Executive Summary

This report summarizes an investigation of cancer patterns and trends and possible contributing factors in the Centereach, Farmingville, and Selden area of Suffolk County. This investigation was conducted as part of <u>Governor Cuomo's Cancer Research Initiative</u> announced in October 2017, which examined cancer trends and the potential causes of cancer in four regions of the state that have higher cancer rates, based on 2011-2015 data. New York State Department of Health (DOH) researchers investigated this area of Long Island because of elevated numbers of lung, bladder, and thyroid cancers and leukemia.

During the Centereach/Farmingville/Selden Investigation, DOH obtained input from interested members of the community. Researchers met with community members to present the design, goals, and approaches of the investigation. Community members and stakeholders provided input at meetings and emailed additional feedback.

DOH will use these findings to work with partners to enhance community cancer prevention, recommend appropriate screening efforts, and support access to appropriate high-quality health care.

What was Evaluated

Sociodemographic Data

DOH researchers examined data about the population, such as race, ethnicity, age, education, income and occupational patterns, to see if these factors could be related to higher cancer rates. These data were obtained from the US Census.

Cancer Data

For each type of cancer that was elevated (lung, bladder, and thyroid cancers and leukemia), the evaluation of Cancer Registry data included cancer trends over time; age and gender of patients diagnosed with cancer; and characteristics of the cancer, such as type of cells that were cancerous, tumor size, and stage of disease at the time of diagnosis. Cancer data were obtained from the New York State Cancer Registry, which contains information on all cases of cancer diagnosed or treated in New York, as mandated by law.

Behavioral, Healthcare and Occupational Data

DOH researchers reviewed available data about behavioral, healthcare, and occupational factors in the community that are known to be related to cancer. These included available information about smoking, obesity, occupation, and medical care access and practices. Data sources included the Behavioral Risk Factor Surveillance System population survey, New York State inpatient and outpatient hospital discharge data, and the American Community Survey of the US Census.

Environmental Data

DOH researchers worked with the Department of Environmental Conservation (DEC) to review available environmental data to look for unusual patterns or trends in the area compared to other areas of New York State. Data included radon concentrations in indoor air, outdoor air pollutants, drinking water contaminants, industrial and inactive hazardous waste disposal sites, pesticides, and traffic density.

Findings

Sociodemographic Factors

Overall, the Centereach/Farmingville/Selden area had characteristics typical of Suffolk County, and more similar to New York State excluding New York City (NYS excluding NYC), than to the state as a whole (NYS including NYC). The study area, Suffolk County and NYS excluding NYC are less racially diverse than the state as a whole, with a greater percentage of people who are white. Educational levels, percent foreign born, and poverty status in the study area and Suffolk County are similar to those in NYS excluding NYC. The percentage of people in the study area and in Suffolk County who are Hispanic is similar to NYS and higher than in NYS excluding NYC.

Because the sociodemographics of the study area were more similar to those of NYS excluding NYC than to NYS, NYS excluding NYC was used as the comparison area in the analysis of cancer patterns and trends.

Cancer Patterns

Lung Cancer. Numbers of lung cancer cases were elevated for both men and women. Adults ages 65 and older accounted for most of the elevation. Lung cancer rates in this study area were also elevated before the timeframe of this investigation, although elevations were greatest in the 2011-2015 timeframe. The average percent of lung cancers diagnosed at an early stage in the study area was similar to that of NYS excluding NYC. Deaths from lung cancer were greater than expected in the study area, reflecting the high death rates associated with this cancer.

Smoking is the most important risk factor for lung cancer. The greatest percent elevations in the study area were observed for small cell lung cancer, the type most closely related to smoking, and adenocarcinoma, the type that is least strongly related to smoking. Most of the people with lung cancer in the study area had a history of smoking at some time in their lives, and the proportion who had never smoked was smallest for the types most closely associated with smoking.

Bladder Cancer. Bladder cancer was elevated in both men and women in the study area. Older men accounted for most of the excess. Bladder cancer rates in the study area were higher compared to Suffolk County and NYS excluding NYC in 2011-2015 but not in the previous time

period, 2005-2009. Most bladder cancer cases in the study area and in the comparison area were of the papillary cell type.

