



**Department
of Health**

Governor Cuomo's Cancer Research Initiative

Staten Island Cancer Incidence Investigation

October 2019

Today's Presentation

- Introduction & Background on the Initiative
- Approach
- Findings
- Limitations
- Conclusions
- Recommendations
- Acknowledgments
- Questions

Introduction & Background on the Initiative

Purpose of the Governor's Cancer Research Initiative

- Learn more about the patterns of cancer in New York
- Identify any reasons for these patterns
- Enhance prevention and screening efforts
- Support access to appropriate high-quality health care services

Selection of Four Study Areas

- **Warren County:** highest overall cancer rate in NYS, 2011-2015
- **Staten Island:** highest overall cancer rate among 5 NYC boroughs, 2011-2015
- **East Buffalo/West Cheektowaga:** where six high clusters overlap (colorectal, esophagus, kidney, lung, oral, prostate)
- **Centereach, Farmingville, Selden:** where four high clusters overlap (bladder, leukemia, lung, thyroid)

Location of the Four Study Areas in the Governor's Cancer Research Initiative



Timeline and Milestones

October 2017: initiative announced in Warren County and Staten Island

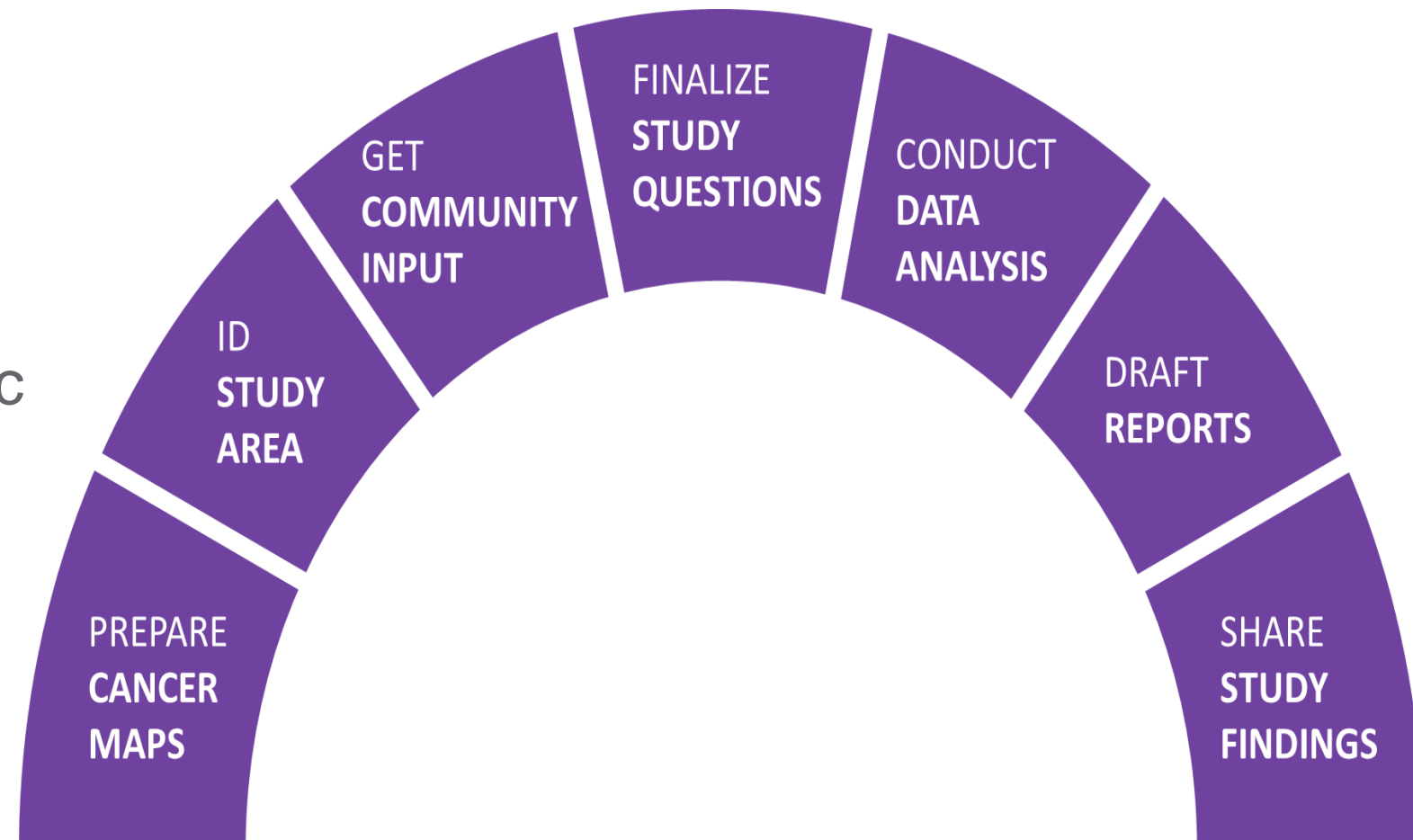
October – June 2018: other two study areas identified; cancer maps updated

July 2018: regional meetings held with elected officials, stakeholders and public

November 2018: study update posted on DOH website and emailed to attendees of July meetings

July 2018 – August 2019: data analyzed and reports drafted

October - November 2019: reports released; regional webinars and meetings to present and discuss results



Sociodemographics

- Staten Island is demographically more similar to NYS excl. NYC than to the other four boroughs of NYC.

