

Impact of Race, Poverty and Foreign Born on Cancer Clusters in New York State

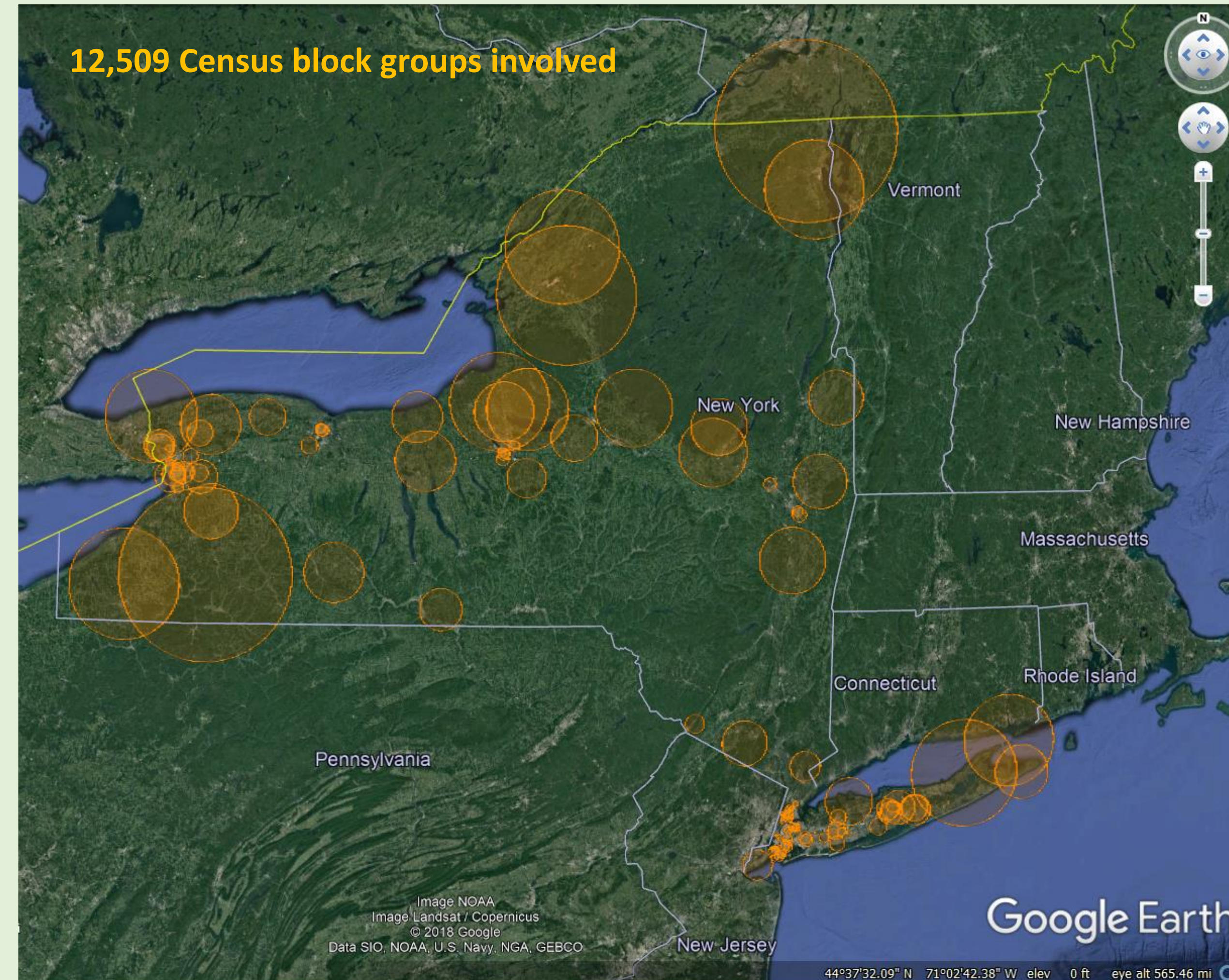
Xiuling Zhang, Francis P Boscoe, Amy R Kahn, Maria J Schymura
New York State Cancer Registry, Bureau of Cancer Epidemiology, New York State Department of Health, Albany, NY



