched to the cases by birth date. Demographic characteristics were determined from birth certificates. Dried blood spot specimens were retrieved using the names of the child and mother, birth date and hospital of birth. DNA was isolated and amplified, and genes for GSTT1 and GSTM were assayed.

This study was the first illustration of a population-based use of newborn blood spots for exploring susceptibility genes for a pediatric cancer. The ability to amplify DNA depended on storage temperature history and all amplified DNA samples yielded unequivocal genotypes. The double null genotype was over-represented in the cases, consistent with previous reports. This study design avoided issues of participation bias by cases and controls and could be used to investigate interactions of susceptibility genes and xenobiotics in semi-ecological studies. It may be useful for generating or testing hypotheses on associations of pediatric illness and environmental contaminants.

Publication:

Klotz J, Bryant P, Wilcox HB, Dillon M, Wolf B, et al. Population-based retrieval of newborn dried blood spots for researching paediatric cancer susceptibility genes. *Paediatr Perinat Epidemiol.* 2006;20(5):449-52.

TITLE: Distant-stage Colorectal Cancer Clusters in New Jersey (1985-2002): A Geographical Modeling Approach.

PRINCIPAL INVESTIGATOR: Kevin A. Henry, MA, PhD

INSTITUTION: Cancer Epidemiology Services (CES)
New Jersey Department of Health and Senior Services (NJDHSS)

NJDHSS CES STUDY COLLABORATORS: Lisa M. Roché, MPH, PhD
Toshi Abe, MSW, CTR

PROJECT PERIOD: 1/2005 - Present

In previous research, we used spatial scan statistical software, SaTScan, to identify geographic clusters of distant stage breast and distant stage prostate cancer in New Jersey, and characterized the clustered populations to provide information for cancer education and screening.

In the present study, we examined distant-stage colorectal cancer clusters in space and time (1985-2002), as a way to determine what socio-demographic variables best predict high and low incidence rates of late-stage colorectal cancer. We hypothesized that changing cluster locations over time is possibly a reflection of migration and settlement of populations at highest risk for colorectal cancer. Clusters and hot-spots of high and low colorectal cancer incidence were determined using Kulldorff's space-time scan statistic and the Local Moran's I measure of spatial autocorrelation. Both methods revealed changes in the location of the clusters and associated incidence rates throughout the study period. Using the time-space clusters and socio-demographic data we applied a spatially weighed regression model to determine which variables best predict distant-stage colorectal cases and whether predictor variables changed over time. We believe that our approach which combines present and historical cancer clusters with socio-demographic data provides a great knowledge base about the demographics and geography of colorectal cancer and the potential to more accurately predict future clusters and target locations for appropriate colorectal cancer intervention.

Abstract:

Henry K, Roché L, Abe T. Distant-stage colorectal cancer clusters in New Jersey (1985-2002): A geographical modeling approach. In: *NAACCR 2005 Annual Meeting Conference Proceedings*; Boston, MA. 2005:49.

TITLE: Estrogen, Diet, Genetics, and Endometrial Cancer (EDGE)
PRINCIPAL INVESTIGATOR: Sara H. Olson, PhD
INSTITUTION: Memorial Sloan-Kettering Cancer Center (MSKCC)
NJDHSS CES CO-INVESTIGATORS: Judith B. Klotz, MS, DrPH
Homer B. Wilcox, MS
STUDY PERIOD: 10/01/01 – 12/31/05
FUNDING SOURCE: National Cancer Institute (NCI)

Endometrial cancer is the most common gynecologic cancer. It is believed that major risk factors, including obesity, use of estrogen replacement therapy, late menopause, and nulliparity may all operate through an estrogen-related pathway. In addition, some studies of diet and endometrial cancer have shown that dietary fat may also influence risk. Indeed, there is some evidence that a low-fat diet can lead to a decrease in levels of serum estradiol (a form of estrogen), particularly in postmenopausal women. Finally, little is known about the risk factors for two rare and more aggressive types of endometrial cancer, serous and clear cell, except for over-representation among older women and African Americans.

Memorial Sloan-Kettering Cancer Center is conducting a five-year population-based case-control study primarily to investigate the role of weight, diet, and individual genetic susceptibility in endometrial cancer. A secondary aim of this study is to assess risk factors for the less common and more lethal types of endometrial cancer.

The role of Cancer Epidemiology Services (CES) was to rapidly ascertain eligible cases from six northeast New Jersey counties diagnosed from July 1, 2001 through June 31, 2005 and obtain physician and patient consents to participate in the study. MSKCC then interviewed and collected buccal samples on the consented cases and controls. Over 500 cases and 500 controls were interviewed.

TITLE: Esophageal and Gastric Adenocarcinoma Study (EGA)
PRINCIPAL INVESTIGATOR: Marilie D. Gammon, PhD
INSTITUTION: Division of Epidemiology, Columbia School of Public Health
NJDHSS CES INVESTIGATOR: Janet B. Schoenberg, MPH
STUDY PERIOD: 8/1/92 – 7/31/96
FUNDING SOURCE: National Cancer Institute (NCI)

In the early 1990s, the incidence of esophageal adenocarcinoma had increased rapidly in the U.S. and Western Europe over the last three decades. In the U.S., the most dramatic increase had occurred in white males, among whom the rate had more than tripled since the mid-1970s. Little was known about the etiology of these cancers, with the exception of an association with Barrett's esophagus.

To determine risk factors for these cancers, NCI conducted a multicenter, population-based case-control study to interview four newly diagnosed case groups of roughly equal size of esophageal adenocarcinoma, gastric cardia adenocarcinoma, esophageal squamous cell carcinoma, and other gastric adenocarcinomas. The study was conducted in three areas of the U.S. with central cancer registries—Connecticut, a 15-county area of New Jersey, and a three-county area of western Washington. In New Jersey, potentially eligible cases were English-speaking men and women who were between the ages of 30-79 and who were diagnosed with primary invasive cancer of the esophagus or stomach from April 1993 through November 1994. Cases were identified by rapid-reporting systems in each of the three areas. Controls were selected via random-digit dialing (under age 65) or via Health Care Financing Administration (HCFA) records (over age 65)¹. In New Jersey, those diagnosed with squamous cell carcinoma of the esophagus or adenocarcinomas located elsewhere in the stomach were sampled by frequency matching to the expected distribution of the target case subjects on the basis of geographic area, age (5-year groups), sex, and race (white or other).

Tobacco, socioeconomic status, diet/nutrient intake, use of lower esophageal sphincter (LES) drugs, and alcohol were among the risk factors analyzed in this study. Esophageal and gastric cardia adenocarcinoma risk was highest for smokers, with little reduction observed until 30 years after smoking cessation; this risk rose with increasing intensity and duration of smoking. For all four cancer types, risks were higher for those with low income or education, and dietary cholesterol, animal protein and vitamin B12 were significantly positively associated with cancer risk. Dietary fat was significantly associated with risk of esophageal adenocarcinoma and an increased risk was found among persons reporting use of asthma drugs containing theophylline or β -agonists, particularly among long-term users (>5 years). Dietary nitrite was associated with noncardia gastric cancer only. Higher intake of nutrients found primarily in foods of animal origin was associated with an increased risk of adenocarcinomas of the esophagus and gastric cardia, whereas, higher intake of nutrients found primarily in fruits and vegetables was associated with a reduced risk. Cancer risk for all cancer types was also reduced for drinking

¹ Centers for Medicare & Medicaid Services (CMS), formerly Health Care Financing Administration

wine and Vitamin C supplement use was associated with a significantly lower risk of noncardia gastric cancer. Beer or liquor consumption was not related to cancer risk and there was little evidence of risk with increasing duration of use of all LES-relaxing drugs together. There was no evidence that the use of calcium channel blockers or other specific groups of drugs increased the risk of any of the cancers studied.

Publications:

Mayne ST, Risch HA, Dubrow R, Chow WH, Gammon MD et al. Carbonated soft drink consumption and risk of esophageal adenocarcinoma. *J Natl Cancer Inst.* 2006;98(1):72-5.

Engel LS, Chow WH, Vaughan TL, Gammon MD, Risch HA, et al. Population attributable risks of esophageal and gastric cancers. *J Nat Cancer Inst.* 2003;95(18):1404-13.

Mayne ST, Risch HA, Dubrow R, Chow WH, Gammon MD, et al. Nutrient intake and risk of subtypes of esophageal and gastric cancer. *Cancer Epidemiol Biomarkers Prev.* 2001;10(10):1055-62.

Vaughan TL, Farrow DC, Hansten PD, Chow WH, Gammon MD, et al. Risk of esophageal and gastric adenocarcinomas in relation to use of calcium channel blockers, asthma drugs, and other medications that promote gastroesophageal reflux. *Cancer Epidemiol Biomarkers Prev.* 1998;7(9):749-56.

Gammon MD, Schoenberg JB, Ahsan H, Risch HA, Vaughan TL, et al. Tobacco, alcohol, and socioeconomic status and adenocarcinomas of the esophagus and gastric cardia. *J Natl Cancer Inst.* 1997;89(17):1277-84.

TITLE: Drinking Water Contamination and the Incidence of Leukemia: An Ecologic Study¹

PRINCIPAL INVESTIGATOR: Jerald A. Fagliano, MPH, PhD

INSTITUTION: Consumer and Environmental Health Services (CEHS)
New Jersey Department of Health and Senior Services (NJDHSS)

NJDHSS CES INVESTIGATORS: Toshi Abe, MSW, CTR

STUDY PERIOD: 1989-1990

Since the mid-1970s, there has been considerable epidemiologic interest in the relation between organic contaminants in drinking water and increased cancer incidence in exposed populations. The focus of several studies has been on chlorinated compounds that can form in relatively high concentrations following chlorination of surface water for disinfection. Groundwater was long thought to be relatively protected from such contamination. However, national and state surveys have demonstrated that numerous groundwater supplies throughout the nation have contained volatile organic compounds (VOCs) other than volatile trihalomethanes (THMs). In New Jersey, routine semi-annual testing for 14 VOCs including halogenated solvents has been required of public community water systems since late 1984. Results from 1984 and 1985 showed that about 18 percent of the state's 620 water systems, estimated to serve approximately 20 percent of the state's population, contained detectable levels of non-THM VOCs.

CEHS performed an exploratory ecologic study to examine the possible relation between the incidence of leukemia and VOC contamination of drinking water in New Jersey. The New Jersey Department of Environmental Protection (NJDEP) compiled all sampling results for each water system serving populations in the study area, which consisted of 27 towns bounded by the Lower Passaic River and Saddle River drainage basins. NJDEP also provided other available sampling data, information on extent of distribution systems, well or reservoir use, and patterns of water purchases among systems so that the water supply of each town could be characterized. Populations served by community water supplies were classified into exposure categories according to VOC contamination status based on 1984-1985 sampling data. Leukemia incidence data were collected from the New Jersey State Cancer Registry (NJSCR).

For females, the standardized incidence ratio (SIR) was elevated only in towns in the highest of three exposure categories. No association was observed in males in any of the exposure categories. A Poisson regression analysis of the data, using finer exposure strata, indicated an increase in risk among females with increasing level of contamination which appeared to be distributed evenly across all age groups. The observed association appears to suggest that drinking water contaminated with VOCs may increase the incidence of leukemia among exposed females.

Publication:

Fagliano J, Berry M, Bove F, Burke T. Drinking water contamination and the incidence of leukemia: an ecologic study. *Am J Public Health*. 1990;80(10):1209-12.

¹ A subsequent study conducted in 1993 looked at leukemia and non-Hodgkin's lymphoma. See page 35.

TITLE: Occupational Risk Factors and Liver Cancer: A Retrospective Case-Control Study of Liver Cancer in New Jersey

PRINCIPAL INVESTIGATOR: Annette Stemhagen, DrPH

INSTITUTION: Cancer Epidemiology Services (CES)
New Jersey Department of Health and Senior Services (NJDHSS)

NJDHSS CES COLLABORATORS: Ronald Altman, MD, MPH
Joanne Bill, RN, BSN

STUDY PERIOD: 1974-1981

FUNDING SOURCE: Hazard Evaluation Division, Health Effects Branch of the
Environmental Protection Agency (USEPA)
National Cancer Institute (NCI)

Liver cancer currently ranks as the sixth most common type of cancer worldwide, while in the U.S. it is the 18th. The major causes of liver cancer are cirrhosis and chronic infection with Hepatitis B and C virus. Occupational risk factors for liver cancer have not been well documented, with the exception of angiosarcoma in vinyl chloride workers.

With partial support from NCI and the Hazard Evaluation Division within the Health Effects Branch of the USEPA, CES focused on exploring the relationship between pesticide exposure and primary liver cancer based upon earlier participation in a multi-area study which observed health effects of pesticide exposure. A retrospective case-control study was designed to examine occupational associations with liver cancer, with a particular emphasis on occupations that might be related to pesticide exposure. Hospital records, New Jersey State Cancer Registry, and death certificate searches yielded 335 cases of liver cancer diagnosed between January 1, 1975 and March 1, 1980. Controls were selected from hospital records and death certificates. Interviews were completed for 265 of the identified cases and 530 matched controls by age (+/- 2 years), race, sex, and county of residence.