Key demographic and socioeconomic characteristics by region, American Community Survey, 2011-2015

Characteristics		Staten Island	Other 4 Boroughs	NYS excl. NYC	NYS
Race (%)	White alone	75.3	41.4	80.5	64.6
	Black alone	10.5	25.3	8.9	15.6
	A/PI/AI/AN	8.3	14.3	4.2	8.4
	Other	5.8	19.0	6.3	11.4
Ethnicity - Hispanic (%)		17.8	29.6	10.5	18.4
High School/College Diploma, 25+ (%)		88.7	79.9	89.7	85.6
Foreign Born (%)		21.6	38.2	11.4	22.5
Income Below Poverty Level (%)		12.5	21.1	11.9	15.7

A/PI/AI/AN: Asian, Pacific Islander, American Indian, Alaska native

Staten Island Cancer Rates in 2011-2015

	Age-adjusted incidence rate per 100,000	Percent difference: Rest of NYC	Percent difference: NYS excl. NYC
All sites	524.9	17%	3%
Breast (females only)	134.8	12%	-2%
Prostate (males only)	125.4	-7%	-3%
Lung	64.7	35%	-4%
Colorectal	43.3	8%	9%
Uterus (females only)	35.4	13%	14%
Thyroid	33.2	67%	69%
Bladder	26.0	57%	-5%
Non-Hodgkin Lymphoma	24.1	22%	8%
Kidney	18.9	36%	5%
Leukemia	18.5	36%	3%



Selection Criteria

- The incidence rate for the cancer type was higher on Staten Island than in the other four boroughs combined and in NYS excluding NYC.
- The elevated incidence rate was statistically significant.
- An elevation must be high enough that it warrants targeted public health intervention.

Type of Cancer Selected for Study – Thyroid Cancer

Age-adjusted cancer incidence rates¹ for thyroid cancer, Staten Island vs. comparison areas, 2011-2015

Sex	Rate			Percent difference	
	Staten Island	Other 4 Boroughs	NYS excl. NYC	Other 4 Boroughs	NYS excl. NYC
Male & Female	33.2	19.9	19.6	66.9*	69.5*
Male	18.3	9.6	10.3	90.3*	77.4*
Female	47.0	29.0	28.6	61.9*	64.1*

¹ Rates are per 100,000 and age-adjusted to the 2000 US Standard population.

* Statistically significantly higher

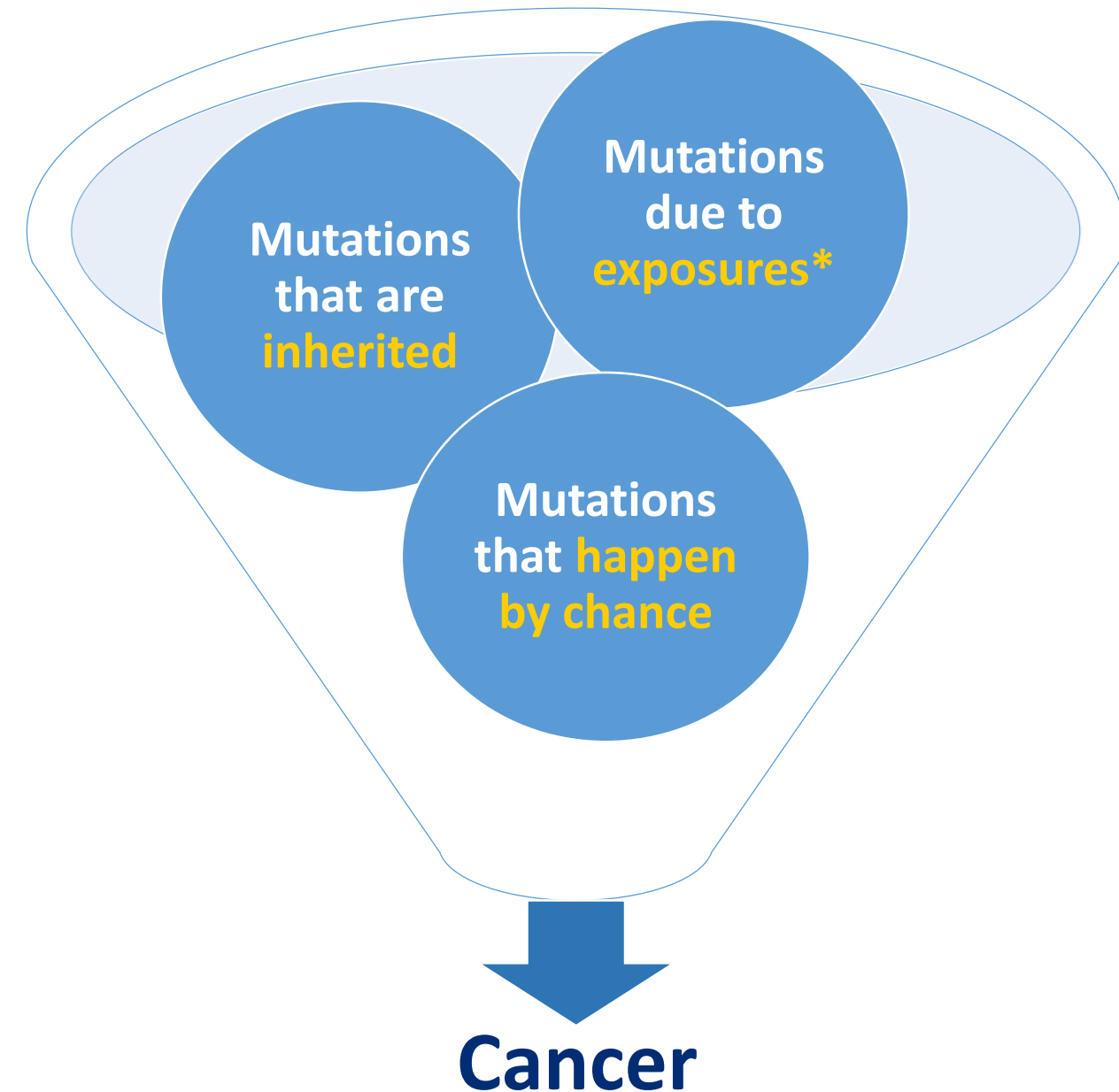
Approach

Approach

- Literature review on the risk factors for thyroid cancer
- Evaluation of:
 - ✓ Trends and patterns for thyroid cancer in study areas compared to other areas of NYS
 - ✓ Environmental factors that were unusual in study areas compared to other areas of NYS
 - ✓ Behavioral, healthcare and occupational factors that were unusual in study areas compared to other areas of NYS
- For most factors, no information was available on whether the people with cancer actually had or were exposed to this factor
- Study cannot draw definitive conclusions about what caused the elevations in cancer but may suggest factors that contributed to elevations

Background: What causes cancer?