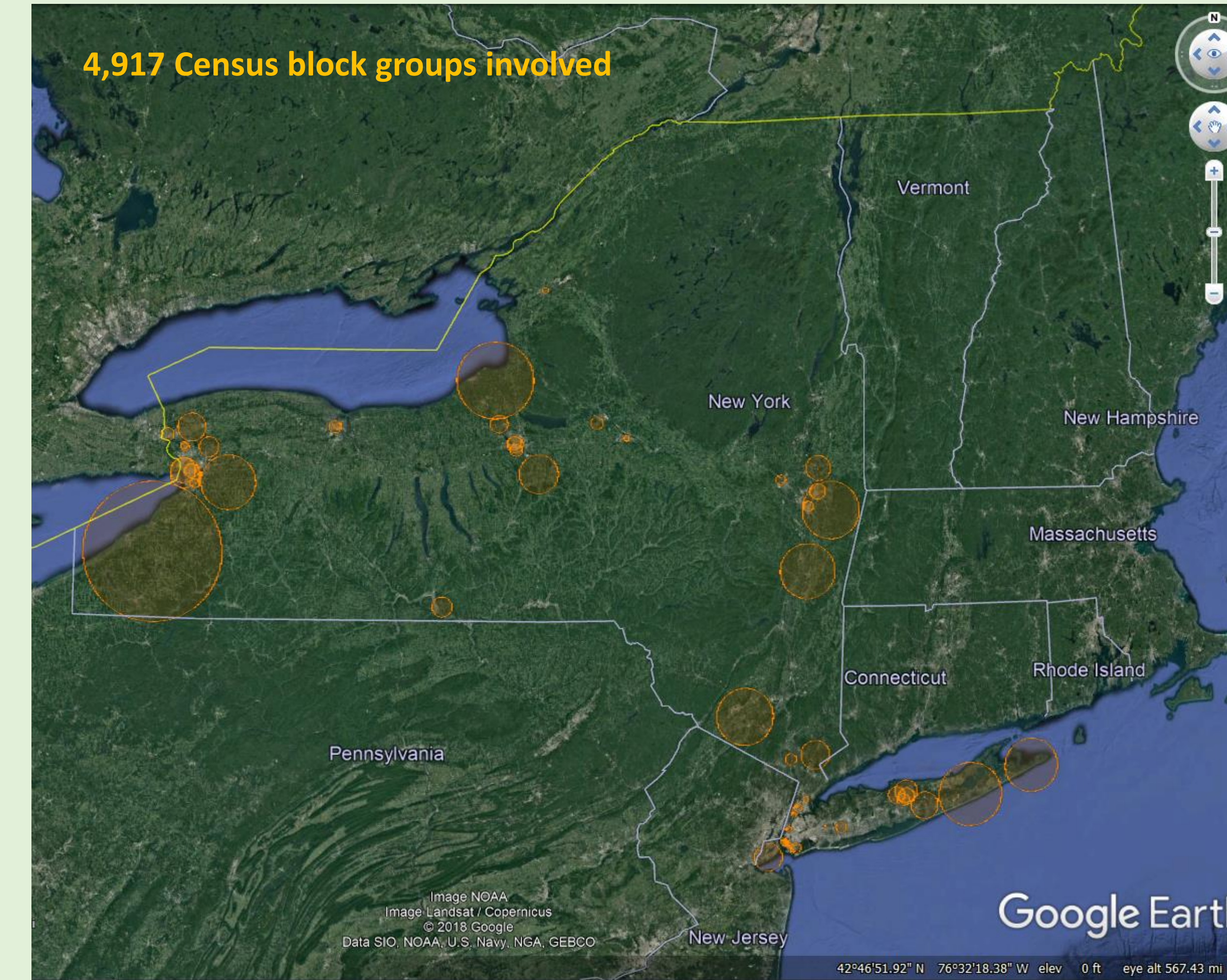
Introduction

Areas detected with high cancer clusters are always of concern for both residents and public health officials. Exploring and explaining these apparent cancer disparities requires a lot of effort and resources on the part of public health organizations. For example, since the publication of the NYS Environmental Facilities and Cancer Map on the NYSDOH website (https://apps.health.ny.gov/statistics/cancer/environmental_facilities/mapping/map/), some residents and local public health officials who live within or close to high cancer clusters (circles in orange color shown on map 1) have requested investigations into the causes of high cancer incidence, and the NYS Cancer Surveillance Program must respond to the requests.