A statistically significant relationship between agricultural occupation and primary liver cancer was identified among male farm laborers. Among non-agricultural occupations, elevated risks were found for men working as bartenders and those employed in eating and drinking places, laundries and dry cleaning services, and gasoline service stations. An elevated risk of liver cancer was also associated with women employed as cleaning service workers. This study was unable to characterize a history of hepatitis B or cirrhosis among the study population.

Publication:

Stemhagen A, Slade J, Altman R, Bill J. Occupational risk factors and liver cancer: A retrospective case-control study of primary liver cancer in New Jersey. *Am J Epidemiol.* 1983;117(4):443-454.

TITLE: Residential Radon and Risk of Lung Cancer: A Combined Analysis of 7 North American Case-Control Studies

PRINCIPAL INVESTIGATOR: Daniel Krewski, PhD, MHA

INSTITUTION: McLaughlin Centre for Population Health Risk Assessment, Institute of Population Health, University of Ottawa

NJDHSS CES COLLABORATORS: Janet B. Schoenberg, MPH
Judith B. Klotz, MS, DrPH
Homer B. Wilcox, MS

STUDY PERIOD: 2000-2004

FUNDING SOURCE: National Cancer Institute (NCI)
National Institute for Environmental Health Sciences (NIEHS)
Canadian Institutes of Health Research
Natural Sciences and Engineering Research Council of Canada
Health Canada
U.S. Department of Energy (USDOE)

Underground miners exposed to high levels of radon were known to have an excess risk of lung cancer. Residential exposure to radon at much lower levels, and the risk of lung cancer with residential exposure was less clear.

To better understand the differences among these studies and to obtain direct estimates of potential lung cancer risks associated with radon in homes, a combined analysis of the original data from all North American case-control interview studies of residential radon and lung cancer was conducted, including studies in New Jersey¹, Winnipeg, Missouri nonsmoking women, Missouri women, Iowa, Connecticut, Utah, and South Idaho. The specific objectives of the combined analysis were to test the null hypothesis that residential radon does not increase risk of lung cancer, to evaluate the consistency of effects among the different studies, to evaluate variations in the exposure-response relationship with other lung cancer risk factors, and to compare risk estimates from the pooled residential data with extrapolations from miner-based risk models. These studies combined included a total of 3662 cases and 4966 controls. Cases were ascertained through state and provincial cancer registries and were histologically or cytological confirmed. Controls were population-based, matched to cases by age (5-year groups) and gender. An attempt was made to monitor homes occupied for at least 1 year within the exposure time window considered to be most directly related to lung cancer risk.

The risk for lung cancer increased with residential radon concentration. There was no evidence of differences of radon effects across studies. There were no apparent differences in the association by sex, educational level, type of respondent, or cigarette smoking, although there was some evidence of a decreasing radon-associated lung cancer risk with age.

Publication:

Krewski D, Lubin JH, Zielinski JM, Alavanja M, Catalan VS, et al. Residential radon and risk of lung cancer: a combined analysis of 7 North American case-control studies. *Epidemiology*. 2005;16(2):137-45.

¹ New Jersey data and methods referenced in another study. See page 24.

TITLE: Case-Control Study of Lung Cancer and Residential Radon Exposure among New Jersey Women

PRINCIPAL INVESTIGATOR: Janet B. Schoenberg, MPH

INSTITUTION: Division of Epidemiology and Disease Control
New Jersey State Department of Health and Senior Services

NJDHSS CES COLLABORATORS: Judith B. Klotz, MS, DrPH
Homer B. Wilcox, MS
Stasia F. Burger, MS, CTR
Maria T. Gil-del-Real, MPH
Annette Stemhagen, DrPH

STUDY PERIOD: 8/01/89 – 7/31/96

FUNDING SOURCE: State of New Jersey
National Cancer Institute (NCI)

Prolonged exposures to high levels of radon were identified as a cause of lung cancer in underground miners, with numerous studies showing a strong and consistent dose-response relationship. Based on extrapolation from the miner data, it was thought that concentrations of radon found in some houses may also result in a substantial lung cancer risk. However, direct information on risk from residential radon was limited.

Based upon a previous study of risk for lung cancer¹, Cancer Epidemiology Services (CES), in collaboration with the New Jersey Department of Environmental Protection (NJDEP) and NCI, initiated an epidemiologic study of lung cancer risk and exposure to residential radon in New Jersey women. The original study collected extensive data on smoking, occupation, and diet. This study extended the previous study to include data on radon exposures in order to evaluate the association of indoor radon with lung cancer risk. For this study, the cases or their next of kin were re-contacted to determine exact street addresses and dates of residence. Those who lived for at least 10 years in the 10-30 year period prior to diagnosis or control selection were included in this study (433 cases, 402 controls). For a one-year period, radon concentrations in the subjects' living area (usually the master bedroom) were measured by α track detectors. At each residence, 4-day measurements of radon were also conducted in the basements using charcoal canisters to provide back up data if α track measurements were not completed and to provide current residents with a screening measurement to identify any high radon levels which might need immediate remediation.

The trend for increasing risk for lung cancer with increasing radon exposure was statistically significant. The association between residential radon exposure and lung cancer was strongest for women who smoked less than 15 cigarettes a day. In a combined residential radon analysis of three studies over a period of two years in Sweden and Shenyang and one year in New Jersey, cigarette smoking was the predominant cause of lung cancer with the risk ratio significantly elevated in all studies.

¹ See page 26 for a description of the earlier case-control lung cancer study.

The NJDHSS study was the first major epidemiologic study of radon exposure and lung cancer that used both measurements of radon levels in homes and detailed smoking histories of the participants.

Publications:

Lubin JH, Liang Z, Hrubec Z, Pershagen G, Schoenberg JB, et al. Radon exposure in residences and lung cancer among women: combined analysis of three studies. *Cancer Causes Control*. 1994;5(2):114-28.

Klotz JB, Schoenberg JB, Wilcox H. Relationship among short and long-term radon measurements within dwellings: influence of radon concentrations. *Health Phys*. 1993;65(4):367-74.

Schoenberg JB, Klotz JB, Wilcox HB, Nicholls GP, Gil-del-Real MT, et al. Case-control study of residential radon and lung cancer among New Jersey women. *Cancer Res*. 1990;50(20):6520-4.

Schoenberg JB, Klotz JB, Wilcox HB, Szmaziasz SF. A case-control study of radon and lung cancer in New Jersey women. Proceedings 29th Hanford Symposium: Indoor Radon and Lung Cancer. Reality or Myth? October 1990;15-19.

Schoenberg JB, Klotz JB, Wilcox H, Gil-del-Real M, Stemhagen A, et al. Lung cancer and exposure to radon in women-New Jersey. *MMWR Morb Mortal Wkly Rep*. 1989;38(42):715-8.

TITLE: Case-Control Study of Lung Cancer

PRINCIPAL INVESTIGATOR: Regina G. Ziegler, MPH, PhD

INSTITUTION: Environmental Epidemiology Branch, Epidemiology and Biostatistics Program, Division of Cancer Etiology, National Cancer Institute (NCI)

NJDHSS CES COLLABORATORS: Annette Stemhagen, DrPH
Janet B. Schoenberg, MPH¹
Ronald Altman, MD, MPH

STUDY PERIOD: 1980-1983

FUNDING SOURCE: National Cancer Institute

Lung cancer is the leading cause of cancer-related death in both men and women and the most important risk factor is cigarette smoking. To assess the roles of smoking, occupation, dietary intake, including Carotene and Vitamin A, and other potential risk factors, NCI and CES designed a large population-based case-control study of lung cancer in high-risk areas of New Jersey. Data were collected in three phases between 1980 and 1983.

Cases for Phase I included all male residents of six high-risk areas in New Jersey, ages 25-89, diagnosed with incident, histologically confirmed, lung cancer between September 1980 and October 1981. Cases were obtained through local hospitals, the NJSCR and mortality files (n=1084). Controls were selected either from New Jersey drivers' license files or from New Jersey mortality files (n=894). Controls were frequency or individually matched to cases by age (5-year groups), race, area of residence, and closest date of death. Phase II extended the study to cover all incident lung cancers occurring among black males between August 1982 and November 1983 (n=269). Controls were selected using similar methods as Phase I (n=170). Phase III identified all New Jersey women diagnosed with incident, histologically confirmed primary cancer of the lung, trachea, or bronchus between August 1982 and September 1983 (n=1,306 cases, 1,449 controls). Cases and controls were selected using similar methods as the other two phases, with the exception that controls were selected randomly from Health Care Financing Administration files² for cases aged 65 or older.

There was a significant increased trend in lung cancer risk with increasing duration and exposure to smoking after adjusting for age and gender. This effect was limited to females, especially older women whose husbands were heavy smokers. Risks also increased for nonsmokers living with a smoker for 40 or more years. An analysis of risk as a function of cigarette tar content found that men who smoked low-tar cigarettes compensated for reduced tar by increasing the number of cigarettes they smoked by almost half a pack per day, while population-based controls and high-tar cigarette smoking cases did not increase the number of cigarettes smoked.

Altogether, 27 job categories were identified to have significantly or moderately high lung cancer risk. Adjustment for smoking did not markedly reduce the risk estimates. Shipbuilding workers had significantly high risk overall and for short duration of employment, primarily due

¹ Janet B. Schoenberg was the Principal Investigator for the case control study of lung cancer among New Jersey women. See page 24.

² Centers for Medicare & Medicaid Services (CMS), formerly Health Care Financing Administration

to asbestos exposure. Cancer risk was also high among welders, burners, sheet metal workers, and boilermakers with no reported asbestos exposure. For motor exhaust-related occupations (MER), lung cancer risk was elevated for truck drivers. An overall pattern of excess risk was associated with long-term (10 or more years) employment in MER occupations and the 50% excess risk could not be explained by smoking or other occupational exposures.

Associations were not found between lung cancer and carotene, retinol, or total Vitamin A intake. Vegetable intake, specifically dark green and dark yellow-orange vegetables showed a protective effect when only current and recent smokers were analyzed. Cancer risk was not elevated in non-smokers and smokers who had quit more than 5 years. Negative associations between lung cancer and certain dietary factors were found among black and white women, and white men. No inverse associations were found for black men.

Publications:

Ziegler RF, Colavito EA, Hartge P, McAdams MJ, Schoenberg JB, et al. Importance of alpha-carotene, beta-carotene, and other phytochemicals in the etiology of lung cancer. *J Natl Cancer Inst.* 1996;88(9):612-5.

Dorgan JF, Ziegler RG, Schoenberg JB, Hartge P, McAdams MJ, et al. Race and sex differences in associations of vegetables, fruits, and carotenoids with lung cancer risk in New Jersey (United States). *Cancer Cause Control.* 1993;4(3):273-81.

Hayes RB, Thomas T, Silverman DT, Vineis P, Blot WJ, et al. Lung cancer in motor exhaust-related occupations. *Am J Ind Med.* 1989;16(6):685-95.

Schoenberg JB, Stemhagen A, Mason TJ. Case-control studies of occupation and lung cancer in New Jersey. *Bulletin for NJ Academy of Science.* 1989;34:1-8.

Schoenberg JB, Wilcox HB, Mason TJ, Bill J, Stemhagen A. Variation in smoking-related lung cancer risk among New Jersey women. *Am J Epidemiol.* 1989;130(4):688-95.

Vineis P, Thomas T, Hayes RB, Blot WJ, Mason TJ, et al. Proportion of lung cancers in males, due to occupation, in different areas of the USA. *Int J Cancer.* 1988;42(6):851-6.

Wilcox HB, Schoenberg JB, Mason TJ, Bill JS, Stemhagen A. Smoking and lung cancer: risk as a function of cigarette tar content. *Prev Med.* 1988;17(3):263-72.

Schoenberg JB, Stemhagen A, Mason TJ, Patterson J, Bill J, et al. Occupation and lung cancer risk among New Jersey white males. *J Natl Cancer Inst.* 1987;79(1):13-21.

Dalager NA, Pickle LW, Mason TJ, Correa P, Fonham E, et al. The relation of passive smoking to lung cancer. *Cancer Res.* 1986;46(9):4808-11.

Ziegler RG, Mason TJ, Stemhagen A, Hoover R, Schoenberg JB, et al. Carotenoid intake, vegetables, and the risk of lung cancer among white men in New Jersey. *Am J Epidemiol.* 1986;123(6):1080-93.

Ziegler RG, Wilcox HB 3rd, Mason TJ, Bill JS, Virgo PW. Seasonal variation in intake of carotenoids and vegetables and fruits among white men in New Jersey. *Am J Clin Nutr.* 1987;45(1):107-14.

Ziegler RG, Mason TJ, Stemhagen A, Hoover R, Schoenberg JB, et al. Dietary carotene and vitamin A and risk of lung cancer among white men in New Jersey. *J Natl Cancer Inst.* 1984;73(6):1429-35.