- Cancer begins when the genes in a cell are damaged (mutations) and the cells grow out of control.
- Mutations may be ones you are born with (inherited), or that happen due to chance when cells grow and divide, or that happen after exposure to a cancer-causing substance.
- Several mutations may need to occur in a person to lead to cancer.
- Some people with several risk factors may never develop cancer, while other people with no known risk factors do.



**Exposures: UV radiation, smoking, alcohol, certain chemicals, etc.*

Background: What causes cancer?

- Different cancers have different causes and risk factors.
- Anyone can get cancer; there are many factors that affect a person's chances of getting cancer.
- Some cancer risk factors can be changed, and others cannot:
 - ✓ Family history, genetics, race and ethnicity
 - ✓ Lifestyle factors: smoking, unhealthy diet, excessive alcohol, physical inactivity
 - ✓ Other exposures: Ultraviolet radiation from sunlight and indoor tanning devices, x-rays, certain chemicals that may be found in the air, water, food, drugs and workplace
 - ✓ Chronic inflammation, infectious agents, immunosuppression
 - ✓ Often multiple interacting factors

Findings - Examination of Elevated Cancer Incidence

Findings: Thyroid Cancer Risk Factors

- Medical system (e.g. screening for thyroid cancer in the absence of symptoms, finding thyroid cancer when people have tests for other problems)
 - ✓ There is strong consensus in the scientific literature that the primary factors for increased thyroid cancer diagnosis relate to medical system practices, such as the overuse of thyroid cancer screening and incidental findings from surgery or testing for other reasons.
 - ✓ These practices do not cause cancer, but detect subclinical thyroid tumors that pose no actual health risk. Results from autopsy studies (of populations other than Staten Island) suggest that over 10% of people have thyroid cancer at the time of death.

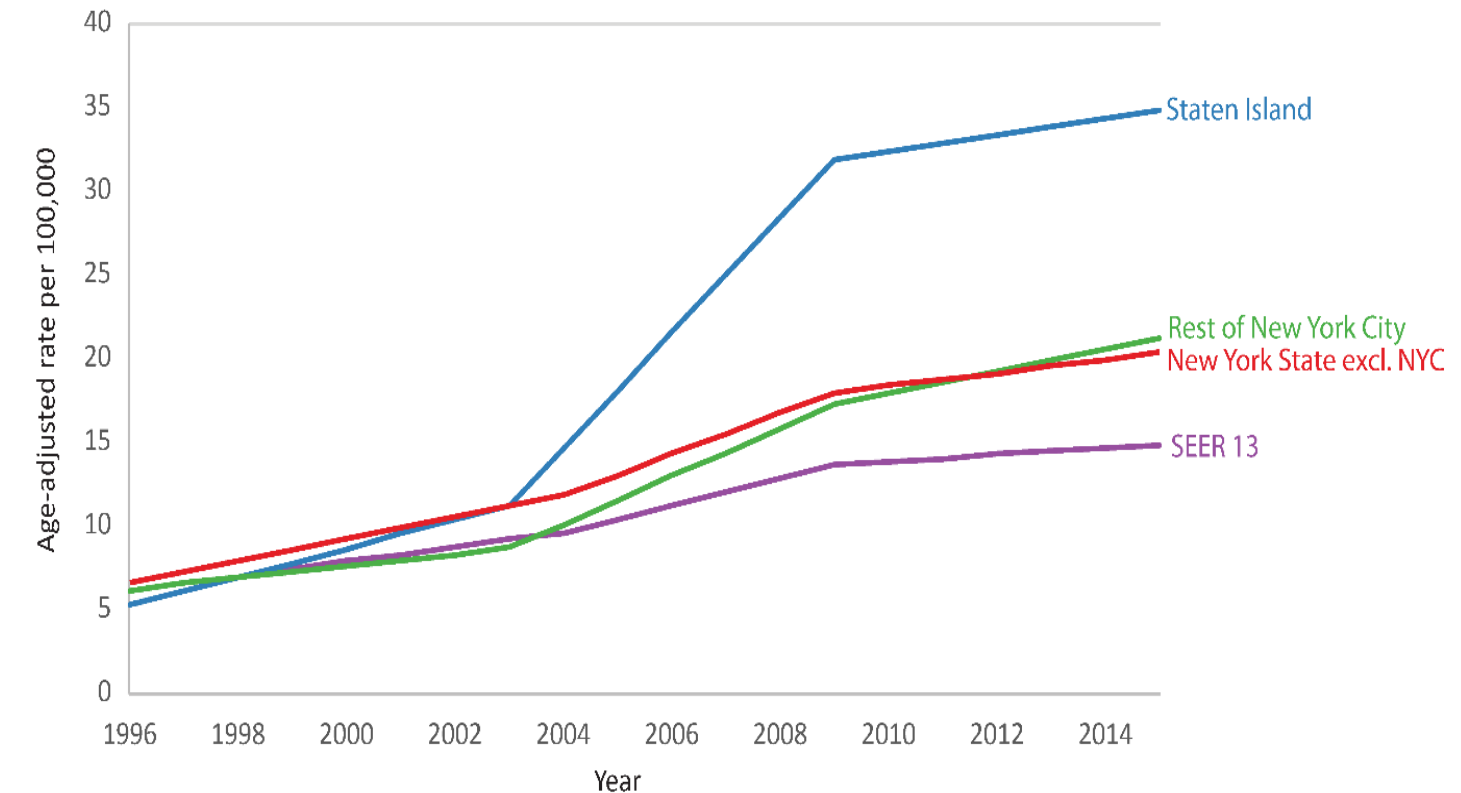
Findings: Thyroid Cancer Risk Factors

- Exposure to ionizing radiation or radioactive materials, particularly at a young age (e.g. from X-rays, CT scans, treatments for a previous cancer, emissions from nuclear accidents)
- Diet low in iodine - follicular subtype of thyroid cancer
- Excess body fat
- Hereditary conditions
- Family history of thyroid cancer

Findings: Incidence Trend

- In the 1990s, incidence of thyroid cancer on Staten Island was similar to the rest of NYC, NYS excl. NYC, and the US.
- Beginning in 2003, incidence rates on Staten Island began to increase much more rapidly than in the rest of NYS.
- Since 2008, the increase in incidence on Staten Island has slowed, and the gap between Staten Island and the rest of NYS has remained constant.