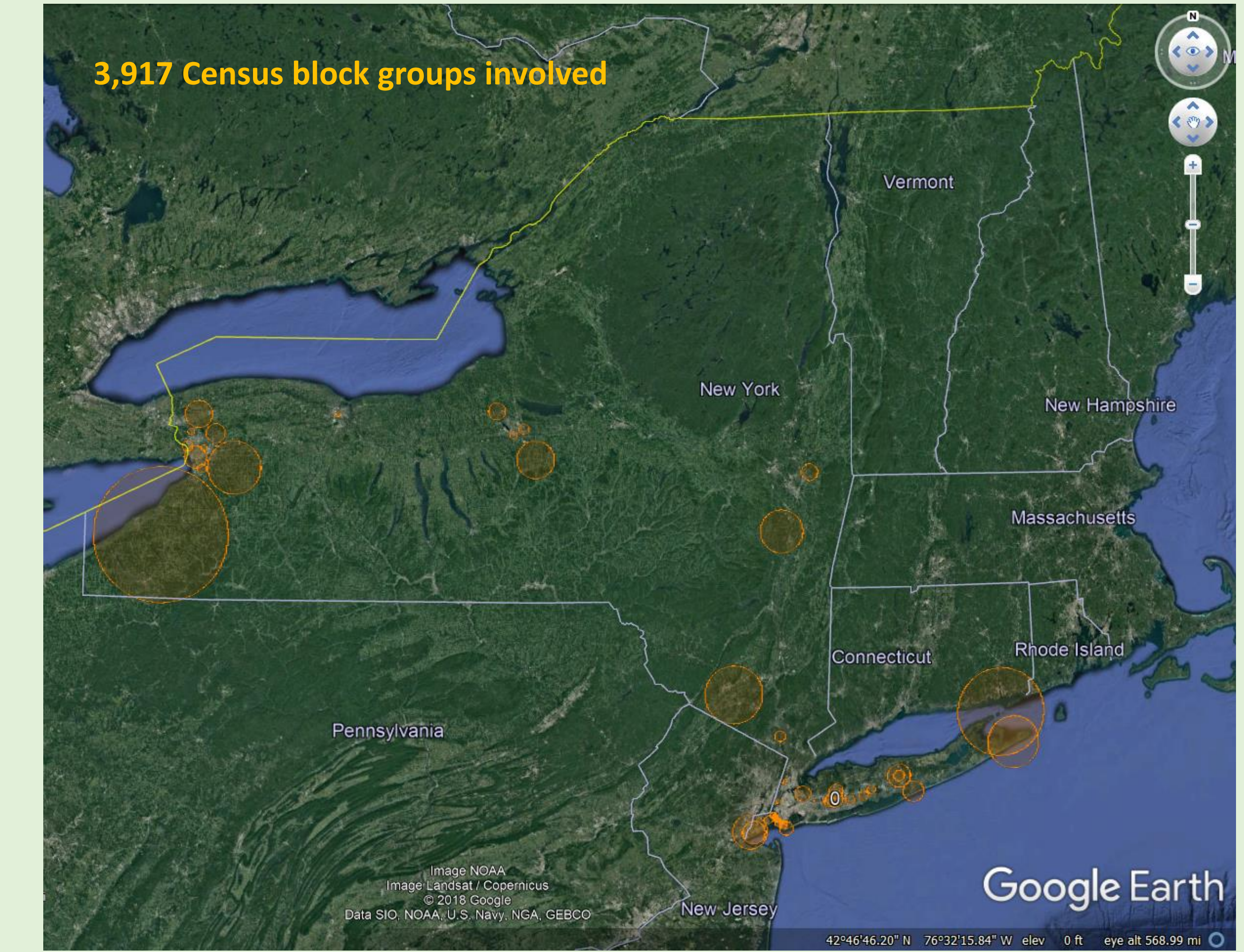
Researchers have already found that race, poverty level and percent of foreign born (PFB) are significantly associated with cancer risks [1,2,3]. In this study, we undertook to investigate the magnitudes of the roles of these factors in the formation of the high cancer clusters.