Thyroid Cancer. Thyroid cancer was elevated in both men and women in the study area, although the percent elevation was greater in men. Numbers of cases were greater than expected in almost all age groups, with the greatest elevations found in young adults, ages 20-49, and adults ages 65 and older. Thyroid cancer incidence in the study area was higher than that in Suffolk County, which itself had incidence higher than in the rest of the state, in both 2011-2015 and in 2005-2009. Most of the excess in 2011-2015 was in the papillary type of thyroid cancer, which accounted for most of the cases, and in tumors that measured 2 centimeters or less. The number of deaths from thyroid cancer was not elevated, but deaths from this cancer are rare.

Leukemia. Most of the excesses in leukemia in the study area were among children who had been diagnosed with acute lymphocytic leukemia (ALL), and adults aged 65 and older who had been diagnosed with chronic lymphocytic leukemia (CLL) and chronic myelogenous leukemia (CML). The excess was not present in the previous time period, 2005-2009, and numbers of cases increased over time. The number of deaths from leukemia in the study area was not elevated.

The excess in childhood leukemia occurred in both boys and girls but was only statistically significant in boys. About half of the children with leukemia were diagnosed in 2015. None of the children with leukemia lived in proximity to each other.

Reporting of cancer cases by health care providers other than hospitals is especially important for cancers for which patients are not always hospitalized, such as chronic leukemias. In the study area and in Suffolk County, there was a greater proportion of chronic leukemia cases reported by independent laboratories compared to NYS excluding NYC.

Behavioral, Healthcare System, and Occupational Factors

Tobacco Use. Lung and bladder cancer are both tobacco-related. Behavioral surveillance data suggested that people age 18 years and older in the study area were more likely to smoke, although the sample size was limited. A review of hospital discharge data indicated that a slightly higher proportion of people in the Centereach/Farmingville/Selden area had records with billing codes related to smoking compared to Suffolk County and NYS excluding NYC. The rate was most elevated in people aged 65 and older.

Obesity. An increased risk of thyroid cancer is modestly associated with obesity. Behavioral surveillance data suggested that the percent of people aged 18 and older in the study area who are obese is greater than in the other areas, although the sample size was limited. A review of hospital discharge data indicated that a slightly higher proportion of people in the Centereach/Farmingville/Selden area had records with billing codes related to obesity

compared to Suffolk County and NYS excluding NYC. The differences were greatest in people over age 50.

Healthcare System. The healthcare system itself can influence the likelihood that someone could be diagnosed with certain cancers, such as thyroid cancer or chronic leukemias, before any symptoms appear. People with health coverage can more easily access healthcare services. Behavioral surveillance data suggested that a greater percentage of Centereach/Farmingville/Selden area residents aged 18-64 had health coverage compared to Suffolk County and NYS excluding NYC, although sample size was limited.

Occupation. Lung and bladder cancers and certain types of leukemia have been associated with various workplace exposures. U.S. Census data on employed persons 16 years and older showed that the study area had a slightly greater percentage of people working in occupations with a higher probability of workplace exposures to elevated levels of hazardous substances compared to persons in NYS exclusive of NYC and NYS as a whole. These occupations included production, construction, installation, maintenance and repair, transportation and firefighting.

Community members and medical professionals reported that many first responders to the World Trade Center attacks in NYC on September 11, 2001 lived in the Centereach/Farmingville/Selden study area. The U.S. Census indicated a slightly higher percentage of people in the study area were firefighters and law enforcement personnel compared to other areas of the state, but these estimates were based on small numbers. The nearby Stony Brook University Hospital conducts medical monitoring of World Trade Center rescue and recovery workers. Researchers reviewed available studies of three groups of World Trade Center rescue and recovery workers. These populations were 81-100% men. The studies showed that World Trade Center rescue and recovery workers had an elevated rate of thyroid cancer, with numbers of cases two to three times those expected. The higher incidence of thyroid cancers in the period directly after the attacks was believed to be due to the enhanced medical surveillance that these workers received.