Smoothed age-adjusted thyroid cancer incidence rates¹, Staten Island and comparison areas, 1996-2015.



¹ Rates are per 100,000 and age-adjusted to the 2000 US Standard population.

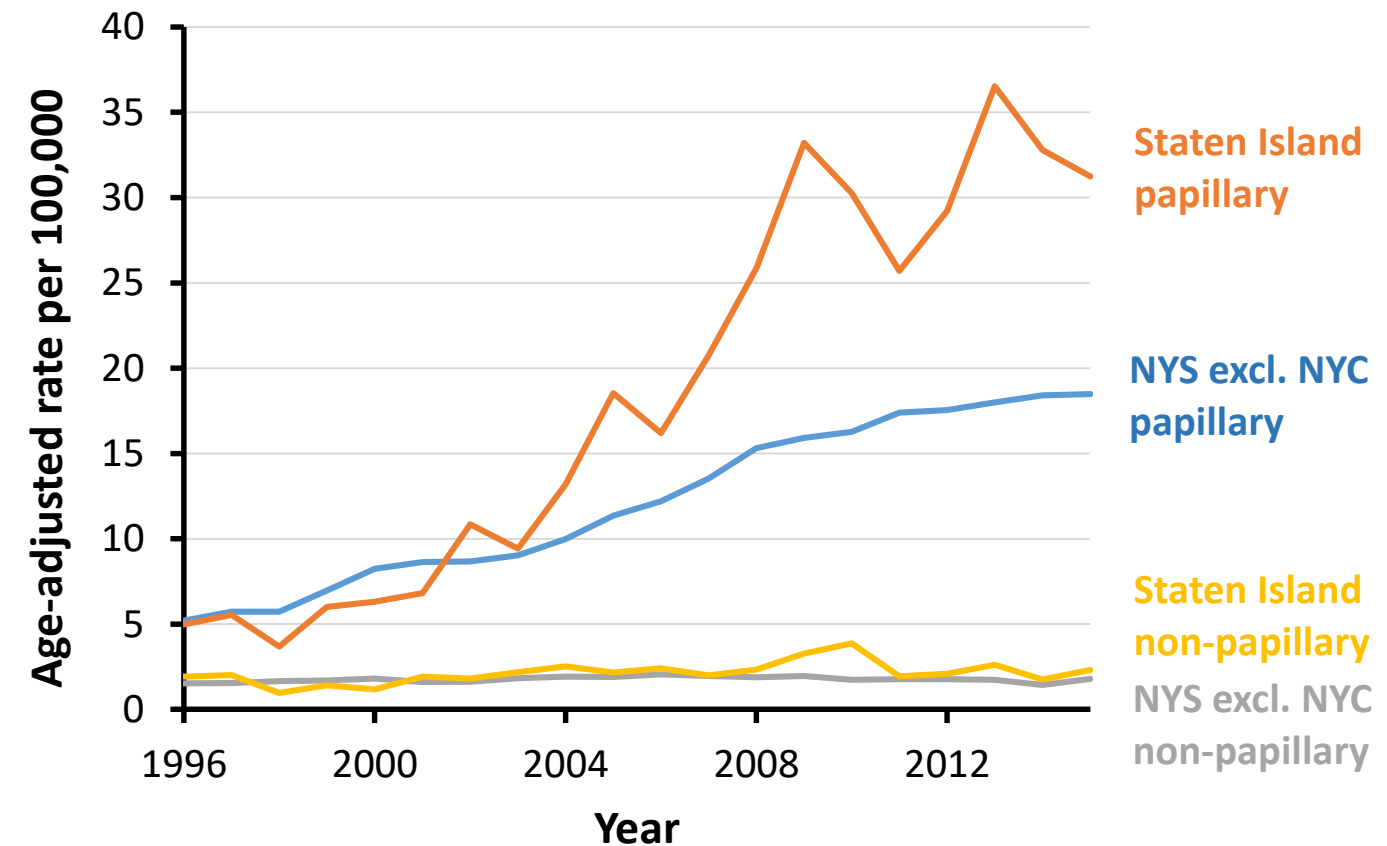
“SEER 13” refers to 13 states and cities belonging to the SEER program of the National Cancer Institute, which is a proxy for national rates.

Findings: Tumor Characteristics

• Cell Type

- ✓ Papillary carcinoma accounts for about 93% of the cases in NYS.
- ✓ This cancer tends to grow very slowly and is rarely fatal.
- ✓ Nearly all the increase in thyroid cancer has been of the papillary subtype.