Map 1. 119 high cancer clusters (12,509 block groups) were first detected, including 20 out of 23 cancer sites using the age- and sex-stratified state level cancer incident rates as standards. Cancer sites with no high cluster detected were pancreas, soft tissue and uterus. Analysis using PROC GENMOD yielded very similar results.



Map 2: After further adjustment for race, the number of high clusters was reduced to 62 (~48% reduction); the number of cancer sites with high clusters was reduced from 20 to 15; and the number of block groups involved was reduced from 12,509 to 4,917 (~61% reduction).



Map 3: After further adjustment for ADI and % foreign born, the number of high clusters was reduced to 50 (~10% additional reduction); the number of cancer sites with high clusters was reduced from 15 to 14; and the number of block groups involved was reduced from 4,917 to 3,917 (~8% additional reduction).

Methods

- NYS Cancer Registry invasive cancer cases diagnosed between 2011-2015 were used in the calculation of expected case counts at the Census block group level for 23 major cancer sites: oral, esophagus, stomach, colorectal, liver, pancreas, nasal, larynx, lung, bone, soft tissue, breast, uterus, ovary, prostate, testis, bladder, kidney, brain, thyroid, NHL, leukemias, and mesothelioma.
 - Population data by age and sex at the Census block group level for the years between 2011 and 2015 were derived from the SEER population data and 2010 census data.
 - An Area Deprivation Index (ADI), recently calculated and published for the entire United States by researchers at the University of Wisconsin [4], was used as the surrogate person-level SES indicator. Race and PFB were obtained from the American Community Survey.
 - Expected case counts by site by Census block group were calculated for three levels of adjustment: 1. adjusted for age and sex; 2. further adjusted for race; and 3. further adjusted for ADI and for PFB.
- Expected case counts adjusted for age and sex were calculated using the standard SIR method (state level age- and sex-stratified cancer incidence rates used as standards). PROC GENMOD (see below) was also used here.
- For each cancer site, block-group-level expected case counts were then adjusted for race, and further for ADI and PFB using the Poisson regression model (procedure GENMOD of SAS/STAT, backward step-wise elimination). Block-group-level adjustment was necessary because SES was not available at the person level.
- Identification of high cancer clusters for 23 cancer sites was carried out using the SaTScan program (probability model: Poisson, Spatial window: 2.0 percent of the population at risk, RR ≥ 1.5 and $P < 0.05$). The output KML files were uploaded into Google Earth for mapping the high cancer clusters.