TITLE: Genes and Environment in Melanoma (GEM)
PRINCIPAL INVESTIGATOR: Marianne Berwick, MPH, PhD
INSTITUTION: Memorial Sloan-Kettering Cancer Center (MSKCC)
NJDHSS CES CO-INVESTIGATORS: Judith B. Klotz, MS, DrPH
Homer B. Wilcox, MS
STUDY PERIOD: 10/01/99 – 3/31/04
FUNDING SOURCE: National Cancer Institute (NCI)

Melanoma, a life-threatening form of skin cancer, is important to study as incidence has increased substantially over the past half century and is now one of the most common cancers in populations of European origin. How can this increase be explained? In addition, there is a subset of the population that develops multiple primary melanomas. The relationship of sun exposure to melanoma risk is complex and may depend on other factors, such as specific genetic mutations or variations in DNA repair genes.

Cancer Epidemiology Services (CES) participated in a five-year international population-based case-control study of the genetic and environmental factors that may underlie susceptibility to melanoma. Headed by researchers at MSKCC, this study involved subjects from population-based registries in the United States, Canada, Italy, and Australia. New Jersey is one of four participating geographic locations in the U.S.

The principal objectives of the study are to evaluate the risk of melanoma conferred by a variety of genetic factors and to evaluate evidence of interaction between these genetic factors and sun exposure. A novel approach was utilized – controls included individuals with a first primary melanoma diagnosed within a specified time period and cases included individuals from the control group who were diagnosed within a subsequent 4-year period with more than one primary melanoma.

CES identified 526 cases and 442 controls from the New Jersey State Cancer Registry (NJSCR) and obtained physicians' consents. MSKCC consented and interviewed the cases and controls. In the future, CES will periodically review the NJSCR files to monitor the vital status of the eligible cases and controls.

Publication:

Begg CB, Orlow I, Hummer AJ, Armstrong BK, Kricker A, et al. Lifetime Risk of Melanoma in CDKN2A Mutation Carriers in a Population-Based Sample. *J Natl Cancer Inst.* 2005;97(20):1507-15.

TITLE: Exposure to Tremolite Asbestos in Vermiculite Ore (Pilot Surveillance for Mesothelioma)

PRINCIPAL INVESTIGATORS: Betsy A. Kohler, MPH, CTR
Lisa M. Roché, MPH, PhD

INSTITUTION: Cancer Epidemiology Services (CES)
New Jersey Department of Health and Senior Services (NJDHSS)

STUDY PERIOD: 9/29/02 – 9/28/06

FUNDING SOURCE: Agency for Toxic Substances and Disease Registry (ATSDR)
Centers for Disease Control and Prevention (CDC)

Mesothelioma is a rare deadly disease of the lining of the lung or abdomen, usually associated with exposure to asbestos. Between 1950 and 1980, asbestos-containing vermiculite ore was shipped from the Libby, Montana vermiculite mine to approximately 300 sites within 40 states, including eight sites in New Jersey.

With funding from the federal Agency for Toxic Substances and Disease Registry (ATSDR), Cancer Epidemiology Services (CES) is conducting a pilot study to explore the feasibility of determining possible associations between newly identified cases of mesothelioma and exposure to vermiculite ore from Libby mines and products manufactured from this ore. Another objective of this study is to develop a system to collect detailed information on possible environmental and occupational exposures to asbestos among patients diagnosed with mesothelioma. Because of the high mortality rate of this disease, interviews with patients are not always possible. An important goal of this study is to assess the validity of next-of-kin interviews. In addition, this pilot surveillance study will evaluate whether cancer reporting can act as a surveillance system for exposure to asbestos.

CES identified New Jersey patients diagnosed with mesothelioma from October 1, 2002 through March 31, 2004, and obtained physician and patient consents. Once consents were obtained, CES conducted phone interviews with patients and/or next-of-kin focusing on the patients' residential and occupational history, family history of exposure to asbestos, and medical and smoking history. In addition, the patients' residential and workplace addresses are being geocoded to see how close they are to the vermiculite processing facility sites. Through a collaborative relationship, CES also is interviewing mesothelioma cases and next-of-kin identified and consented by the New York State Cancer Registry.

TITLE: Second Malignant Neoplasms Following Cancer of the Ovary or Testis
PRINCIPAL INVESTIGATOR: Lois B. Travis, MD, ScD
INSTITUTION: Epidemiology and Biostatistics Program, Division of Cancer Etiology
National Cancer Institute (NCI)
NJDHSS CES INVESTIGATOR: Betsy A. Kohler, MPH, CTR
Janet B. Schoenberg, MPH
STUDY PERIOD: 8/4/95 – 8/8/99
FUNDING SOURCE: National Cancer Institute

Cisplatin and carboplatin (derivatives of platinum) are among the most important drugs introduced during the past three decades for the treatment of cancer and have a central role in chemotherapy and radiotherapy for patients with cancers of the ovary, testis, bladder, lung, endometrium, and head and neck. Currently, ovarian cancer ranks second among gynecologic cancers, with a 5-year relative survival of 45 percent among new ovarian cancer patients. Testicular cancer is one of the most curable forms of cancer, with a 5-year relative survival rate of more than 95 percent.

The objective of the study was to quantify the risk of second primary leukemias among patients with ovarian or testicular cancer in relationship to therapy, i.e. exposure to cytotoxic drugs and/or ionizing radiation. Increased risk of secondary tumors may also be related to radiotherapy, or to a combination of therapies, if the chemotherapeutic agent acts as a radiosensitizer.

Cancer Epidemiology Services (CES) collaborated with NCI on a case-control study of secondary leukemia among men and women in North America and Europe who received a diagnosis of invasive testicular or ovarian cancer reported to population-based cancer registries in Connecticut, Iowa, New Jersey, Ontario, Denmark, Finland, and Sweden. Eligibility criteria for the cases and controls included diagnosis of a first primary cancer of the ovary or testis, excluding extragonadal germ cell tumors, between January 1970 and December 1993, and survival for at least one year. For each patient, the registries were searched to identify all subsequent diagnoses of leukemia (except chronic lymphocytic leukemia) or the myelodysplastic syndrome (MDS). Mortality files, as well as hospital-discharge records were searched to identify other blood disorders that might represent MDS. For each patient with secondary leukemia, three control patients were chosen by random sampling from the defined cohort, except in New Jersey, where two control patients were chosen for each of two case patients. Controls were matched for registry, age when ovarian or testicular cancer was diagnosed, year of ovarian or testicular cancer diagnosis, and survival without a second primary cancer for at least as long as the interval between the case patient's diagnoses of ovarian or testicular cancer and leukemia. Standardized forms were used to collect demographic and clinical data for all patients, including information on all treatment for ovarian and testicular cancer during the matched time period.

In an estimation of risk of second cancers among 1-year survivors of testicular cancer, significantly elevated risks were observed for all second solid tumors, including cancers of the

stomach, small intestine, colon, rectum, pancreas, prostate, kidney, bladder, thyroid, and connective tissue as well as malignant melanoma. Significant excess of acute lymphoblastic leukemia, acute nonlymphocytic leukemia, and non-Hodgkin's lymphoma¹ were also found. Risks for second cancers were significantly elevated in all registries, except in New Jersey. Elevated risks for leukemia were observed within two decades after testicular cancer diagnosis; however, afterwards, the risks decreased to expectation. For several solid tumors, there was an increasing risk over time, suggesting the late effects of treatment. For other cancers, elevated risks were observed throughout follow-up or exhibited no discernible trends. Radiotherapy without chemotherapy was associated with a threefold elevated risk of leukemia. Secondary leukemia was associated with both radiotherapy and chemotherapy, whereas excess cancers of the stomach, bladder, and possibly, pancreas were associated mainly with radiotherapy. Risk increased with increasing dose of radiation to active bone marrow.

Among the women diagnosed with ovarian cancer, the risk of leukemia was significantly increased after treatment with platinum-based chemotherapy but was considerably lower than the risk after treatment with melphalan. There was a dose-response relation for platinum among both women who received radiotherapy and those who did not, with a higher risk in the radiotherapy group. For each registry, the risk of leukemia was three to seven times as high for women who received platinum-based treatment (cases) as for the controls, with higher risks at centers that administered radiotherapy. Radiotherapy without chemotherapy did not increase the risk of leukemia. Patterns of second cancers among men and women suggest that many factors may be involved, although the precise roles of treatment, natural history, diagnostic surveillance, and other influences are yet to be clarified.

Publications:

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¹ Non-Hodgkin's Lymphoma also known as Non-Hodgkin Lymphoma

TITLE: Cancers that Occur Excessively Among Blacks
PRINCIPAL INVESTIGATOR: Christine A. Swanson, PhD
INSTITUTION: Epidemiology and Biostatistics Program, Division of Cancer Etiology
National Cancer Institute (NCI)
NJDHSS CES INVESTIGATOR: Annette Stemhagen, DrPH
Janet B. Schoenberg, MPH
STUDY PERIOD: 1986-1996
FUNDING SOURCE: National Cancer Institute

Blacks in the U.S. have a higher risk of several cancers than do whites, including cancers of the esophagus, pancreas, prostate, and multiple myeloma. The factors contributing to excess cancer risk among blacks had not been determined, but diet, smoking, tobacco, and family history among others, were thought to play a role.

To explore reasons for the racial disparity in cancers of the prostate, esophagus, pancreas, and multiple myeloma, NCI conducted a multicenter case-control study of these cancers in three areas of the U.S. (New Jersey, Detroit, Atlanta). The cases included residents aged 30-80 of the three areas reported to the population-based cancer registries newly diagnosed with multiple myeloma or cancers of the esophagus, pancreas, or prostate. In each geographic area, controls were frequency matched to cases by age (5-year groups), gender, and race. Controls under age 65 were selected by random-digit dialing, while controls over age 65 were identified from Health Care Financing Administration (HCFA) records of Medicare registrants¹. For efficiency, one large control group was chosen for all four cancer types. Pathology specimens were requested from cases' hospitals.

For prostate cancer, an increase in risk was found among white men who had a vasectomy 20 or more years prior to the study or who had a vasectomy before the age of 35, and in both races among those who reported a history of prostate cancer in first-degree relatives or heavy smoking (40 or more cigarettes per day). In both races, carotenoids (except lycopene) and alcohol were positively associated with prostate cancer risk, with significantly elevated risks for those who had 22 or more drinks per week. Diets high in animal fat were linked to prostate cancer (independent of other caloric intake) among blacks.

For esophageal cancer, there were significantly elevated risks for men who smoked cigarettes or drank alcohol with significant risk gradients associated with the amount consumed. Risk was also significantly elevated among those in the heaviest quartile of body mass index and among those with a history of ulcers. Low intake of fruit and vegetables was associated with significantly higher cancer risks while a significant protective effect was observed with increasing intake of dietary fiber. Cancer risk also increased for those with low annual incomes for both races, but the risk was higher in low-income blacks.

Smokers had a significantly increased risk of pancreatic cancer and a significant positive trend in risk was observed with increasing duration smoked, with long term smokers (≥ 40 years)

¹ Centers for Medicare & Medicaid Services (CMS), formerly Health Care Financing Administration

experiencing double the risk. A protective effect was observed for long-term smoking cessation. Blacks had significantly higher risk associated with heavy alcohol drinking in men and with moderate-to-heavy drinking (>8 drinks/week) in women due mainly to consumption of hard liquor. Obesity and increased caloric intake also were associated with a statistically significant increased risk of pancreatic cancer that was consistent by sex and race. Those in the highest quartile of both body mass index and caloric intake had a statistically significantly higher risk than those in the lowest quartile.

History of urinary tract infections among black men was associated with significantly increased risks of multiple myeloma. Obesity was found to increase the risk for multiple myeloma in both races. Cancer risk was significantly elevated for those with an immediate family history of multiple myeloma and reduced risks were associated with frequent intake of vegetables (notably cruciferous vegetables), fish, and vitamin supplements (especially vitamin C) in both races. However, frequent intake of vitamin C from food and supplements combined was associated with a protective effect in whites, but not blacks.

In a general dietary analysis among blacks and whites, blacks were found to be more frequent consumers of fruits and vegetables considered to be protective against cancer e.g., citrus fruits, cruciferous vegetables, and vegetables rich in vitamins A and C.

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Brown LM, Gridley G, Pottern LM, Baris D, Swanson CA, et al. Diet and nutrition as risk factors for multiple myeloma among blacks and whites in the United States. *Cancer Causes Control.*2001; 12(2):117-25.

Brown LM, Hoover RN, Silverman D, Baris D, Hayes R, et al. Excess incidence of squamous cell esophageal cancer among U.S. black men: role of social and other risk factors. *Am J Epidemiol.* 2001;153(2):114-22.

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Brown LM, Swanson CA, Gridley G, Swanson GM, Schoenberg JB, et al. Adenocarcinoma of the esophagus: role of obesity and diet. *J Natl Cancer Inst*. 1995;87(2):104-9.

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Pottern LM, Gart JJ, Nam J, Dunston G, Wilson J, et al. HLA and multiple myeloma among black and white men: evidence of a genetic association. *Cancer Epidemiol Biomarkers Prev*. 1992;1(3):177-82.