Thyroid cancer incidence rates¹ by tumor type, Staten Island and NYS excluding NYC, 1996-2015



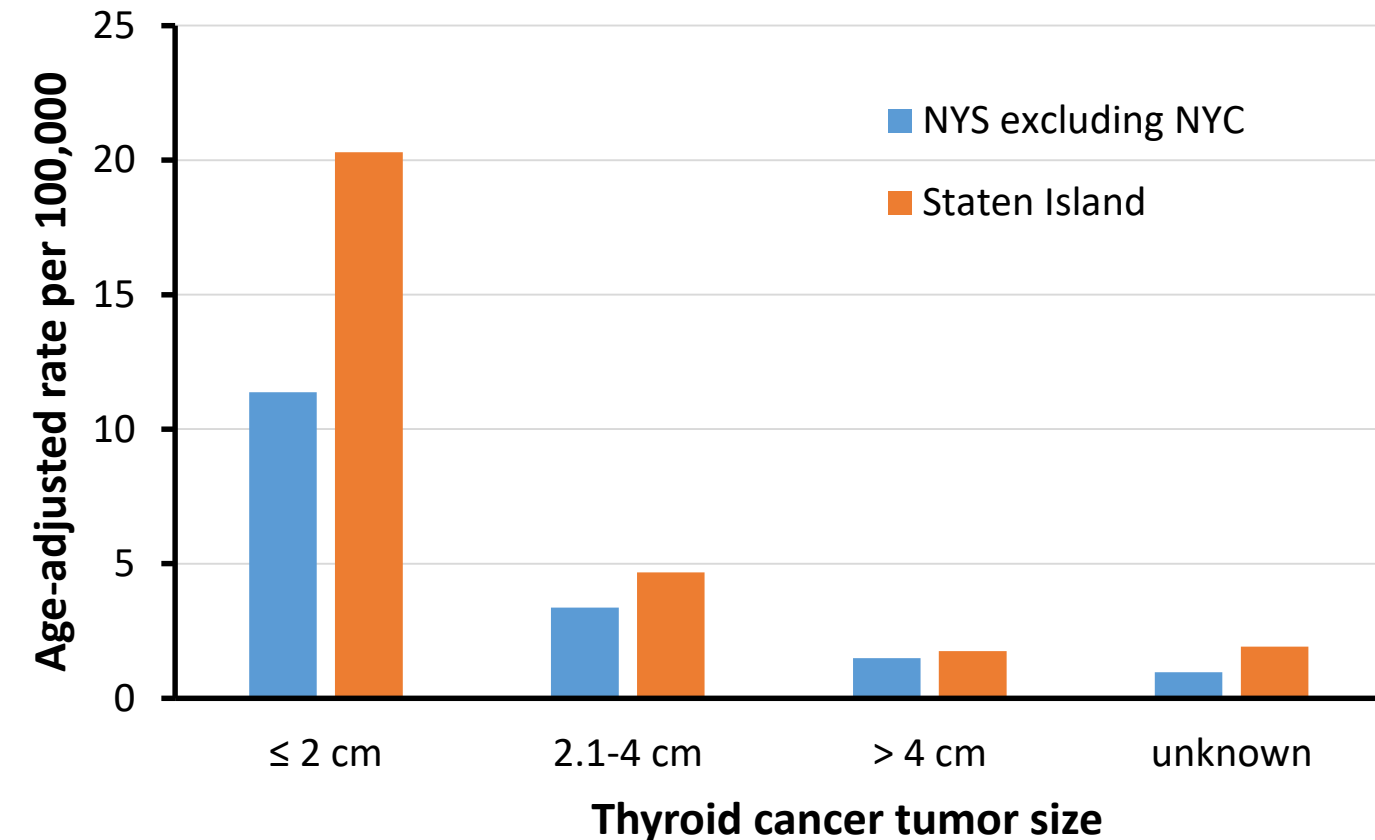
¹ Rates are per 100,000 and age-adjusted to the 2000 US Standard population.

Findings: Tumor Characteristics

• Tumor Size

- ✓ 85% of the difference in rates between Staten Island and NYS excl. NYC is accounted for by tumors ≤ 2 centimeters.
- ✓ Nearly all the increase in thyroid cancer incidence on Staten Island were subclinical tumors, which do not have readily observable symptoms.

Thyroid cancer rates¹ by tumor size, Staten Island and NYS excluding NYC, 2004-2015



¹ Rates are per 100,000 and age-adjusted to the 2000 US Standard population.

Findings - Review of Environmental Data

Background: Environmental Causes of Cancer

- Certain chemicals/agents are known to be human carcinogens at high exposure levels over a long period of time.
 - ✓ e.g., radon and lung cancer, vinyl chloride and liver cancer, asbestos and mesothelioma
 - ✓ Most knowledge on links between exposures to toxic substances and cancer (i.e., carcinogenicity) comes from occupational studies and laboratory studies of animals.
- Less certainty on health risks associated with exposures to chemicals at typical levels found in the environment.
 - ✓ Carcinogens are present in the environment, **but** environmental exposures are generally substantially lower than occupational exposures or laboratory studies.

Background: Environmental Causes of Cancer

- Environmental exposures are difficult to study because of:
 - ✓ Long cancer latency,
 - ✓ Mobile human populations, and
 - ✓ Many factors that affect a person's chances of getting cancer.
- Smoking, poor diet, obesity and lack of physical activity are thought to be more important risk factors for some types of cancers.
- Research continues to help us better understand:
 - ✓ Impact of lower levels of exposure on cancer burden,
 - ✓ How mixtures of toxic substances influence cancer risk, and
 - ✓ Interaction of genetic factors and personal behaviors with environmental factors.

Background: Environmental Exposure

- Exposure is contact. People can be exposed to environmental contaminants by
 - ✓ Breathing them in (inhalation),
 - ✓ Consuming them in food or water (ingestion), and
 - ✓ Getting them on their skin (dermal contact).
- *Without exposure, there can be no health effects.*

Findings: Outdoor Air Pollution

- In the 2011 & 2014 NATA, modeled estimates showed only five known/probable carcinogens were above the one-in-one-million cancer risk level. They are benzene, acetaldehyde, 1,3-butadiene, carbon tetrachloride, and formaldehyde.
 - ✓ For each of these five hazardous air pollutants, Staten Island was not unusual in comparison to other areas. Staten Island had similar or lower risks than the rest of NYC, similar or higher risks than NYS excl. NYC, and similar risks to NYS.
 - ✓ None of these chemicals has been associated with thyroid cancer.

Findings: Radon in Indoor Air

- No studies have found an association between radon and thyroid cancer.
- Radon does not appear to be a significant environmental exposure on Staten Island.
- Since results can vary from home to home, values of radon in tested homes do not necessarily represent other homes in the neighborhood.