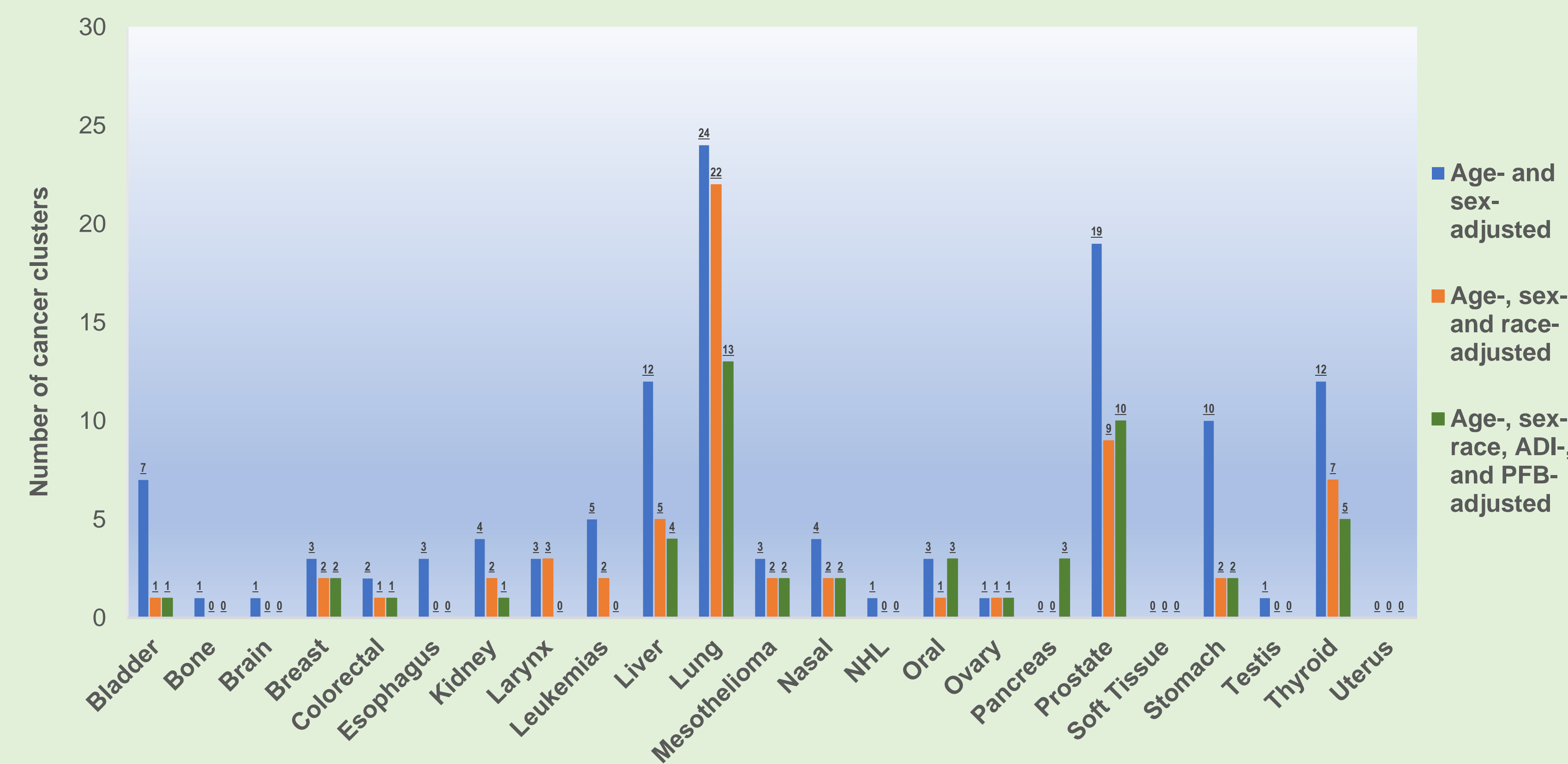


Figure 1. Number of cancer clusters detected using three levels of adjustment (age and sex, further race, and further ADI and PFB) on 23 cancer sites