TITLE: Drinking Water Contamination and the Incidence of Leukemia and Non-Hodgkin's Lymphoma

PRINCIPAL INVESTIGATOR: Perry Cohn, PhD, MPH

INSTITUTION: Consumer and Environmental Health Services (CEHS)
New Jersey Department of Health and Senior Services (NJDHSS)

NJDHSS CES INVESTIGATOR: Judith B. Klotz, DrPH, MPH

STUDY PERIOD: 1992-1993

Epidemiologic studies have suggested an association between organic drinking water contaminants and increased cancer incidence. NJDHSS previously conducted an exploratory study of leukemia incidence in a part of the state with a broad range of contamination. Analysis of data from the New Jersey State Cancer Registry (NJSCR) and the water testing results from 1984-1985 demonstrated a statistically significant association between the concentration of trichloroethylene (TCE) and perchloroethylene (PCE) and the overall leukemia rate among females from 1979 to 1984 in 27 towns.¹

This study expanded upon the earlier study from 27 to 75 towns for the 1979-1987 period and also included non-Hodgkin's lymphomas (NHL)² as well as leukemias. As in the original study, the counties and townships were selected because they were in a portion of the state that was either completely served by public water supplies and had a wide dispersion of type and concentrations of water contaminants. To study whether there were associations with any history of drinking water contamination utilizing data other than the mandatory monitoring in 1984-1985, the non-systematic drinking water survey data from 1978-1983 was combined with the 1984-1985 mandatory monitoring data. This combined data showed associations between towns "ever" contaminated with both TCE and PCE and the incidence of childhood acute lymphocytic leukemia (ALL) and non-Burkitt's high grade NHL among females.

Study results suggest a link between TCE and PCE in drinking water and the incidence of certain types of leukemias and NHL. However, conclusions are limited by potential misclassification of exposure due to the lack of individual information on degree of exposure to drinking water contaminants and long-term residence. Information about potentially confounding exposures also was not available. However, there was no a priori reason to believe that radiation, smoking, occupational exposures, genetic disposition or infections agents were differentially distributed among the exposure strata in this study to an extent that would affect these findings.

Publications:

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Cohn P, Bove F, Klotz J, Berkowitz M, Fagliano J. *Drinking water contamination and the incidence of leukemia and non-Hodgkin's lymphoma.* New Jersey Department of Health, Consumer and Environmental Health Services, Division of Epidemiology, Environmental and Occupational Health, Trenton, NJ. 1993.

¹ For more information on earlier leukemia study, see study summary on page 21.

² Non-Hodgkin's Lymphoma, also known as Non-Hodgkin Lymphoma

TITLE: Case-Control Study of Oral and Pharyngeal Cancer
PRINCIPAL INVESTIGATOR: William J. Blot, PhD
INSTITUTION: Epidemiology and Biostatistics Program, Division of Cancer Etiology
National Cancer Institute (NCI)
NJDHSS CES COLLABORATORS: Annette Stemhagen, DrPH
Janet B. Schoenberg, MPH
STUDY PERIOD: 1983-1986
FUNDING SOURCE: National Cancer Institute

Tobacco smoking and alcohol use are the major risk factors for oral and pharyngeal cancer in North American and in European countries. Among other suspected risk factors are poor dentition, inadequate oral hygiene, diet, and use of mouthwash, particularly among non-users of tobacco and alcohol.

NCI conducted a case-control interview study in four areas of the U.S. to investigate the risk factors for oral and pharyngeal cancer. Pathologically confirmed incident cases of oral and pharyngeal cancer diagnosed from January 1984 through March 1985, were identified from the population-based cancer registries of New Jersey, metropolitan Atlanta, and Los Angeles, Santa Clara and San Mateo in California. Cancers of the lip, salivary glands, and nasopharynx were excluded. Cases were all residents 18 to 79 years of age. Controls under age 65 at diagnosis were selected through random digit dialing, while controls aged 65 and older were selected from Medicare files maintained by the Health Care Financing Administration (HCFA)¹. In each geographic area, controls were frequency matched to cases by age (5-year groups), gender, and race.

Among the risk factors studied, tobacco smoking and alcohol drinking were found to be the major risk factors for oral and pharyngeal cancer and they separately increased the risk after controlling for the other. A sharp decline in risk was observed following smoking cessation. Also, oral and pharyngeal cancer patients with the highest intakes of tobacco and alcohol were found to be the most prone to develop second primary cancers. Among mouthwash users, oral cancer risks were elevated in men and women, after adjusting for tobacco and alcohol use. Effects were confined to users of mouthwash high in alcohol content and cancer risks increased in proportion to duration and frequency of use. Diets high in nitrite-containing meats were associated with increased cancer risk whereas vegetable and fruit intake was associated with a decreased risk in men and women, although the protective effect was stronger among men. Risk also declined in both sexes with an increase in the consumption of vitamin C and fiber. Among occupations, cancer risk increased among male carpet installers with longer duration of employment, and a decreased risk was found among men and women textile mill workers. Risks were non-significantly elevated among the men and women with a history of cancers arising from the oral cavity/pharynx.

¹ Centers for Medicare & Medicaid Services (CMS), formerly Health Care Financing Administration

Publications:

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TITLE: Radium in Drinking Water and the Incidence of Osteosarcoma

PRINCIPAL INVESTIGATORS: Perry Cohn, MPH, PhD
Jerald A. Fagliano, MPH, PhD

INSTITUTION: Consumer and Environmental Health Services (CEHS)
New Jersey Department of Health and Senior Services (NJDHSS)

NJDHSS CES INVESTIGATORS: Ric Skinner, MS
Stasia F. Burger, MS, CTR
Judith B. Klotz, MS, DrPH

STUDY PERIOD: 2001

Osteosarcoma is a bone cancer, occurring in approximately three persons per million per year, with incidence peaking in adolescence and in older adults. High levels of exposure to radium isotopes were linked to an increased risk of this bone cancer among radium dial painters and patients receiving oral radium treatment. In New Jersey, naturally occurring radium was found to be elevated in several aquifers, which supply drinking water to the southern and central parts of the state. The purpose of this study was to investigate the association between osteosarcoma incidence and radium levels in New Jersey community water supplies.

The New Jersey Department of Environmental Protection (NJDEP) and the U.S. Geological Survey (USGS) obtained data on levels of radium in community drinking water supplies from groundwater and drinking water surveys. Community water supplies were mapped using a geographic information system (GIS). Cancer Epidemiology Services (CES) provided information on incident cases of osteosarcoma in the study area from 1979 through 1998 from the New Jersey State Cancer Registry (NJSCR). Using the GIS, residence addresses of cases at the time of diagnosis were geocoded to the street level.

This study found an association between naturally occurring radioactivity levels in drinking water and the incidence of osteosarcoma among males, but not among females. Indeed, among males, the osteosarcoma rate was more than three times higher in areas with elevated radium levels in the water supply than in areas without elevated radium levels. The results of this study provide further evidence that exposure to radium at levels found in drinking water pose a measurable risk of this rare bone cancer.

Publication:

Cohn P, Skinner R, Burger S, Fagliano J, Klotz J. *Radium in Drinking Water and the Incidence of Osteosarcoma*. New Jersey Department of Health and Senior Services, Division of Epidemiology, Environmental and Occupational Health, Trenton, New Jersey: September 2003.

TITLE: Phytoestrogens, Folate, DNA Repair and Ovarian Cancer Risk
PRINCIPAL INVESTIGATOR: Elisa V. Bandera, MD, PhD
INSTITUTION: Cancer Institute of New Jersey (CINJ)
University of Medicine and Dentistry of New Jersey (UMDNJ)
NJDHSS CES CO-INVESTIGATOR: Lisa Paddock, MPH
STUDY PERIOD: 9/01/03 – 8/31/06
FUNDING SOURCE: Cancer Institute of New Jersey

Cancer of the ovary is the second most common gynecologic cancer and the leading cause of death from gynecologic malignancies. The causes of this deadly cancer are not well understood. The relationship between dietary phytoestrogens, folate, and ovarian cancer has received little attention, but is supported scientifically and warrants further investigation. In addition, ovarian cancer is known to be associated with mutations in specific genes, including genes affecting the body's DNA repair capability.

CINJ, in collaboration with Cancer Epidemiology Services (CES), is studying the respective roles of phytoestrogens and folate from dietary and supplement sources, as well as DNA repair capability, on ovarian cancer risk. The main objective of this study is to evaluate the hypothesis that consumption of phytoestrogen-containing food (e.g., soy, whole grains) decreases ovarian cancer risk. Another aim is to examine the association between folate from dietary and supplement sources and ovarian cancer risk. The third objective is to compare the DNA repair capability between individuals who have been diagnosed with ovarian cancer with those who have not.

Using a population-based case-control design, this study is building on the ongoing National Cancer Institute-funded study of endometrial cancer (see page 18). The same study protocol and data collection materials are being used as Memorial Sloan Kettering Cancer Center is using for the endometrial cancer study. CES is rapidly ascertaining cases of ovarian cancer that reside in one of six northeastern New Jersey counties, obtaining physician consent, and assisting with obtaining patient consent. Between 200 and 300 women with ovarian cancer are expected to participate in the study. The cases are being matched to the same controls who are already participating in the endometrial cancer study.

TITLE: GIS to Assess Late-Stage Prostate Cancer Incidence

PRINCIPAL INVESTIGATORS: Toshi Abe, MSW, CTR
Lisa M. Roché, MPH, PhD
Ric Skinner, MS

STUDY PERIOD: 9/30/00 – 9/29/03

FUNDING SOURCE: Association of Teachers of Preventive Medicine through Centers
for Disease Control and Prevention

CDC PROJECT OFFICER: Thomas B. Richards, MD

The study was performed by Cancer Epidemiology Services (CES) using a Geographic Information System (GIS) and spatial scan statistical software to identify and characterize geographic areas of New Jersey with high proportions of distant stage prostate cancer. Prostate cancer cases, diagnosed in New Jersey residents from 1995-1999 (n=30,505), were selected from the New Jersey State Cancer Registry (NJSCR) and their residences at time of diagnosis were geocoded to the census tract level. SaTScan, a spatial scan statistical software, was used to find clusters of census tracts with elevated proportions of cases of distant stage prostate cancer. ArcGIS 9 was used to map the most likely and secondary clusters. Demographic data from the 1990 U.S. Census were used to characterize the most likely cluster in comparison to the remainder of the state.

A large statistically significant cluster of distant stage prostate cancer was identified in the northeastern area of the state. The demographic data showed that this cluster contained a population with higher proportions of blacks, Hispanics, Asians, foreign-born persons, non-English speaking persons, persons below the poverty line and proportionately fewer high school graduates compared to the remainder of the state. Two smaller non-statistically significant clusters also were identified, one in Mercer County and the other in Camden County.

SaTScan was judged to be a useful tool to find clusters of distant stage prostate cancer in New Jersey using census tract as the geographic unit of analysis. Public health professionals can use the information from this study to develop programs to educate men about prostate cancer screening and treatment.

Publication:

Abe T, Martin IB, Roché LM. Clusters of census tracts with high proportions of men with distant stage prostate cancer incidence in New Jersey, 1995-1999. *AM J Prev Med.* 2006;30(2 Suppl):S60-6.

TITLE: PSA-Screening and Prostate Cancer Mortality
PRINCIPAL INVESTIGATOR: George G. Rhoads, MD, MPH
INSTITUTION: School of Public Health,
University of Medicine and Dentistry of New Jersey (UMDNJ)
NJDHSS CES COLLABORATORS: Betsy A. Kohler, MPH, CTR
Homer B. Wilcox, MS
STUDY PERIOD: 6/17/97 – Present
FUNDING SOURCE: National Cancer Institute (NCI)

Prostate specific antigen (PSA) screening to prevent death and disability from prostate cancer has come into widespread use in the U.S. since 1989. The American Cancer Society recommends that all men over the age of 50 have this blood test done annually, and there is evidence that a majority of 50-79 year old men have had the test at least once. While screening has led to a major increase in the diagnosis of cancer and, consequently, radical prostate surgeries, its efficacy in preventing death from this disease is unproven. Prostate cancer mortality has continued to increase.

A population-based, case-control study of PSA screening was conducted to evaluate this major screening modality. This type of study has been used successfully to evaluate other screening modalities and is predicated on the notion that if screening prevents mortality, the decedents should be less likely to have been screened than comparable men in the population. Cases were 55-79 year old, married, New Jersey men, who died from prostate cancer in 1998-2000 in the New Jersey State Cancer Registry (NJSCR). Married controls were selected from random digit dialing (age 55-64) or from Federal Medicare files (age 65-79) and were matched to cases by age and race. Case and control families were interviewed to ascertain all sources of medical care since 1989 and secure permission to review these records for PSA screening. All inpatient and outpatient providers were contacted to ascertain instances of PSA screening since 1989.