Environmental Factors

Outdoor Air Pollution. Researchers reviewed air quality monitoring and computer modeled data for air pollutants and air toxics. The available data suggest that people living in the Centereach/Farmingville/Selden study area are not exposed to unusual levels of air pollution and the overall cancer risk associated with air pollution levels is low.

Radon in Indoor Air. Radon is the second leading cause of lung cancer after smoking. Researchers evaluated radon testing frequency and compared average concentrations in the Centereach/Farmingville/Selden area to EPA's recommended action level, as well as other areas of the state. This evaluation showed that radon is not a significant environmental exposure in the study area and that radon tests were generally lower than those for NYS, NYS excluding NYC and Suffolk County.

Drinking Water Quality. Researchers reviewed public drinking water data to identify potential drinking water exposures. The study area is served by the Suffolk County Water Authority, which services all of Suffolk County through a network of groundwater wells. The review showed no exceedances of drinking water standards in the public water supply system for cancer-related contaminants during the time period that data were available. Review of available data for unregulated contaminants, based on the United States Environmental Protection Agency's (EPA) unregulated contaminant monitoring rule program, showed that the public water delivered within the study area had levels below EPA reference concentrations.

Industrial and Inactive Hazardous Waste Disposal Sites. Researchers reviewed information about existing sites in the Centereach/Farmingville/Selden study area. Local residents also raised concerns about the Northville pipeline, which runs through the study area, and about a gasoline spill at the Northville Terminal in East Setauket. The existing information did not suggest that any contamination from the Northville pipeline, the gas spill at the Northville Terminal or any other sites is causing widespread exposures in the study area.

Pesticides. DOH researchers reviewed the available data on commercial pesticide applications to assess whether unusual patterns exist in the Centereach/Farmingville/Selden study area. Commercial pesticide use in the ZIP Codes of the study area was compared to an area of Suffolk County running from the eastern border of the Town of Brookhaven west to the Nassau County border. The evaluation showed that commercial pesticide applications in ZIP Codes corresponding to the study area were smaller in quantity per square mile and per household than in the comparison area. Almost all of the ingredients applied were in products used to keep lawns green and free from weeds and insects.

Traffic. Researchers evaluated the impacts of traffic as part of the outdoor air and emissions data evaluation described above. Researchers also reviewed available data about how impacts of traffic pollution compare with other areas of NYS. In general, the Centereach, Farmingville, Selden had a similar percentage of people living near roadways as NYS excluding NYC.

Discussion

Lung Cancer

Although lung cancer rates have declined in recent years, lung cancer remains the leading cause of death from cancer for both men and women in the U.S. Cigarette smoking is still the most important cause of lung cancer, accounting for 80 to 90 percent of all cases. Exposure to radon, a naturally occurring colorless, odorless gas, is the most important environmental risk factor for lung cancer. Other important risk factors include secondhand smoke, radiation to the chest from medical procedures, family history, some air pollutants, and possibly diet. Workplace exposures to asbestos and arsenic, as well as chloromethyl ethers, beryllium, chromium, cadmium, nickel, silica, diesel exhaust, and soot, are also associated with lung cancer.

Data suggest that people living in the study area were more likely to use tobacco than people in the comparison areas. The study area had slightly higher percentages of people working in occupations where workplace exposures linked to lung cancer were more likely, although data were insufficient to evaluate possible exposures. Results of radon testing in area homes indicate that concentrations are lower than in comparison areas. Results from the environmental data review did not show any environmental exposures that could explain the elevated incidence of lung cancer in the study area.

Bladder Cancer

The most important risk factor for bladder cancer is smoking. It is estimated that smoking is responsible for up to 50% of all bladder cancer cases. Workplace exposures are also important in bladder cancer and may account for as many as 20% of cases. Elevated risks have been found among rubber, plastic, dye, and metal workers, hairdressers, painters, and bus and truck drivers. Specific substances linked to bladder cancer in these occupations include aromatic amines (used in dyes), diesel exhaust, and polycyclic aromatic hydrocarbons (formed during the incomplete burning of coal, oil, gas, wood, or other organic substances). Bladder cancer has been associated with exposures to high levels of arsenic in the drinking water, and there is some evidence that it may be related to consumption of water disinfection byproducts (trihalomethanes).