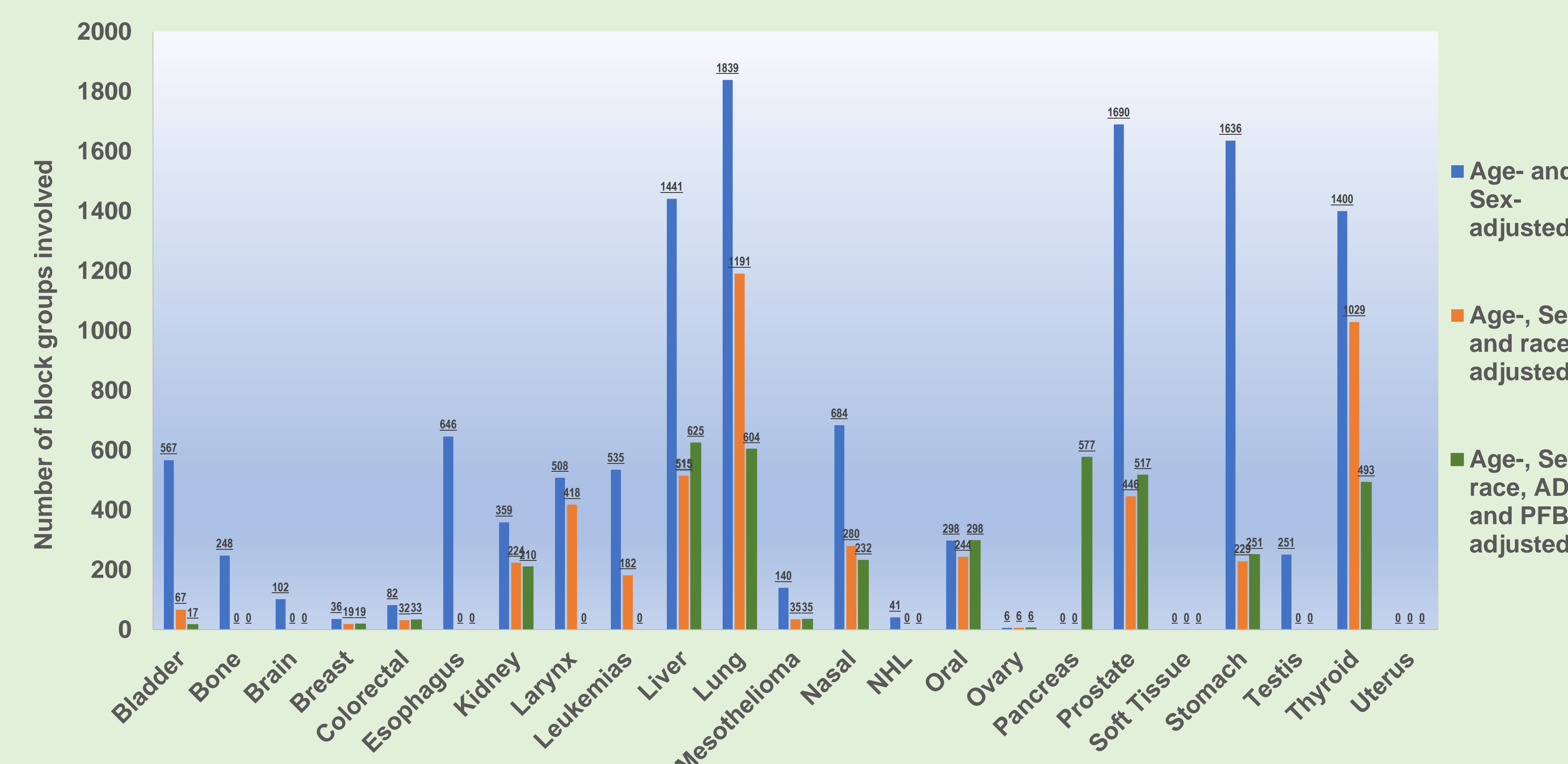


Figure 2. Number of Census block groups involved in cancer clusters detected using three levels of adjustment (age and sex, further race, and further ADI and PFB) on 23 cancer sites

Results

- Overall the numbers of Cancer clusters detected and of Census block groups involved are dramatically reduced when adjusted by additional socio-demographic variables, as shown below on Maps 1-3 and Figures 1 and 2.
- Two exceptions to the trends must be noted. One additional cluster was detected for prostate after the third adjustment compared to the second; and although no cluster had been detected for pancreas at the first two levels of adjustment, three clusters were identified at the third level of adjustment. Race is a stronger factor than ADI or PFB in the formation of high cancer clusters.

Conclusions

- Due to the appreciable contributions of race, poverty and percent foreign born to high cancer clusters, adjusting for these factors should be considered as the first step in understanding and reducing the burden of investigating high cancer clusters.
- PROC GENMOD is an easy-to-use SAS procedure to assist in the detection of cancer clusters.

References

- Clegg LX, Reichman ME, Miller BA, et al. Impact of socioeconomic status on cancer incidence and stage at diagnosis: selected findings from the surveillance, epidemiology, and end results: National Longitudinal Mortality Study. *Cancer Causes Control*. 2008;20(4):417-35.
- E. Ward, et al. Cancer disparities by race/ethnicity and socioeconomic status *CA Cancer J Clin*, 54 (2) (2004), pp. 78-93
- Nasca PC, Greenwald P, Burnett WS, Chorost S, Schmidt W. Cancer among the foreign-born in New York State. *Cancer*. 1981 Nov 15;48(10):2323-8.
- University of Wisconsin School of Medicine and Public Health. Area Deprivation Index. 5/1/2018. Available at: <https://www.neighborhoodatlas.medicine.wisc.edu/>

Acknowledgements

This project has been funded in whole or in part by:

- New York State (NYS);
- The Centers for Disease Control and Prevention's National Program of Cancer Registries through cooperative agreement 6NU58DP006309 awarded to the New York State Department of Health;
- Federal funds from the National Cancer Institute, National Institutes of Health, Department of Health and Human Services, under Contract No. HHSN2612018000091.

The contents are solely the responsibility of the New York State Department of Health and do not necessarily represent the official views of the Centers for Disease Control and Prevention.