Analysis will focus on whether or not cases were screened from 1989 to the time of diagnosis. An exactly comparable calendar time period will be studied in controls. The extent of protection (measured as an odds ratio for prostate cancer death of less than 1.0) associated with screening will be calculated before and after adjustment for potential confounders. This study is proposed to provide the first direct estimate of the effectiveness of PSA screening on prostate cancer mortality.

TITLE: Case-Control Study of Renal Pelvis and Ureter Cancers

PRINCIPAL INVESTIGATOR: Joseph K. McLaughlin, PhD

INSTITUTION: Epidemiology and Biostatistics Program, Division of Cancer Etiology
National Cancer Institute (NCI)

NJDHSS CES COLLABORATORS: Annette Stemhagen, DrPH
Janet B. Schoenberg, MPH

STUDY PERIOD: 1982-1987

FUNDING SOURCE: National Cancer Institute

Cancers of the renal pelvis and ureter (RPU) are relatively rare and account for less than one percent of all newly diagnosed cancers in the U.S. However, the incidence rates have been rising by 2 to 4 percent annually among both men and women since 1970. The major risk factor for these cancers is cigarette smoking.

In order to further evaluate smoking and a number of other exposures, including analgesics and hypertension in relation to RPU cancers, NCI conducted a large case-control study in three areas of the U.S. Cases of histologically confirmed RPU cancers diagnosed between January 1983 and December 1986 between the ages of 20 and 79 from population-based cancer registries in New Jersey, Iowa, and Los Angeles, California were included. The study was restricted to whites because few cases of these rare cancers occurred among non-whites. Controls under age 65 at diagnosis were selected through random digit dialing, while controls aged 65 and older were selected from Medicare files maintained by the Health Care Financing Administration (HCFA)¹. In each geographic area, controls were frequency matched to cases by age (5-year groups) and gender. Interviews were obtained for 502 cases and 496 controls in all study areas combined.

Cigarette smoking was found to be the major cause of cancers of the RPU and statistically significant dose-response associations were observed for both cancer sites and in both sexes. Smoking cessation demonstrated a significant decreasing trend in risk for these cancers, especially with increasing years of cessation. Additionally, no significant increases in risk were found for any of the non-prescription and prescription analgesics evaluated. Finally, a history of hypertension (diagnosis reported >5 years before interview) was associated with a small but significantly increased risk, after controlling for the effects of smoking, age, gender, and geographic residence. Stratified analysis showed that the risk associated with hypertension was twice as high among users of diuretics or other antihypertensive drugs.

Publications:

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McLaughlin JK, Silverman DT, Hsing AW, Ross RK, Schoenberg JB, et al. Cigarette smoking and cancers of the renal pelvis and ureter. *Cancer Res*. 1992;52(2):254-7.

¹ Centers for Medicare & Medicaid Services (CMS), formerly Health Care Financing Administration

TITLE: SEER Patterns of Care Studies

PRINCIPAL INVESTIGATOR: Linda C. Harlan, PhD

INSTITUTION: Surveillance, Epidemiology, and End Results (SEER) Program,
National Cancer Institute (NCI)

NJDHSS CES COLLABORATORS: Betsy A. Kohler, MPH, CTR
Susan VanLoon, RN, CTR
Linda Johnson, CTR

STUDY PERIOD: I. 7/01/02 – 6/30/03
II. 9/30/03 – 9/29/04
III. 9/30/04 – 8/31/05
IV. 9/30/05 – 9/29/06

FUNDING SOURCE: National Cancer Institute

In a continuing effort to insure quality of care for cancer patients, NCI examines the full range of care received by cancer patients across the country through the annual Patterns of Care Studies conducted through the SEER registries. These studies verify the forms of therapies used in the treatment of selected cancers. Supplemental information is collected on surgery, pathologic margins, tumor characteristics, enrollment in clinical trials, and hospital characteristics for detailed analysis of national treatment patterns. New Jersey has participated in these studies since 2002 when the New Jersey State Cancer Registry (NJSCR) was officially recognized as a SEER registry.

Each year, patterns of care for a different group of cancers are studied. In the first study period in which NJSCR participated, cases diagnosed in 2001 with melanoma, esophageal/gastric, or cervical cancers were studied. In the second study period, cases diagnosed in 2002 with sarcoma, ovarian or prostate cancers were studied and in the third study period, cases diagnosed in 2003 with bladder cancer, myeloma, chronic myeloid leukemia (CML), or B-cell lymphoma were studied. In the current study period, male cases diagnosed in 2003 and 2004 aged 20 or older with invasive breast cancer are being studied. Additionally, cases diagnosed in 2004 aged 20 or older with breast cancer with negative nodes and estrogen receptive positive tumors, invasive kidney cancer and cancer of the head and neck are also being studied. Provided continuing funding is available, the NJSCR plans to collaborate on these studies annually.

Each SEER registry is responsible for randomly selecting the requisite number of cases of each of the cancers being studied and collecting the comprehensive data required by the NCI protocol. With its wide variety of racial and ethnic groups, New Jersey is an important component of these Patterns of Care studies.

TITLE: Environmental Public Health Tracking
PRINCIPAL INVESTIGATOR: Jerald A. Fagliano, MPH, PhD
INSTITUTION: Consumer and Environmental Health Services (CEHS)
New Jersey Department of Health and Senior Services (NJDHSS)
NJDHSS CES STUDY COLLABORATORS: Lisa M. Roché, MPH, PhD
Kevin A. Henry, MA, PhD
PROJECT PERIOD: 9/01/03 – 8/31/06
FUNDING SOURCE: Centers for Disease Control and Prevention (CDC)

Environmental factors are believed to play an important role in the etiology of many diseases. No systems exist at the state or national level to track exposures and health effects that may be related to environmental hazards. The purposes of environmental public health tracking are to: monitor and distribute information about environmental hazards and disease trends; advance research on possible linkages between environmental hazards and disease; and develop, implement, and evaluate regulatory and public health actions to prevent or control environment-related diseases. Many states, some cities, and three universities have been funded to conduct various activities for this national effort. CEHS was awarded a Planning and Capacity Building grant to build demonstration environmental public health tracking systems for three disease outcomes—cancer, birth defects, and lead poisoning. The NJDHSS has contracted with the New Jersey Department of Environmental Protection (NJDEP) to assist with the delineation of environmental hazards.

The objective of the first demonstration project is to conduct ecologic epidemiologic studies of the relationships among selected cancers and specific environmental hazards: leukemia and benzene in ambient air; brain cancer and angiosarcoma of the liver and vinyl chloride emissions in the air; and bladder cancer and disinfection by-products in drinking water. Cases are New Jersey residents newly diagnosed with the selected cancers between 1979 and 2002; the source of data is the New Jersey State Cancer Registry (NJSCR). The data for the environmental metrics are from the U.S. Environmental Protection Agency's (USEPA) National Air Toxics Assessment, NJDEP's database on facility location and emissions, and public drinking water supply monitoring. The geocoded cancer cases were aggregated to the census tract level by age group and sex and the exposure metrics were categorized into two or three levels by census tract. Additional variables for the modeling were 2000 Census data on poverty level and race. Rate ratios by exposure level were estimated using Poisson regression models, and 95% confidence intervals were calculated.

TITLE: American Cancer Society Studies of Cancer Survivors (SCS I, SCS II)

PRINCIPAL INVESTIGATOR: Frank Baker, PhD

INSTITUTION: Behavioral Research Center, American Cancer Society (ACS)

NJDHSS CES STUDY COLLABORATORS: Lisa M. Roché, MPH, PhD
Homer B. Wilcox, MS

PROJECT PERIOD: 10/01/98 – 9/30/02

FUNDING SOURCE: American Cancer Society (ACS)

Great advances in diagnostic and treatment protocols for many cancers have swelled the ranks of cancer survivors; over 7 million people alive today in the United States have a history of cancer. Until recently, survivorship issues have received relatively little attention. It is now clear that these issues, such as community reintegration, psychosocial adjustment, job and insurance discrimination, and prevention of late effects, are necessary parts of comprehensive cancer care.

To this end, the American Cancer Society is conducting a two-part population-based study of the long-term needs of people who are surviving with cancer. Part I is a longitudinal study of a sample of approximately 100,000 newly diagnosed cancer patients from multiple states. Cancer Epidemiology Services (CES) sampled eligible cases from the New Jersey State Cancer Registry (NJSCR) within their first year of diagnosis and obtained physician and patient consents for about 3,500 cases. ACS mailed questionnaires to consenting subjects upon enrollment, and again after one and three years.

Part II of this study is a cross-sectional study of long-term cancer survivors. CES sampled eligible cancer survivors from the NJSCR, who were diagnosed 2, 5, and 10 years prior to the study date and obtained over 2,300 consents. ACS mailed surveys regarding issues of long-term survivorship to these subjects. CES also participated in the pilot phase of this study. CES will be collaborating with ACS on data analyses of the questionnaire data collected from consented cases in New Jersey.

Publication:

Denniston M, Stein K, Baker FB, Brogan D, West M, et al. An experiment in data collection mode preference of long-term cancer survivors. In: *Proceedings of the Section on Survey Research Methods*; Alexandria, Va. 2001:411-416.

TITLE: Descriptive Epidemiology of Cancer Mortality in New Jersey: 1949-1976

PRINCIPAL INVESTIGATORS: Annette Stemhagen, DrPH¹
Alexander P. Mogielnicki, MA¹
Ronald Altman, MD, MPH¹
Thomas J. Mason, PhD²

INSTITUTION: Cancer Epidemiology Services (CES)
New Jersey State Department of Health and Senior Services (NJDHSS)

NJDHSS CES COLLABORATORS: Carolyn M. Winkler
Homer B. Wilcox, MS

STUDY PERIOD: 1979-1981

FUNDING SOURCE: National Cancer Institute (NCI)

The major public health problems in New Jersey at the turn of the century included infectious diseases, acute lung disease, tuberculosis, and diarrheal diseases of childhood. During this period, there were less than one thousand cancer deaths recorded per year. By 1976, nearly one out of every five deaths in New Jersey was due to cancer, and the major causes of death were diseases of the heart, malignant neoplasms, cerebrovascular disease and accidents.

Concern over cancer incidence and mortality in New Jersey had been heightened by several national studies. In 1973, NCI published a study describing the pattern of cancer mortality rates for U.S. counties during 1950 to 1969. The cancer mortality rates for many New Jersey counties were well above national cancer mortality rates. To expand upon this information the NJDHSS entered into a collaborative research contract with NCI to produce a comprehensive report detailing cancer mortality in New Jersey from 1949 to 1976. The goal of the report was to stimulate research into the epidemiology of cancer in New Jersey and to participate in the formulation of public health policy for effective cancer control.

Volume I of the report presents basic data and statistical analyses designed to document the cancer mortality rates, to analyze underlying trends in these rates, to illustrate differences in the levels and trends of these rates for sub-groups within the population of New Jersey, and to describe the patterns of cancer mortality rates throughout the state by county and municipality. Volume II is a detailed statistical appendix that contains data tables for the analyses presented in Volume I. Data sources used for these two volumes were death certificates and U.S. Census data. While the NCI study demonstrated the use of routinely collected cancer mortality data to illustrate county variations in cancer mortality rates, the research presented in Volumes I and II refined the NCI approach by using a smaller unit of geographic analysis, the municipality, to provide epidemiologic clues to the etiology of cancer.

Publication:

Stemhagen A, Mogielnicki A, Altman R, Mason T. *Descriptive Epidemiology of Cancer Mortality in New Jersey, 1949-1976; Volume I: Discussion and Analysis and Volume II: Statistics and Appendix*. New Jersey State Department of Health, Trenton, New Jersey: 1981.

¹ New Jersey State Department of Health and Senior Services

² National Cancer Institute

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CLUSTER STUDIES

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TITLE: Childhood Cancer in Dover Township (Toms River), New Jersey
PRINCIPAL INVESTIGATOR: Jerald A. Fagliano, MPH, PhD
INSTITUTION: Consumer and Environmental Health Services (CEHS)
New Jersey Department of Health and Senior Services (NJDHSS)
NJDHSS CES COLLABORATORS: Betsy A. Kohler, MPH, CTR
Judith B. Klotz, MS, DrPH
STUDY PERIOD: 1997-2001
FUNDING SOURCE: Agency for Toxic Substances and Disease Registry (ATSDR)
Centers for Disease Control and Prevention (CDC)

In 1995, CEHS evaluated the occurrence of childhood cancer in Dover Township and found that the incidence was significantly higher than expected for the period 1979 through 1991. Consequently, the NJDHSS and ATSDR, in cooperation with the local Citizen Action Committee for Childhood Cancer Cluster, developed a Public Health Response Plan (PHRP) to systematically investigate the elevated incidence of childhood cancer in Dover Township. This PHRP confirmed that the overall childhood cancer incidence rate in Dover Township was significantly elevated and that residents of the township had been exposed to toxic chemicals through air pollution emissions and contamination of potable water.