Data suggest that people living in the study area were more likely to use tobacco than people in the comparison areas. The study area had slightly higher percentages of people working in occupations where workplace exposures were more likely compared to NYS excluding NYC and Suffolk County, although data were insufficient to evaluate possible exposures. A review of drinking water testing data in the study area showed no evidence that exposures to contaminants in drinking water that have been linked to bladder cancer contributed to the elevated incidence of this cancer. Results from the environmental data review did not show any environmental exposures that could explain the elevated incidence of bladder cancer in the study area.

Thyroid Cancer

Many recent articles in the scientific literature have concluded that the primary risk factor for thyroid cancer is medical system practices. These include diagnostic imaging with a neck ultrasound, or another form of imaging in the absence of symptoms. It has been estimated that 70-80% of female thyroid cancer cases and 45% of male thyroid cancer cases diagnosed in the U.S. fall into this category. Other risk factors for thyroid cancer include exposure to ionizing radiation such as radiation treatments for a previous condition, a family history of the disease, and certain hereditary conditions. Obesity has been associated with a relatively small increased risk of thyroid cancer.

The elevations in papillary tumors and tumors less than 2 centimeters in the study area are consistent with national trends. Papillary carcinomas are slow growing and rarely fatal. While

larger tumors might be found as a noticeable lump that would cause a patient to seek medical care, smaller tumors may not produce any symptoms and may only be detectable by medical techniques. The finding that a greater proportion of study area residents may have health care coverage suggests that they would have greater opportunity to have medical imagery and other examinations performed. There may also be differences in contact with the healthcare system in people with coverage, and in local practices of medical imaging, use of sensitive diagnostic techniques, and clinical examination.

Rescue and recovery workers at the World Trade Center site have an elevated rate of thyroid cancer, and the location of medical monitoring services in a nearby community suggests that many of these workers may live in the study area. The greater elevation of thyroid cancer in men than in women in the study area is also consistent with a contribution by World Trade Center workers. The probability of any one worker being diagnosed with thyroid cancer in a five-year period, even at an elevated rate, however, is small, and any World Trade Center first responders living in the area would likely have had a very small influence on the overall higher rates of thyroid cancer.

Data indicate that a greater proportion of people in the study area were obese compared to Suffolk County and NYS excluding NYC. Since the differences in percent obese were only of moderate size and obesity is only associated with a small increased risk of thyroid cancer, this would only have a very small influence on the higher rates of thyroid cancer in the area.

Results from the environmental investigation did not show any unusual environmental exposures that could explain the elevated incidence of thyroid cancer in the study area.

Leukemia

There are four major types of leukemia, distinguished by how quickly the disease progresses (acute vs. chronic), and the type or types of blood cells affected. Acute lymphocytic leukemia (ALL), the most frequently diagnosed type in children, has been associated with certain genetic syndromes such as Down syndrome and exposure to ionizing radiation. Parental exposures and conditions around the time of birth may be important in children, and numerous occupational exposures have been investigated in adults. Acute myelogenous leukemia (AML) is the second most frequently diagnosed type of leukemia in adults, but also affects children and adolescents. Established risk factors include genetic syndromes such as Down syndrome, exposure to ionizing radiation, several drugs used in chemotherapy, occupational exposures to benzene and possibly other chemicals, and smoking. Chronic lymphocytic leukemia (CLL) is the most frequently diagnosed type of leukemia in adults, but rarely occurs in children. The only well-established risk factor for CLL is a family history of the disease. Chronic myelogenous leukemia (CML) occurs mostly in older adults but can affect children and adolescents. Exposure to ionizing radiation is a risk factor, and it may also be related to smoking, certain types of chemotherapy and possibly certain occupational exposures.

Even after intensive investigation, the causes of many reported clusters of childhood cancers remain unknown. These occurrences are often limited in time. Since about half of the cases in the study area occurred in the last year of the time period studied, it is not known whether the increased incidence has continued.

The elevated number of cases of chronic leukemias, especially among older adults, could be due to greater reporting by independent clinical laboratories in the study area. A higher percentage of people with healthcare coverage may also indicate that people in the study area may have greater contact with the health care system and may be more likely to have routine testing that would identify this cancer.