Summary of Radon Tests* in Staten Island, New York City, New York State excluding New York City, and New York State, 1987-2015

Area	Mean Conc. (pCi/L)	% test results ≥ 4 pCi/L
Staten Island	1.49	7.5
NYC	1.62	6.7
NYS excl. NYC	6.70	34.3
NYS	5.99	33.8

* *excluding tests performed at schools and day care centers*

Findings: Public Drinking Water Quality

- **Safe Drinking Water Information System (SDWIS)**
 - ✓ The Catskill/Delaware sources supply all of Staten Island's water.
 - ✓ Analysis revealed no maximum contaminant level violations from 1997 through July 2018.
- **3rd Unregulated Contaminant Monitoring Rule (2013-2015) Occurrence Data**
 - ✓ Under UCMR 3, 30 contaminants in larger public water systems were monitored.
 - ✓ The UCMR 3 contaminants detected in Staten Island public water systems were all below USEPA reference levels.

Findings: Industrial and Inactive Hazardous Waste Disposal Sites

- **The Fresh Kills Landfill**

- ✓ ATSDR 2000: while chemicals were present, they presented little to no public health hazard.
- ✓ NYC DOHMH 2000: “these analyses do not indicate consistent evidence of elevated cancer rates specific to the landfill area”
- ✓ NYC DOHMH 2019: (not released yet)

Findings: Industrial and Inactive Hazardous Waste Disposal Sites

- The Fresh Kills Landfill

- ✓ Engineered cover system to:
 - prevent water from entering into the landfill
 - prevent landfill gas from leaving the landfill
 - protect the public and wildlife from contact with landfill waste
 - Final cover of last section is well underway – expected to be completed in 2021

Findings: Industrial and Inactive Hazardous Waste Disposal Sites

- **The Fresh Kills Landfill - Landfill Closure Components**

- ✓ Leachate collection and treatment to prevent impacts to ground water and surface waters. Collection continues for two landfill sections, and the onsite wastewater treatment plant continues to treat the collected leachate prior to discharge to the Arthur Kill. Collection was determined to be no longer necessary for two landfill sections.
- ✓ Landfill gas collection to minimize fugitive emissions to the environment. The collected gas is piped to the onsite landfill gas purification plant where it is readied for utility customer use or the gas is destroyed by the onsite flares.
- ✓ Monitoring systems have been put in place to ensure the landfill gas and leachate collection systems are properly functioning.
- ✓ Through its Freshkills Park Project, the City of New York is transforming the Landfill into a new public park.

Findings: Industrial and Inactive Hazardous Waste Disposal Sites

- **Other Existing and Known Remedial Sites**

- ✓ There is no information suggesting that contamination from any other existing and known remedial sites is causing widespread exposures on Staten Island.
- ✓ In some cases, on-site contamination exists but is not causing off-site exposure.
- ✓ For many sites, actions to identify, control, and/or remove existing contamination have been implemented and completed.
- ✓ For other sites, information continues to be gathered.

- **Summary**

- ✓ Based on a review of available data, there is no information suggesting that contamination from existing and known remedial sites is causing widespread exposures on Staten Island.

Findings: Proximity to Traffic

- The most heavily trafficked roads are Interstate 278 and Route 440.
- Compared to NYC, Staten Island has a lower percentage of people who live close to heavily trafficked roads.
- Staten Island has a higher proportion of people who live close to the most heavily trafficked roads in comparison to NYS excl. NYC.
- The NATA results are consistent with these traffic density results.
- We are not aware of any studies linking thyroid cancer with vehicular traffic.

Percent Population Living within 500 m of NYSDOT Monitored Roads, Categorized by Average Annual Daily Traffic (AADT) Volume

Region	AADT Volume (1,000 vehicles)		
	75 - 300	25 - <75	<25
Staten Island	11%	28%	61%
NYC	29%	30%	41%
NYS excl. NYC	5%	14%	81%
NYS	15%	21%	64%

Findings - Review of Behavioral, Health Care, and Occupational Factors

Health Behavior and Lifestyle

• Obesity

- ✓ The prevalences of overweight and obesity on Staten Island are statistically similar to those for both NYS excl. NYC and NYC.
- ✓ Other obesity-related cancers do not have rates that are higher on Staten Island than in the rest of NYC or NYS.
- ✓ Obesity probably does not explain the excess of thyroid cancer on Staten Island.

Prevalence¹ (%) of Overweight and Obesity by Region, Expanded Behavioral Risk Factor Surveillance System, 2016

Region	Sample Size	Overweight	Obesity	Overweight & Obesity
Richmond	480	38.7	21.7	60.4
New York City	3,919	33.6	22.9	56.5
NYS excl. NYC	27,350	36.1	27.5	63.6
New York State	31,269	35.0	25.5	60.5

¹ Prevalence is age-adjusted to the 2000 US Standard population.

Health Behavior and Lifestyle

- **Tobacco use**

- ✓ Thyroid cancer is not known to be smoking-related.
- ✓ The rate of smoking on Staten Island is generally lower than the rate for NYS excl. NYC.
- ✓ The incidence of tobacco-related cancers on Staten Island is generally below the incidence for NYS excl. NYC.
- ✓ Tobacco use does not explain the excess of thyroid cancer on Staten Island.

Prevalence¹ (%) of Current Smoker by Region, Expanded Behavioral Risk Factor Surveillance System, 2016

Region	Sample Size	Percent
Richmond	493	12.8
New York City	4,057	11.6
NYS excl. NYC	28,168	17.0
New York State	32,225	14.5

¹ Prevalence is age-adjusted to the 2000 US Standard population.

Health Care

- **Diagnostic Imaging**

- ✓ The SPARCS healthcare utilization data showed wide year-to-year fluctuations that appeared more reflective of variation in reporting practices than of any true variation in the administration of neck ultrasounds.
- ✓ Medicaid data suggested a doubling of neck ultrasounds in NYS between 2006 and 2015, leveling off in 2016 and 2017, with Staten Island lagging somewhat behind the statewide numbers.
- ✓ Medicare data showed that neck ultrasounds doubled statewide between 2004 and 2012, but tripled on Staten Island.
- ✓ Claims data for privately insured patients of working age were not available for analysis.