Based on these findings, the NJDHSS and ATSDR decided to conduct an epidemiologic study in 1997 using a case-control design to evaluate the relationship between the various environmental exposure pathways and the elevated childhood cancer incidence in this community. Cancer Epidemiology Services (CES) assisted with the design and implementation of the study and conducted telephone interviews with the parents of children with cancer (cases) and without cancer (controls). The interviews elicited residential history, environmental exposures, and other potential risk factors and confounders. In addition, the CES conducted matches of births in Dover Township with cancer registries in ten other states to ascertain children who may have moved away from Dover Township prior to being diagnosed with cancer.

No single evaluated risk factor appeared to be solely responsible for the overall elevation of childhood cancer incidence in Dover Township. However, there did seem to be an association between prenatal exposure to industrial air pollution and leukemia in female children diagnosed prior to age five. No association was seen for the prenatal or postnatal exposures in male children. The study findings were generally consistent with the published literature.

Publications:

Fagliano JA, Berry M, Kohler BA, Klotz JB, Imtiaz R. *Case-control Study of Childhood Cancers in Dover Township (Ocean County), New Jersey. Volumes I-V.* New Jersey Department of Health and Senior Services, Trenton, New Jersey and Agency for Toxic Substances Disease Registry, Atlanta, Georgia. 2003

NJDHSS and ATSDR. *Childhood cancer incidence update: a review and analysis of cancer registry data, 1979-2000 for Dover Township (Ocean County), New Jersey*. New Jersey Department of Health and Senior Services, Trenton, NJ, and Agency for Toxic Substances and Disease Registry, Atlanta, GA. 2003.

NJDHSS and ATSDR. Ciba-Geigy Corporation site public health assessment. New Jersey Department of Health and Senior Services, Trenton, NJ, and Agency for Toxic Substances and Disease Registry, Atlanta, GA. 2001a.

NJDHSS and ATSDR. Reich farm site public health assessment. New Jersey Department of Health and Senior Services, Trenton, NJ, and Agency for Toxic Substances and Disease Registry, Atlanta, GA. 2001b.

Blumenstock J, Fagliano J, Bresnitz E. The Dover township childhood cancer investigation. *N J Med*. 2000;97(12):25-30.

Berry M, Haltmeier P. *Childhood cancer incidence health consultation: a review and analysis of cancer registry data, 1979-1995 for Dover Township (Ocean County), New Jersey, final technical report*. New Jersey Department of Health and Senior Services, Trenton, NJ, and Agency for Toxic Substances and Disease Registry, Atlanta, GA. 1997a.

TITLE: Mesothelioma Incidence and Community Asbestos Exposure
PRINCIPAL INVESTIGATOR: Michael Berry, MPH
INSTITUTION: Consumer and Environmental Health Services (CEHS)
New Jersey Department of Health and Senior Services (NJDHSS)
NJDHSS CES COLLABORATORS: Toshi Abe, MSW, CTR
STUDY PERIOD: 1979-1987

Mesothelioma is a rare type of cancer. Between 1912 and 1980, Manville, located in Somerset County, New Jersey was the site of the largest asbestos product manufacturing plant in North America. In 1987, NJDHSS conducted a death certificate analysis of mesothelioma and residence in Somerset County to evaluate the cancer mortality risk after removing the effect of employment at the asbestos plant through the use of a union employment list. Study findings detected a significantly elevated odds ratio for living in Manville, New Jersey. As a result, this study evaluated the environmental (non-occupational) component of the incidence of mesothelioma, using the New Jersey State Cancer Registry (NJSCR), among persons living in an area that had an asbestos manufacturing plant with potentially significant population exposures. The two major routes of environmental exposure considered were ambient air and household contact with plant employees.

Standardized incidence ratios (SIRs) were computed for residents of Manville and Somerset County (less the Manville population) by sex. Residents of Manville had an extremely elevated risk of developing mesothelioma relative to average state incidence rates.

Publication:

Berry M. Mesothelioma incidence and community asbestos exposure. *Environ Res.* 1997;75(1):34-40

TITLE: Epidemiologic Investigation of Clusters of Leukemia and Hodgkin's Disease¹ In Rutherford, New Jersey

PRINCIPAL INVESTIGATOR: William Halperin, MD

INSTITUTION: Cancer Epidemiology Services (CES)
New Jersey Department of Health and Senior Services (NJDHSS)

NJDHSS CES COLLABORATORS: Ronald Altman, MD, MPH
Annette Stemhagen, DrPH
Alfred W. Iaci, MS
Joanne Bill, RN, BSN
Toshi Abe, MSW

STUDY PERIOD: 1978-1980

FUNDING SOURCE: National Cancer Institute (NCI)

In response to concern about an apparent cluster of leukemia and Hodgkin's disease cases at the Pierpont School in Rutherford, New Jersey, the NJDHSS conducted an epidemiologic investigation of possible etiologic risk factors in March 1978. Extensive case ascertainment was conducted in area hospitals and incidence data were obtained from the New York State Cancer Registry and the Third National Cancer Survey. Based on the preliminary analysis, leukemia incidence was significantly elevated in the age group 5-19 and Hodgkin's disease was elevated overall and specifically in the 20-39 age group.

Based on the findings from the preliminary analysis, a case-control interview study was conducted. A case was defined as a person with histologically confirmed leukemia, Hodgkin's disease (HD), or non-Hodgkin's lymphoma (NHL)² who was a resident of Rutherford prior to diagnosis and who was diagnosed in January 1973 through March 1978. Interviewing was limited to the families with a childhood leukemia case and to all cases of HD. Computer programs used for analysis were developed by Cancer Epidemiology Services (CES) under NCI funding to study bladder cancer³. Leukemia cases were found to differ from their controls in the number of rubella vaccinations received and in their possible contact with insecticides. Significantly different histories of vaccination, animal contact, chemical contact, x-ray use, prior illnesses, and tonsillectomy were found among Hodgkin's disease cases than among their controls. However, the significant exposures could not consistently be associated with all cases. It was not possible to determine if the excess disease incidence represented a chance event or a cause unique to Rutherford.

Publication:

Halperin W, Altman R, Stemhagen A, Iaci AW, Caldwell G, et al. Epidemiologic investigation of clusters of leukemia and Hodgkin's disease in Rutherford, New Jersey. *J Med Soc N J.* 1980;77(4):267-73.

¹ Hodgkin's Disease also known as Hodgkin Lymphoma

² Non-Hodgkin's Lymphoma also known as Non-Hodgkin Lymphoma

³ National Survey of Environment and Health (National Bladder Cancer Study) See p. 4.

TITLE: Epidemiologic Investigation of a Cancer Cluster in Professional Football Players

PRINCIPAL INVESTIGATOR: Allen Kraut, MD

INSTITUTION: Department of Internal Medicine, University of Manitoba

NJDHSS CES COLLABORATORS: Toshi Abe, MSW, CTR
Nancy E.L. Hall, PhD

STUDY PERIOD: 1987-1991

In 1976, the New York Giants professional football team relocated to the newly constructed Meadowlands Sports Complex (MSC) in East Rutherford, NJ. Between 1980 and 1987, four team members developed cancer: one case each of non-Hodgkin's lymphoma¹, glioblastoma, angiosarcoma, and Hodgkin's disease². Because the surrounding area contains three superfund sites, concern was widespread that the cancers were related to environmental contamination. To assess for a possible environmental etiology, clinical, environmental, and epidemiologic studies were conducted at the MSC.

Measurements of volatile organic compounds (VOCs) were all below occupational exposure limits and were similar to ambient levels in nearby Lyndhurst, NJ. Outdoor AM radio broadcast field strengths were in the uppermost 0.1 percent of field strengths measured in urban areas of the United States. Proportionate mortality ratio and proportional cancer incidence ratio studies of the MSC workforce found no excesses of cancer deaths or of incident cancer cases either for all sites combined or for any specific site. No significant differences in cancer incidence or mortality were found between indoor and non-indoor workers. Based on examination of all available data, the four cancer cases were judged most likely to have been clustered by chance and not to have been caused by environmental conditions at the MSC.

To assess the ability of the New Jersey State Cancer Registry (NJSCR) to identify known cancer cases among New Jersey residents, a comparison was made of cancer cases identified from three other sources (a death certificate review from the mortality study, employer/union records, and a questionnaire sent to all current MSC employees), and the cancer registry itself. A computer tape listing all cohort members with available demographic information was submitted to NJSCR for data linkage. At the time of the study, NJSCR had complete incidence data for the period 1979 through 1985. For these years, NJSCR located 98 percent of the cancer cases known from the other sources. NJSCR proved to be a very useful tool for the detection of cancer cases among residents of New Jersey.

Publications:

Kraut A, Chan E, Abe T, Hall NEL, Landrigan PJ. Completeness of case ascertainment of the State Cancer Registry. *N J Med.* 1992;89(10):772-3.

Kraut A, Chan E, Liroy PJ, Cohen FB, Goldstein BD, Landrigan PJ. Epidemiologic investigation of a cancer cluster in professional football players. *Environ Res.* 1991;56(2):131-43.

¹ Non-Hodgkin's Lymphoma also known as Non-Hodgkin Lymphoma

² Hodgkin's Disease also known as Hodgkin Lymphoma

TITLE: Report on a Cluster of Germ Cell Testicular Cancer in Garfield, New Jersey

PRINCIPAL INVESTIGATOR: John D. Slade, MD

INSTITUTION: New Jersey Department of Health and Senior Services (NJDHSS)

NJDHSS CES COLLABORATORS: Annette Stemhagen, DrPH
Toshi Abe, MSW, CTR

STUDY PERIOD: 1979-1980

FUNDING SOURCE: National Cancer Institute (NCI)

Rates of testicular cancer have undergone a profound shift in the United States since the early part of the 20th century. Whereas this tumor was formerly more common in the elderly, it is now most commonly diagnosed in young adult men, and its occurrence has undergone an absolute decline in the elderly. A rise in young adult incidence has also been observed in England, Denmark, and Japan.

A young man diagnosed with testicular cancer called the Department of Health to report that he knew of two other young men from his town, Garfield, New Jersey, that were diagnosed with testicular cancer. An epidemiologic investigation was conducted after the New Jersey State Cancer Registry (NJSCR) reviewed and analyzed the state pattern of testicular cancer and in Garfield, New Jersey to uncover unique or unusual associations among the cases. Medical records and death certificates of testicular cancer cases were reviewed to obtain more information regarding Garfield residents. Interviews were conducted with each Garfield-associated case and his mother to identify common features among these cases. A control group was not interviewed because the case interviews failed to produce hypotheses to test in a comparison group.

Examination of data from the NJSCR failed to show evidence of clustering elsewhere in New Jersey. The data were insufficient to decide whether chance alone accounted for these observations.

Publication:

Slade JD, Clark JF, Yee CH, Altman R, Fadil R, et al. *Report on a cluster of germ cells testicular cancer in Garfield, New Jersey*. New Jersey State Department of Health and Senior Services, Trenton, NJ. 1980.

LINKAGE STUDIES

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TITLE: The SEER-National Longitudinal Mortality Study (NLMS) Record Linkage Study

PRINCIPAL INVESTIGATOR: Marsha Reichman, PhD: 3/2005-Present
Gopal Singh, MS, MSc, PhD: 9/30/99-3/2005

INSTITUTION: National Cancer Institute (NCI)

NJDHSS CES COLLABORATORS: Betsy A. Kohler, MPH, CTR
Karen Pawlish, MPH, ScD

STUDY PERIOD: 9/30/99 – Present

FUNDING SOURCE: National Cancer Institute (NCI)

Despite improvements in the early detection and treatment of cancer, socioeconomic inequalities in cancer incidence, mortality, and survival persist. A better understanding of the extent and effects of such social inequalities is vital in developing and implementing a comprehensive and effective national strategy for cancer control and prevention. Most cancer registry databases have limited information on the socioeconomic status of cancer patients. The objective of this study is to estimate the effects of race/ethnicity, family income, occupation, education, and other socioeconomic factors on cancer incidence, survival, and stage at diagnosis.

The National Cancer Institute, through its Surveillance Research Program, is linking individual-level data from the New Jersey State Cancer Registry (NJSCR) and other Surveillance, Epidemiology, and End Results (SEER) registries with data from the Current Population Surveys (CPS) collected by the Census Bureau to obtain data on income, occupation, education, and other socioeconomic and demographic factors. Cancer Epidemiology Services (CES) began participating in 2004 and is responsible for transmitting cancer registry files for linkage. The NJDHSS collaborators also serve on a NCI study advisory committee that will provide input to NCI on analyses using the linked data file.

There have been some preliminary analyses of data from six of the SEER registries. For example, some interesting findings correlate level of education to the risk of some types of cancer. It was found that men with less than a high school education had a higher lung cancer incidence rate than men with at least some college education. On the other hand, it was found that women with less than a high school education had 27 percent lower breast cancer incidence rates than women with at least some college education. This is thought to be related to more educated women bearing no children or having children later in life.

Publications:

There are many publications from this study, however, to date none include New Jersey data. A current bibliography of all publications from the NLMS may be obtained by contacting Norm Johnson, the Census Bureau principal investigator, by phone (301)763-4270 or by email norman.j.johnson@census.gov.