Results from the environmental investigation did not show any unusual environmental exposures that could explain the elevated incidence of leukemia in the study area.

Conclusions

- It is likely that higher rates of current and former tobacco use contributed to the elevated rates of lung and bladder cancer in the Centereach/Farmingville/Selden area.
- Available information did not indicate any particular occupation or workplace that may have played a role in the cancer elevations, although the scientific literature does indicate that exposures to hazardous substances in the workplace can be important for lung and bladder cancers and some types of leukemia.
- Most of the increased incidence of thyroid cancer seen nationally in recent years is likely due to the increased detection of small papillary tumors by medical imaging and other diagnostic techniques, and this likely played a major role in the Centereach/Farmingville/Selden area. Increased surveillance would account for elevated diagnoses of thyroid cancers among people who had spent time in rescue and recovery efforts at the World Trade Center site, although the contribution of these people to the overall excess would likely be small. An increased prevalence of obesity in the area could have also made a small contribution to the increased incidence of thyroid cancer.
- The investigation uncovered no factors that might account for the elevated number of childhood leukemias. Since about half of the cases occurred in the last year of the time period studied, the DOH will continue to monitor the incidence of childhood leukemia in the Centereach/Farmingville/Selden area.
- The elevated number of cases of chronic leukemias, especially among adults 65 years and older, might be related to greater cancer reporting by independent laboratories in the area.
 It might also be related to medical care factors such as healthcare coverage or greater contact with the health care system.
- Environmental factors evaluated in this study, including rad on concentrations in indoor air, environmental contaminants in outdoor air and in drinking water, industrial and inactive hazardous waste disposal sites, pesticides, and traffic density, show no unusual environmental exposures that could explain the elevated incidence of certain cancers in the study area.

Recommendations

The recommendations below are divided into two main sections: 1) recommended actions to address the specific cancers that were elevated in the Centereach/Farmingville/Selden study area, and 2) recommended actions to address all cancer types throughout New York State. Many of the recommended activities are aligned with two existing State plans that address cancer prevention and control, the *New York State 2018-2023 Comprehensive Cancer Control Plan*, and the *New York State Prevention Agenda 2019-2024*.

Recommended Actions Based on Specific Cancers Elevated in the Centereach/Farmingville/Selden Study Area

Health Promotion and Cancer Prevention

Tobacco Prevention

Recommendation: Prevent initiation of tobacco use, including combustible tobacco and electronic vaping products, by youth and young adults.

Recommendation: Promote tobacco use cessation, especially among populations disproportionately affected by tobacco use including: low socioeconomic status; frequent mental distress/substance use disorder; lesbian, gay, bisexual and transgender; and disability.

Recommendation: Eliminate exposure to secondhand smoke and exposure to secondhand aerosol/emissions from electronic vapor products.

Healthy Nutrition and Physical Activity

Recommendation: Promote healthy eating and food security by:

- Increasing access to healthy and affordable foods and beverages,
- Increasing skills and knowledge to support healthy food and beverage choices,
- Increasing food security, and
- Increasing awareness of DOH sportfish advisories to promote healthier fish consumption choices while reducing chemical exposures (https://www.health.ny.gov/environmental/outdoors/fish/health_advisories/).

Recommendation: Increase physical activity by:

- Improving community environments that support active transportation and recreational physical activity for people of all ages and abilities,
- Promoting school, child care, and worksite environments that support physical activity for people of all ages and abilities, and
- Increasing access, for people of all ages and abilities, to safe indoor and/or outdoor places for physical activity.

Cancer Screening and Early Detection

Lung Cancer Screening

Recommendation: Educate men and women who meet the criteria for lung cancer screening about the benefits and risks of screening to help them make informed decisions.

Recommendation: Healthcare providers need tools and support to engage with patients who may benefit from screening, and facilities adopting lung cancer screening programs should be following national guidelines for a quality program.

Thyroid Cancer Screening

Recommendation: The U.S. Preventive Services Task Force recommends *against* screening for thyroid cancer in asymptomatic adults. Educate the public and healthcare providers about recommendations *against* thyroid cancer screening in average risk, asymptomatic adults.