Health Care

- **Screening**

- ✓ Some residents of Staten Island have received free thyroid cancer screening at screening events, though no national organizations in the US currently endorse this practice.
- ✓ Other counties with screening initiatives have above-average thyroid cancer rates.
- ✓ There has also been confusion between recommendations for tests for thyroid function and tests for thyroid cancer.

Background: Thyroid Cancer Screening

- The National Cancer Institute defines cancer screening as “looking for cancer before a person has any symptoms.” When cancers are found early, before symptoms appear, they can be easier to treat or cure.
- Screening for thyroid cancer is NOT recommended for people at average risk.
- The primary methods used to screen for thyroid cancer are
 - ✓ Neck palpation – health care provider feels the neck area to detect nodules
 - ✓ Ultrasound – can identify nodules that can and cannot be felt
- These methods do not involve the use of ionizing radiation such as X-rays or CT scans, which can increase the risk of thyroid cancer.

Background: Thyroid Function Tests

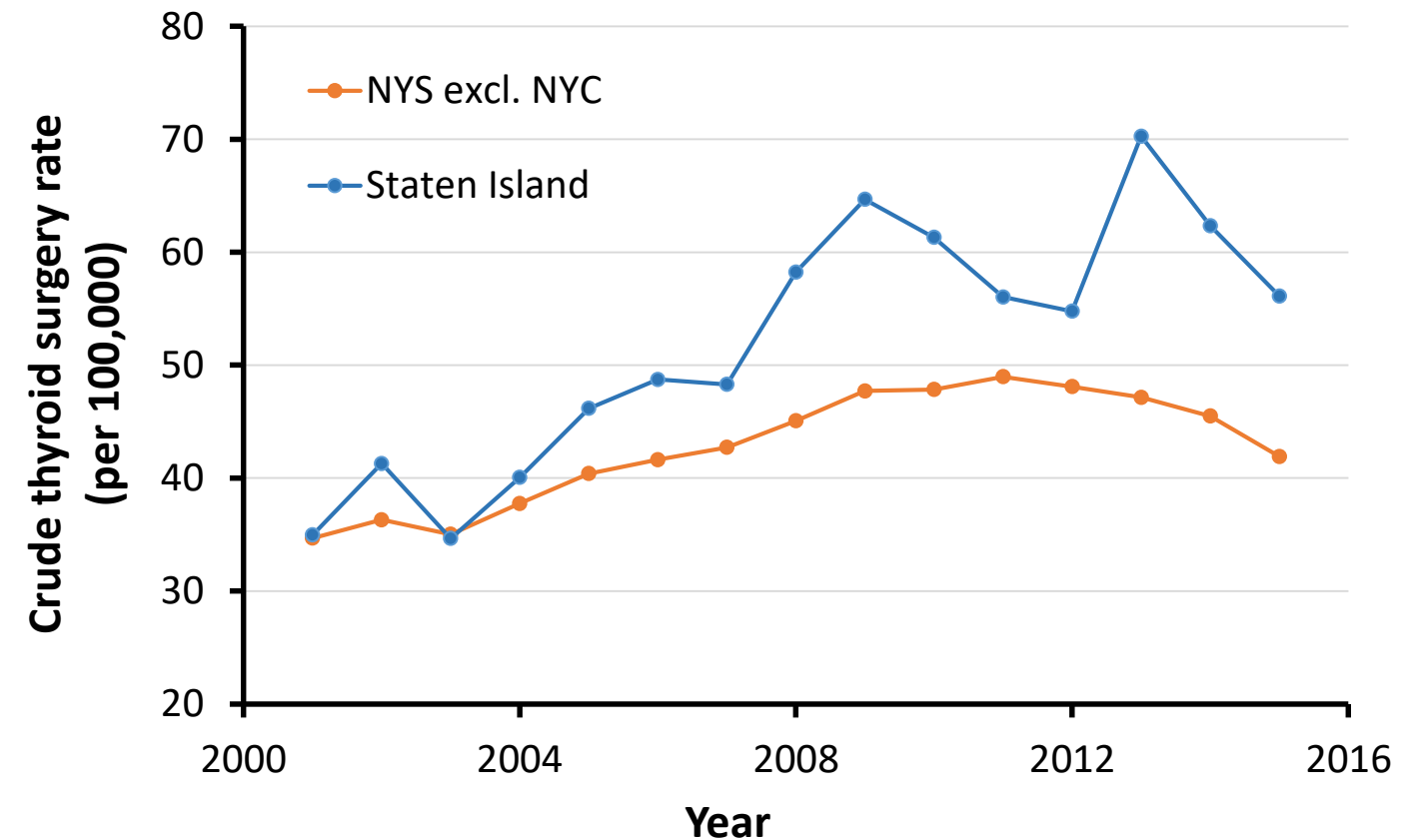
- The thyroid produces hormones to regulate the body's growth and metabolism. A number of tests may be done to measure how well the thyroid is performing this function.
- Blood tests measure the levels of
 - ✓ Thyroid stimulating hormone (TSH). Very high or very low levels of this hormone indicate that the thyroid is either not producing enough hormones (hypothyroidism) or is producing too much hormone (hyperthyroidism).
 - ✓ Hormones produced by the thyroid (T3, T4, and Free T4), and
 - ✓ Thyroid antibody, which may be damaging the thyroid.
- The radioactive iodine uptake test measures how quickly the thyroid takes up a small amount of radioactive iodine.

Health Care

- Surgery

- ✓ Surgery for other benign conditions can lead to thyroid cancer diagnosis.
- ✓ Thyroid surgery is performed disproportionately more frequently on Staten Island than elsewhere in NYS.