TITLE: National AIDS/Cancer Match Registry Study (NACMR)

PRINCIPAL INVESTIGATOR: I. Tim Cote, Ph.D., II. Eric Engels, MPH, MD,
III. Eric Engels, MPH, MD

INSTITUTION: Viral Epidemiology Branch (VEB), National Cancer Institute (NCI)

NJDHSS COLLABORATORS: I: Betsy A. Kohler, MPH, CTR¹, Sam Costa, MS²
II: Betsy A. Kohler, MPH, CTR, Sam Costa, MS
III: Betsy A. Kohler, MPH, CTR, Helene Cross, PhD²

STUDY PERIODS: I. 1992 – 1993, II. 1996 – 1997, III. 2004 – Present

FUNDING SOURCE: National Cancer Institute (NCI)

Adults with HIV/AIDS have an increased risk of developing some types of cancer, notably Kaposi's sarcoma (KS) and Non-Hodgkin's Lymphoma (NHL)³. NCI has linked AIDS registries to cancer registries in 11 sites across the U.S. to investigate the association of AIDS with other cancers. Specifically, the primary objectives of these studies have been to determine the risk of cancer for persons with HIV/AIDS, which factors may be predictive of cancer among persons with HIV/AIDS, and if cancers in persons with HIV/AIDS differ from cancers among the general population. An additional objective is enhanced surveillance stemming from increased communication between the local AIDS and cancer registries. In order to link the AIDS and cancer registries, commercially developed software was used to electronically match cancer registry data to AIDS registry data at each site. Cancers of the anus, mouth, liver, brain, and lung, multiple myeloma, leukemia, non-melanoma skin cancer, melanoma of the skin, and human papillomavirus (HPV) associated cancers including cervical and conjunctival cancers were also found to be elevated in individuals with HIV/AIDS.

Publications:

Biggar RJ, Kirby KA, Atkinson J, McNeel TS, Engels E. Cancer risk in elderly persons with HIV/AIDS. *J Acquir Immune Defic Syndr*. 2004;36(3):861-8.

Biggar RJ, Engels EA, Frisch M, Goedert JJ. Risk of T-cell lymphomas in persons with AIDS. *J Acquir Immune Defic Syndr*. 2001;26(4):371-6.

Frisch M, Biggar RJ, Engels EA, Goedert JJ. Association of cancer with AIDS-related immunosuppression in adults. *JAMA*. 2001;285(13):1736-45.

Roche LM, Paul SM, Costa SJ. Acquired Immune Deficiency Syndrome and the increase in non-Hodgkin's lymphoma incidence in New Jersey from 1979 to 1996. *Cancer*. 2001;92(11):2948-56.

Roche LM, Weinstein RB, Paul SM, Costa SJ. Cancer in people with AIDS in New Jersey. *N J Med*. 2001;98(1):27-36.

¹ Cancer Epidemiology Services

² Division of HIV/AIDS Services

³ Non-Hodgkin's Lymphoma also known as Non-Hodgkin Lymphoma

Biggar RJ, Frisch M, Goedert JJ. Risk of cancer in children with AIDS. *JAMA*. 2000;284(2):205-9.

Frisch M, Biggar RJ, Goedert JJ. Human papillomavirus-associated cancers in patients with human immunodeficiency virus infection and acquired immunodeficiency syndrome. *J Natl Cancer Inst*. 2000;92(18):1500-10.

Biggar RJ, Rabkin CS. The epidemiology of AIDS-related neoplasms. *Hematol Oncol Clin North Am*. 1996;10(5):997-1010.

Biggar RJ, Rosenberg PS, Cote T. Kaposi's sarcoma and non-Hodgkin's lymphoma following the diagnosis of AIDS. *Int J Cancer*. 1996;68(6):754-8.

Melbye M, Cote TR, West D, Kessler L, Biggar RJ. Nasopharyngeal carcinoma: an EBV – associated tumor not significantly influenced by HIV–induced immunosuppression. *Br J Cancer*. 1996;73(8):995-7.

Melbye M, Cote TR, Kessler L, Gail M, Biggar RJ. High incidence of anal cancer among AIDS patients. *Lancet*. 1994;343(8898):636-9.

TITLE: Linkage Study of Cancer Risk Among Lead-exposed Workers in New Jersey: A Pilot.

PRINCIPAL INVESTIGATOR: Thuy V. Lam, MPH

INSTITUTION: Cancer Epidemiology Services (CES)
New Jersey State Department of Health and Senior Services (NJDHSS)

NJDHSS CES COLLABORATORS: Pamela Agovino, MPH
Xiaoling Niu, MS
Lisa M. Roché, MPH, PhD

STUDY PERIOD: 1/02/02 – 09/30/03

Occupational exposure to lead is the primary source of exposure in approximately 95 percent of adults with elevated blood lead levels (BLLs). Lead and inorganic lead compounds have been classified by the International Agency for Research on Cancer (IARC) as “possible” human carcinogens. Epidemiologic studies have illustrated a possible association between occupational exposure to lead and cancer, specifically cancers of the kidney, lung, stomach and nervous system.

A record linkage was performed between the New Jersey State Cancer Registry (NJSCR) and the New Jersey Adult Blood Lead Epidemiology and Surveillance System (ABLES), both within the NJDHSS, for 1985-2001. The purpose of the study was to ascertain the risk of cancer in lead-exposed workers and to evaluate the usefulness of this type of linkage. AUTOMATCH was used to link the two databases and a standardized incidence ratio (SIR) analysis was performed. The cohort consisted of male New Jersey workers above the age of 15 with BLLs greater than 25 micrograms per deciliter ($\mu\text{g/dL}$). After all exclusions, a total of 83 observed cancers remained among a cohort of 3,165 men.

The SIR analysis showed a large overall deficit of cancer ($\text{SIR}=0.51$; 95% CI 0.41 to 0.62). Prostate cancer showed the only statistically significant SIR, a deficit with an SIR of 0.35 (95% CI 0.20 to 0.57). Deficits also occurred in cancers of the lung, kidney, and brain. Non-significant elevations were observed in cancers of the stomach, breast, larynx, intrahepatic bile duct, and chronic myeloid leukemia. The results do not indicate that occupational exposure to lead is associated with cancer. However, firm conclusions are not possible because of various study limitations, including small numbers, a large percentage of workers without age information, short follow-up time, and lack of vital status information. Cancer incidence in this cohort was expected to be low due to the Healthy Worker Effect and young age. Increased worker cohort information would also improve this type of study.

Publication:

Lam TV, Agovino P, Niu X, Roché LM. Linkage study of cancer risk among lead-exposed workers in New Jersey. Submitted for publication 2006.

TITLE: Updating the Linkage of SEER-Medicare Data
PRINCIPAL INVESTIGATOR: Joan Warren, PhD
INSTITUTION: National Cancer Institute (NCI)
NJDHSS CES COLLABORATORS: Betsy A. Kohler, MPH, CTR
Stasia F. Burger, MS, CTR
STUDY PERIOD: 2001 – 2006
FUNDING SOURCE: National Cancer Institute (NCI)

The New Jersey Department of Health and Senior Services (NJDHSS) is part of the Surveillance, Epidemiology, and End Results (SEER) Program sponsored by NCI. As a SEER registry, the NJDHSS participates in the linkage of the SEER and Medicare data. The linkage of the SEER and Medicare data creates a large population-based source of information for cancer related epidemiologic and health services research. The SEER data provide the identification of incident cases with detailed site and stage reporting and information about the cause of death. The Medicare data offer a longitudinal perspective, making it possible to look at services prior to, during, and following diagnosis.

The linkage of the SEER and Medicare data was first completed in 1989, with updates to the linkage every three years. New Jersey State Cancer Registry (NJSCR) data were included beginning in 2001. The linkage process requires registries to send personal identifiers for their cancer cases to be linked to Medicare's master enrollment file. Once the linkage is completed, all identifiers are permanently destroyed. The SEER-Medicare data file is a rich resource for researchers as the most recent linkage of the SEER-Medicare data includes 2.4 million cases from all SEER registries; 501,790 cases are from New Jersey.

Although the SEER-Medicare data are de-identified, because of the breadth of the data, the SEER-Medicare data are not public use files. Investigators are required to obtain approval from NCI in order to acquire data. The purpose of the approval process is to ensure the confidentiality of the patients and providers in SEER areas. For more information, please visit NCI's Cancer Control and Population Sciences website <http://healthservices.cancer.gov/seermedicare/>.

Publications:

There have been over 175 publications based on the SEER-Medicare data. A current bibliography of all publications may be obtained from Cancer Epidemiology Services by phone (609) 588-3500 or email: <http://nj.gov/health/feedback.shtml>.

TITLE: The Relation between Health Insurance and Clinical Outcomes among Women with Breast Cancer

PRINCIPAL INVESTIGATOR: John Z. Ayanian, MD, MPP

INSTITUTION: Section on Health Services and Policy Research
Department of Medicine
Brigham and Women's Hospital and Harvard Medical School

NJDHSS CES COLLABORATOR: Betsy A. Kohler, MPH, CTR
Toshi Abe, MSW, CTR

STUDY PERIOD: 1987-1993

Access to health care is currently a subject of considerable concern in the United States. National surveys have demonstrated that women without private health insurance are less likely than privately insured women to be screened for breast cancer, and thus their treatment may differ after cancer is diagnosed. To examine this topic, two questions were posed to analyze clinical outcomes for individual patients according to their insurance coverage: Do uninsured patients and those covered by Medicaid have more advanced breast cancer than privately insured patients when the disease is first diagnosed? And do these patients die sooner, on average than privately insured patients during the 7.5 years after breast cancer is diagnosed?

New Jersey women diagnosed with invasive breast cancer during 1985 through 1987 with stage information and between the ages of 35 and 64 were identified from the New Jersey State Cancer Registry (NJSCR) (n=6026). NJSCR records were linked to hospital-discharge data at NJDHSS, 4765 women were matched. The registry records were linked to 1980 Census data on median household income for the smallest residential area in which they could be categorized. Comparisons of the stage of disease and stage-specific survival among women with private insurance, no insurance, and Medicaid coverage through June 1992 were made.

Uninsured patients and those covered by Medicaid presented with more advanced disease than did privately insured patients. Survival was worse for uninsured patients and those with Medicaid coverage than for privately insured patients with local disease and regional disease, but not distant metastases. The adjusted risk of death was 49 percent higher for uninsured patients and 40 percent higher for Medicaid patients than for privately insured patients during the 54 to 89 months after diagnosis. The study suggests that women without private health insurance would benefit from improved access to screening and optimal therapy.

Publication:

Zyanian JZ, Kohler BA, Abe T, Epstein AM. The relation between health insurance coverage and clinical outcomes among women with breast cancer. *N Engl J Med.* 1993;329(5):326-31.

Other Linkages with the New Jersey State Cancer Registry (in order of completion date)

Medicare claims data validation study for selected cancer diagnoses, Sebastian Schneeweiss, Harvard School of Public Health & Brigham and Women's Hospital, 2004-present.

Continuation of a follow-up study of participants in the breast cancer detection demonstration project (BCDDP) cancer record linkage study, Catherine Schairer, PhD, National Cancer Institute, 1998-present.

National Institutes of Health (NIH)/American Association of Retired Persons (AARP) diet and health study, Arthur Schatzkin, MD, DrPH, National Cancer Institute, 1997-present.

New York University women's health study, Roy E. Shore, PhD, DrPH, Department of Environmental Medicine, New York University School of Medicine, 1996-Present.

Cancer prevention study II (CPS-II) mortality follow-up and registry linkage, Eugenia E. Calle, PhD, American Cancer Society, 1995-present.

Quality and costs of colon cancer care in VA and Medicare, Denise Hynes, RN, MPH, PhD, Midwest Center for Health Services and Policy Research, Hines VA Hospital, 2006.

Segregation and racial disparities in prostate cancer, Katrina Armstrong, MD, MSCE, University of Pennsylvania, School of Medicine, General Internal Medicine, 2005-06.

Cohort mortality and cancer incidence studies of the Rahway, NJ facility, Gary M. Marsh, PhD, University of Pittsburgh, 2005-06.

Verification study of mesothelioma diagnoses on death certificates with mesothelioma diagnoses of the New Jersey State Cancer Registry (NJSCR), Wendy Huebner, PhD ExxonMobile, 2005-06.

Investigation of brain cancer in an occupational cohort, Thomas A. Burke, MPH, PhD, Johns Hopkins Bloomberg School of Public Health, 2002-06.

Follow back pilot study for National Death Index matches, Toshi Abe, MSW, CTR, Cancer Epidemiology Services, New Jersey Department of Health and Senior Services, 2003.

Cancer incidence among union carpenters in New Jersey, John Dement, PhD, Division of Occupational and Environmental Medicine, Duke University Medical Center, 2002-03.

New York cancer project, Stephen Johnson, MS, PhD, Medical Informatics, Columbia University, 2002-03.

Greater Delaware Valley pediatric tumor registry, Greta R. Bunin, PhD, Pediatrics/Oncology, Children's Hospital of Philadelphia, 1997-03.

Comparative analysis of South Asian Names, Gurparkash Singh, PhD, Humri & Company, Inc., 2002.