Healthy and Safe Environment

Radon Testing and Mitigation

Recommendation: Improve the public's awareness about the relationship between indoor radon exposure and lung cancer by conducting outreach and education about building testing and remediation. Promote the DOH's free and low-cost radon test kit programs, provision of test kits at half price to schools and daycares, and free test kits as part of the DOH's Healthy Neighborhoods Program and other grant-funded programs.

Recommendation: Explore local level policy and/or code adoption to require radon resistant construction in high radon areas.

Recommendation: Increase the number of health care providers that ask their patients if they have had their homes tested for radon and refer them to the DOH, as needed. Add radon testing questions to routine electronic medical questionnaires.

Radiation from Medical Imaging

Recommendation: Increase awareness of such programs as NYS's "Image Gently" and the national "Image Wisely" campaigns that educate physicians and the public about potential radiation exposure from CT scans and X-rays in both children and adults.

Safety in the Workplace

Recommendation: Develop targeted occupational safety and health training programs for employers and workers in high-risk jobs.

Recommendation: Incorporate industry and occupation into electronic health records and other patient-oriented databases.

Recommended Actions to Reduce the Burden of All Cancers Statewide

Below are highlights of what individuals can do and what DOH and its partner organizations are doing. For more information on activities, by type of organization, that New Yorkers can do to help reduce the burden of cancer, see:

https://www.health.ny.gov/diseases/cancer/consortium/docs/2018-2023 comp cancer control plan.pdf#page=62.

For All New Yorkers

The following are things that all individuals can do to reduce their risk of cancer:

- If you use tobacco, quit. If you don't use tobacco, don't start.
- Eat nutritious meals that include fruits, vegetables and whole grains.
- Get moving for at least 30 minutes a day on five or more days each week.
- Use sunscreen, monitor sun exposure and avoid tanning salons.
- Limit alcohol use.
- Get cancer-preventive vaccines such as hepatitis B and HPV.
- Learn your family health history (if possible) and discuss with your healthcare provider whether genetic counseling might be right for you.
- Discuss what cancer screening tests might be right for you with your healthcare provider.
- Test your home for radon.
- For women of child-bearing age, know the benefits of breastfeeding and, if possible, breastfeed infants exclusively for at least the first six months of life.

For NYS Department of Health and Partner Organizations

Cancer Surveillance: The New York State Cancer Registry (NYSCR) was designated by the CDC (Centers for Disease Control and Prevention) as a Registry of Excellence and has achieved Gold-level certification since 1998. In 2018, the NYSCR became a member of the National Cancer Institute's Surveillance, Epidemiology and End Results Program (SEER), the nation's preeminent source of population-based cancer data.

Recommendation: Continue to meet the highest cancer registry standards for timeliness, completeness and quality of data, and make these data available to researchers, clinicians, public health officials, legislators, policymakers, community groups and the public.

Environmental Health: DOH's Center for Environmental Health (CEH) works collaboratively with other agencies including the NYS Department of Environmental Conservation, the federal Environmental Protection Agency, the Centers for Disease Control and Prevention (CDC), and the Agency for Toxic Substance and Disease Registry (ATSDR). CEH programs evaluate health

effects associated with environmental exposures, develop policies, and maintain a variety of programs to reduce and eliminate exposures.

Recommendation: Continue to identify and assess potential exposures throughout the state and take action to reduce those exposures. NYS will continue to support programs to promote and maintain clean air, clean water and reduce human exposures to environmental hazards, with particular attention to the needs of environmental justice communities.

Recommendation: Promote awareness of programs and initiatives to reduce environmental hazards in our communities.

Statewide Initiatives: The overarching goals of cancer prevention and control efforts in New York State are detailed in two State plans, the *New York State 2018-2023 Comprehensive Cancer Control Plan*, and the *New York State Prevention Agenda 2019-2024*.

Recommendation: Continue to work with partners to implement cancer-related initiatives.

- More details about the NYS Comprehensive Cancer Control Plan can be found at: https://www.health.ny.gov/diseases/cancer/consortium/index.htm.
- More details about the NYS Prevention Agenda can be found at: https://www.health.ny.gov/prevention/prevention_agenda/2019-2024/.