Thyroid surgery trends, Staten Island and NYS excluding NYC, 2001-2015



Occupation

- **First responders, firefighters, and rescue and recovery workers**
 - ✓ The latency period for thyroid cancer is measured in decades, so exposures from the World Trade Center alone could not have resulted in the excess thyroid cancers having developed in such a short time.
 - ✓ Previous study suggested higher incidence may be due to enhanced medical surveillance first responders received.
 - ✓ As nearly the entire firefighter cohort are men, this offers no explanation for the similar elevations in thyroid cancer incidence among women on Staten Island.
 - ✓ Other cancers known to be associated with specific occupational exposures do not have rates that are higher than the rest of NYC or NYS.
 - ✓ Exposures in World Trade Center first responders likely had a very small influence on thyroid cancer rates on Staten Island.

Limitations

General Considerations

- Latency and population migration
- Most cancers have multiple risk factors, all of which influence incidence.

Cancer Data

- The completeness and accuracy of the data depend upon reporting from many sources.
- There may also be differences in how cancer is diagnosed, treated, and recorded in different areas of the state.

Environmental Data

- Environmental measurements are not always a good indication of exposure and there is no individual exposure assessment.
- The availability of environmental data is limited across space and time.
- Data on past exposures, which are most important for cancer, are particularly hard to come by.
- Effects of exposures to chemical mixtures are difficult to evaluate.

Behavioral, Lifestyle, Health Care, and Occupational Data

- e-BRFSS: small sample size; wider margins of error; limited number of indicators; accuracy of people's answers to the survey questions
- SPARCS: administrative data; missing non-hospital treatment info; differences in the likelihood of being admitted to or visiting a hospital facility for specific reasons
- ACS: wide margin of error in small areas; tabulated into broad categories

BRFSS: Behavioral Risk Factor Surveillance System

SPARCS: Statewide Planning and Research Cooperative System

ACS: American Community Survey

Conclusions

Conclusions

- Staten Island's demographic makeup more closely resembles areas outside of the NYC area (NYS excl. NYC).
- Using the comparison areas of both NYS excl. NYC and rest of NYC, thyroid cancer was the only cancer that was statistically elevated with public health significance.
- Results from the environmental investigation did not show any unusual environmental exposures that could explain the excess in thyroid cancers on Staten Island.

Conclusions

- The marked excess in small, papillary thyroid tumors on Staten Island suggests an increase in the diagnosis of clinically inapparent (“occult”) cases, most of which would pose no health risk. Some people residing on Staten Island have received free thyroid cancer screening at screening events, though no national organizations in the US currently endorse this practice. Incidental diagnoses, that is, diagnoses of thyroid cancers during surgery or diagnostic procedures for other conditions, may also play a role. The apparent elevation is likely due to greater efforts to detect thyroid cancer on Staten Island.

Recommendations

Recommended Actions Based on Specific Cancers Elevated in the Staten Island Study Area

Cancer Screening and Early Detection

- Thyroid cancer screening (Recommendation against screening in asymptomatic adults)

Healthy and Safe Environment

- Reducing radiation from medical imaging (X-rays, CT scans, nuclear medicine studies)

JAMA | US Preventive Services Task Force | EVIDENCE REPORT

Screening for Thyroid Cancer

Updated Evidence Report and Systematic Review for the US Preventive Services Task Force

Jennifer S. Lin, MD, MCR; Erin J. Aiello Bowles, MPH; Selvi B. Williams, MD, MPH; Caitlin C. Morrison, MPH

IMPORTANCE The incidence of detected thyroid cancer cases has been increasing in the United States since 1975. The majority of thyroid cancers are differentiated cancers with excellent prognosis and long-term survival.

OBJECTIVE To systematically review the benefits and harms associated with thyroid cancer screening and treatment of early thyroid cancer in asymptomatic adults to inform the US Preventive Services Task Force.

- ← Editorial page 1840
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Thyroid Cancer: Screening

Release Date: May 2017

Recommendation Summary

Population	Recommendation	Grade (What's This?)
Adults	The USPSTF recommends against screening for thyroid cancer in asymptomatic adults.	D

To read the recommendation statement in JAMA, select [here](#).

To read the evidence summary in JAMA, select [here](#).

“The USPSTF recommends *against* screening for thyroid cancer in asymptomatic adults.”



Harms from Thyroid Cancer Overdiagnosis

- No benefit to the early detection and treatment of occult (clinically inapparent) cases. Potential downsides to finding these occult thyroid cancers include:
 - Overtreatment resulting from overdiagnosis
 - Surgical harms: permanent hypoparathyroidism; vocal cord paralysis; other harms
 - RAI (radioactive iodine) harms: risk of second primary cancer; damage to salivary glands
 - Psychological and financial stress

Recommended Actions to Reduce the Burden of All Cancers Statewide

For All New Yorkers

It is not always possible to know why one person develops cancer while another person does not. But 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.
- For women of child-bearing age, know the benefits of breastfeeding and, if possible, breast-feed infants exclusively for at least the first six months of life.
- Discuss with your healthcare provider what cancer screening tests might be right for you.
- Get cancer-preventive vaccines such as hepatitis B and HPV.
- Learn your family health history (if possible).
- Test your home for radon.

Recommended Actions to Reduce the Burden of All Cancers Statewide

NYS Department of Health and Partner Organizations

Cancer Surveillance – NYS Cancer Registry

- 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

- Continue to identify and assess potential exposures throughout the state and take action to reduce those exposures.
- Continue to support programs to promote and maintain clean air, clean water and reduce human exposures to environmental hazards
- Promote awareness of programs and initiatives to reduce environmental hazards in our communities.

Today's Announcement

- New \$675,000 grant to support local **Cancer Prevention in Action** project.
- New Training and Education Forum for Healthcare Providers on Best Practices for Thyroid Cancer Screening.
 - ✓ The State will partner with Greater New York Hospital Association, the Staten Island PPS, the Medical Society of the State of New York, Staten Island University Hospital and Richmond University Medical Center, to hold a training and informational forum for healthcare providers.

Acknowledgments

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Questions