A comparison of longitudinal patterns of breast and cervical cancer screening and stage at diagnosis, Franco Sassi, PhD, Institute for Health Policy Studies, University of California, San Francisco, 2001-02.

Family health study, Louise Wideroff, PhD, MSHP, Division of Cancer Control and Population Sciences, National Cancer Institute, 2001-02.

Improving the quality of cancer surveillance data for American Indians in the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) Program, Charles L. Wiggins, PhD, Utah Cancer Registry, 2001-02.

Short-term physical and psychosocial impact of the law to ban "drive-through" mastectomies, Michael Greenberg, MD, Peggy Wong, MS, University of Medicine and Dentistry of New Jersey, Merck & Co, Inc., 2001-02.

Pilot test for linking population-based cancer registry with CCG/POG pediatric registries, William E. Wright, PhD, Cancer Surveillance Section, California Department of Health Services, 2000-02.

Multi-state case-control study of childhood brain cancers, Youn Shim, PhD, Agency for Toxic Substances and Disease Registry, 1998-02.

Racial differences in the use of PSA for prostate cancer screening in New Jersey, Timothy Gilligan, MD, 2001.

Analysis of air quality modeling and pediatric cancer at the census tract level, Judith B. Klotz, DrPH, Cancer Epidemiology Services, New Jersey Department of Health and Senior Services, 1999-01.

Endometrial cancer following endometrial ablation, Therese R. Trehaile, MD, Department of Obstetrics/Gynecology, St. Luke's—Roosevelt Hospital, 2000.

Is testicular cancer related to Gulf War deployment? Evidence from a pilot population-based study of Gulf War era veterans and cancer, Paul H. Levine, MD, Epidemiology and Biostatistics, George Washington University, 2000.

Cancer risk following evaluation and treatment for infertility, Rita Oullet-Hellstrom, PhD, SRA Life Sciences, 1999-00.

Cancer incidence among workers exposed to Ethylene Oxide, Kyle Steenland PhD, NIOSH, 1994-00.

Chemical Control, Elizabeth Fire Fighter Study, Peter R. Lenahan, DC, DABCO, University of Medicine and Dentistry of New Jersey, 1999.

Incidence of childhood leukemia near electrified rail lines, Linda S. Erdreich, PhD, Bailey Research Associates, Inc., 1999.

An update of the mortality study of Ciba-Geigy employees at the Toms River plant and a cancer incidence feasibility study, Nalini Sathiakumar, MD, DrPH, University of Alabama at Birmingham School of Public Health, 1997.

Analysis of brain cancer incidence near National Priorities List (NPL) sites, Oleg I. Muravov, MD, PhD, Agency for Toxic Substances and Disease Registry, Division of Health Studies, 1996-97.

Wilm's Tumor study, James Tsai, MD, MPH, Agency for Toxic Substances and Disease Registry, Division of Health Studies, 1996-97.

A retrospective cohort study of antidepressants and breast cancer, Philip S. Wang, MD, DrPH, Division of Pharmacoepidemiology and Pharmacoeconomics, Brigham and Women's Hospital, 1995.

Cooperative relationships in cancer care initiative, Robert L. Comis, MD, Division of Neoplastic Diseases, Jefferson Cancer Center, 1995.

New Jersey pediatric cancer incidence: data quality and trends 1979-1988, Dona Schneider, PhD, Rutgers University, Department of Urban Studies and Community Health, 1988-89.

STUDIES USING NAACCR'S CINA DELUXE DATAFILE

The North American Association of Central Cancer Registries (NAACCR), Inc. has an annual call for data from its registry members. The submitted data are evaluated for their quality and then registry data that meet the standards are compiled into analytic files. One analytic file, Cancer Incidence in North America (CINA) *Deluxe*, is available for cancer surveillance research. Currently, CINA *Deluxe* has data from 1995 through 2002. For NAACCR researchers to be granted access to CINA *Deluxe*, they must apply, obtain approval from the appropriate NAACCR committee, sign the NAACCR Research Agreement form and the Assurance form, and receive NAACCR IRB approval. Also, individual registries must give consent for the specific research project before their data are included in the data set accessible to the researcher. Please visit the NAACCR website (www.naacr.org) for more information about CINA *Deluxe*.

Studies conducted by CES using CINA *Deluxe* are listed below.

Cutaneous malignant melanoma differences in epidemiology between U.S. adults and children, 1995-2002, Lisa Paddock, MPH, Lisa M. Roché, MPH, PhD, 2005.

The incidence of cutaneous malignant melanoma among children (0-14) by race and gender will be compared to adults. NAACCR approved the application.

Comparison of trends in infant neuroblastoma and other cancers in the United States, Lisa M. Roché, MPH, PhD, Pamela Agovino, MPH, Betsy A. Kohler, MPH, CTR, 2004

Temporal trends in the incidence of infant neuroblastomas and other cancers in the United States and Canada between 1995 and 2000 will be evaluated. The analyses are complete and a report is under preparation.

Incidence of cutaneous melanoma in the United States by race, age, and anatomic Sub-site, 1995-2001, Lisa M. Roché, MPH, PhD with the NAACCR CAIR Committee, 2004

The incidence of cutaneous melanoma in the United States by race, age, sex, anatomic site, histologic type and stage for 1995 through 2001 will be examined. The analyses are complete and a report is under revision.

Trends in thyroid cancer histologic sub-types in the United States, Karen Pawlish, ScD, 2004

Temporal trends in thyroid cancer incidence during 1996-2000 were evaluated for differences by histologic subtype, gender, race, age, and region of the country. A report of the findings was accepted by NAACCR and an article has been prepared for submission to a peer-reviewed journal.

Other Studies using CINA DELUXE (with NJSCR data included):

Howe HL, Weinstein R, Alvi R, Kohler B, Ellison JH. Women with multiple primary breast cancers diagnosed within a five year period, 1994-1998. *Breast Cancer Res Treat.* 2005;90(3):223-32.

McLaughlin CC, Wu X, Jemal A, Martin HJ, Roche LM, et al. Incidence of noncutaneous melanomas in the U.S. *Cancer.* 2005;103(5):1000-7.

Wu X, Groves FD, McLaughlin CC, Jemal A, Martin J, et al. Cancer incidence patterns among adolescents and young adults in the United States. *Cancer Causes Control*. 2005;16(3):309-20.

Hotes JL, Ellison LF, Howe HL, Friesen I, Kohler B. Variation in breast cancer counts using SEER and IARC multiple primary coding rules. *Cancer Causes Control*. 2004;15(2):185-91.

Perkins CI, Hotes J, Kohler BA, Howe HL. Association between breast cancer laterality and tumor location, United States, 1994-1998. *Cancer Causes Control*. 2004;15(7):637-45.

Howe HL, Weinstein R, Hotes J, Kohler B, Roffers SD, et al. Multiple primary cancers of the ovary in the United States, 1992-1997. *Cancer*. 2003;97(10 Suppl):2660-75.

Howe HL, Weinstein R, Schult T, Kohler B, Hotes J. Registering multiple primary tumors in central cancer registries. *J Registry Manag*. 2003;30(4):113-6.

Wu SC, Chen VW, Steele B, Roffers S, Klotz JB, et al. Cancer incidence in adolescents and young adults in the United States, 1992-1997. *J Adolesc Health*. 2003;32(6):405-15.

Young JL Jr, Cheung Wu X, Roffers SD, Howe HL, Correa C, et al. Ovarian cancer in children and young adults in the United States, 1992-1997. *Cancer*. 2003;97(10 Suppl):2694-700.

Howe HL, Weinstein R, Schult T, Kohler B, Hotes J. Breast-ovarian cancer syndrome in U.S. women, 1994-1998. Standard Methods Section for NAACCR Breast Cancer Research Group. 2002;1-26.

Appendix I. The New Jersey State Cancer Registry (NJSCR) and Data Confidentiality

Registry Overview

The objectives of the New Jersey State Cancer Registry (NJSCR) are to:

- monitor cancer trends in New Jersey;
- promote scientific research;
- respond to New Jersey residents about cancer concerns;
- educate the public;
- provide information for planning and evaluating cancer prevention and control activities; and
- share and compare cancer data with other states and the nation.

The NJSCR is a population-based cancer incidence registry that serves the entire state of New Jersey, which has a population of over 8.4 million people. The NJSCR was established by legislation (NJSA 26:2-104 et. seq.) and includes all cases of cancer diagnosed in New Jersey residents since October 1, 1978. New Jersey regulations (NJAC 8:57A) require the reporting of all newly diagnosed cancer cases to the NJSCR within three months of hospital discharge or six months of diagnosis, whichever is sooner. Reports are filed by hospitals, diagnosing physicians, dentists, and independent clinical laboratories. Every hospital in New Jersey reports cancer cases electronically. In addition, reporting agreements are maintained with New York, Pennsylvania, Delaware, Florida, Maryland, and North Carolina so that New Jersey residents diagnosed with cancer outside the state can be identified. Legislation passed in 1996 strengthened the Registry by: requiring electronic reporting; requiring abstracting by certified tumor registrars; and establishing penalties for late or incomplete reporting.

All primary invasive and *in situ* neoplasms are reportable to the NJSCR, except cervical cancer *in situ* diagnosed after 1994 and certain carcinomas of the skin. The information collected by the NJSCR includes basic patient identifiers, demographic characteristics of the patient, medical information on each cancer diagnosis (such as the anatomic site, histologic type and stage of disease), first course of treatment and vital status (alive or deceased) determined annually. For deceased cases, the underlying cause of death is also included. The primary site, behavior, grade, and histology of each cancer are coded according to the *International Classification of Diseases for Oncology* (ICD-O), 2nd edition for cancers diagnosed through 2000 and the 3rd edition for cancers diagnosed after 2000. The NJSCR follows the data standards promulgated by the North American Association of Central Cancer Registries (NAACCR), including the use of the Surveillance, Epidemiology, and End Results (SEER) multiple primary rules. An individual may develop more than one cancer. Following the SEER multiple primary rules, patients could therefore be counted more than once if they were diagnosed with two or more primary cancers.

The NJSCR is a member of NAACCR, an organization that sets standards for cancer registries, facilitates data exchange, and publishes cancer data. The NJSCR has been a participant of the National Program of Cancer Registries (NPCR) sponsored by the Centers for Disease Control and Prevention (CDC) since it began in 1994 and is one of the National Cancer Institute's (NCI) SEER expansion registries.

Data Quality

NAACCR has awarded the Gold Standard, the highest standard possible, to the NJSCR for the quality of the data for each year 1995 through 2002. The NJSCR has consistently achieved the highest level of certification for its data since the inception of this award. The criteria used to judge the quality of the data are completeness of cancer case ascertainment, completeness of certain information on the cancer cases, percent of death certificate only cases, percent of duplicate cases, passing an editing program, and timeliness.

Confidentiality

The legislation that established the NJSCR requires that the identity of any person who appears in the NJSCR be maintained as confidential. Any information that could identify an individual such as name, social security number, address, telephone number, birth date or any combinations of factors that could reveal someone's identity cannot be released to anyone. The exception is for *bona fide* research by a qualified researcher with a protocol and confidentiality procedures approved by the Institutional Review Board (IRB). The New Jersey Department of Health and Senior Services strictly adheres to this requirement and there has never been a breach of confidentiality.

Appendix II. Abbreviations

ABLES	Adult Blood Lead Epidemiology and Surveillance
ACS	American Cancer Society
ATSDR	Agency for Toxic Substances and Disease Registry
CDC	Centers for Disease Control and Prevention
CEHS	Consumer and Environmental Health Services
CES	Cancer Epidemiology Services
CINJ	Cancer Institute of New Jersey
CPS	Current Population Survey
CTR	Certified Tumor Registrar
DHAS	Division of HIV/AIDS Services
EDGE	Estrogen, Diet, Genetics and Endometrial Study
EGA	Esophageal and Gastric Adenocarcinoma Study
FHCRC	Fred Hutchinson Cancer Research Center
GEM	Genes and Environment in Melanoma Study
GIS	Geographic Information Systems
HCFA	Health Care Financing Administration
MSKCC	Memorial Sloan-Kettering Cancer Center
NAACCR	North American Association of Central Cancer Registries
NACMR	National AIDS Cancer Match Registry
NCI	National Cancer Institute
NIEHS	National Institute for Environmental Health Sciences
NIH	National Institutes of Health
NIOSH	National Institute for Occupational Safety and Health
NJDEP	New Jersey Department of Environmental Protection
NJDHSS	New Jersey Department of Health and Senior Services
NJSCR	New Jersey State Cancer Registry
NLMS	National Longitudinal Mortality Study
PHRP	Public Health Response Plan
RPU	Renal, Pelvis, and Ureter
SCS	Study of Cancer Survivors
SEER	Surveillance, Epidemiology, and End Results
UMDNJ	University of Medicine and Dentistry of New Jersey
USDOE	U.S. Department of Energy
USEPA	U.S. Environmental Protection Agency
USFDA	U.S. Food and Drug Administration
USGS	United States Geological Survey
VEB	Viral Epidemiology Branch

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