

Thyroid Diseases in Staten Island Residents in Relation to Proximity to the Fresh Kills Landfill

Marlene T. Dela Cruz¹, Taylor M. Iannicelli¹, Lauren M. Piro¹, Merna A. Shehata¹, Matthew Whalen¹, and Anthony V. D'Antoni²

¹ Student, Physician Assistant Program, Wagner College; ² Faculty Member, Physician Assistant Program, Wagner College, Staten Island, NY, 10301, USA

INTRODUCTION

- Thyroid diseases (hypothyroidism, hyperthyroidism, and thyroid cancer) can range from benign to life-threatening conditions.
- A recent New York State Department of Health (DOH) study reported that Staten Island residents have a 67% higher rate of thyroid cancer compared to the other NYC boroughs (NYS DOH, 2019).
- One possible factor threatening Staten Island residents is the Fresh Kills Landfill, which was the world's largest landfill in operation from 1955 to 2001.
- Prior studies suggest that residents adjacent to landfills have a higher incidence of cancer and adverse birth defects, (see Fig. 1 below).

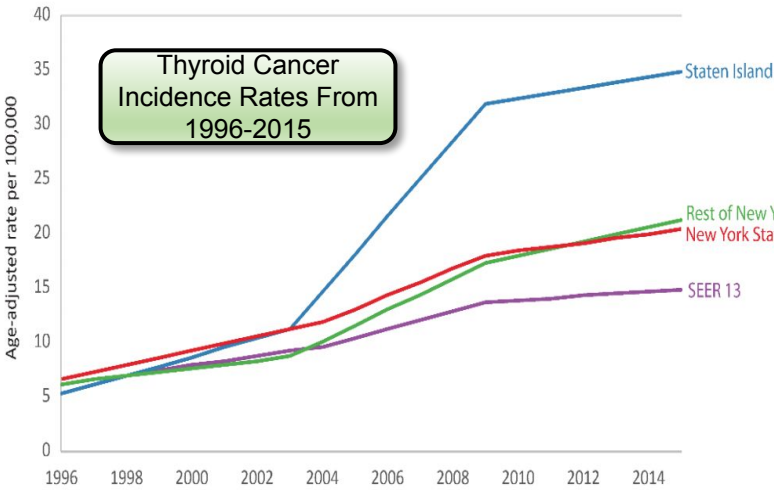


Fig. 1. Smoothed age-adjusted thyroid cancer incidence rates, Staten Island and comparison areas, 1996- 2015. "SEER 13" refers to 13 states and cities belonging to the SEER program of the National Cancer Institute, which is a proxy for national rates. (NYS DOH, 2019).

PURPOSE

- The purpose of this prospective study was to explore associations between the Fresh Kills Landfill and residential locations of Staten Islanders with thyroid diseases.

METHODS

- IRB approval was granted.
- An *a priori* power analysis revealed that the minimum sample size needed to achieve significance was 183 subjects (G-power Version 3.1.9.6, Germany).
- An electronic survey was distributed on Staten Island social media groups.
- Sample size was **N = 189** respondents.
- Data were analyzed with IBM SPSS Version 26 (Armonk, NY) with alpha level set at 0.05.

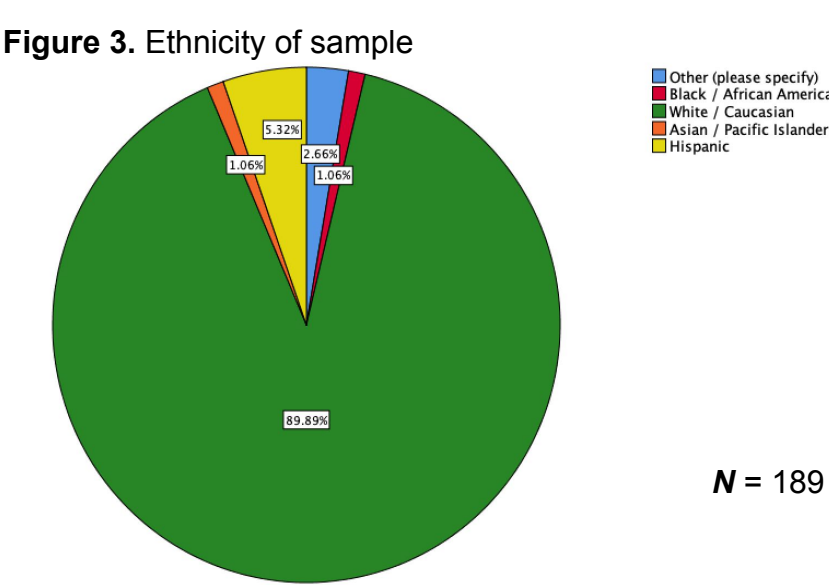
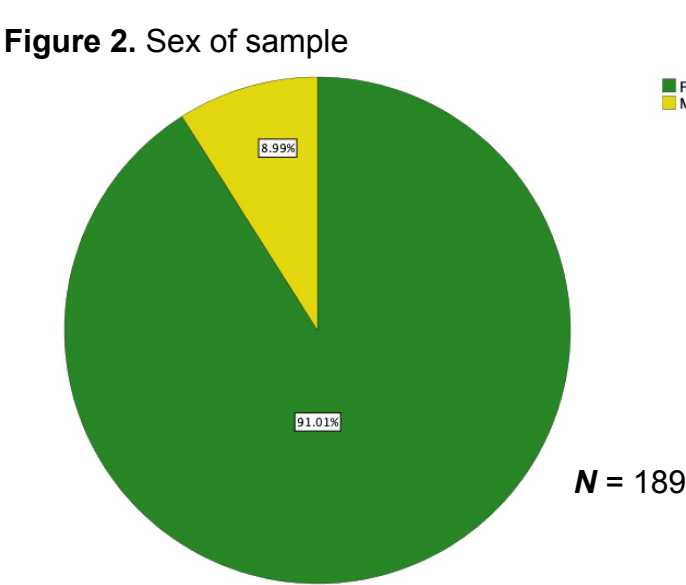
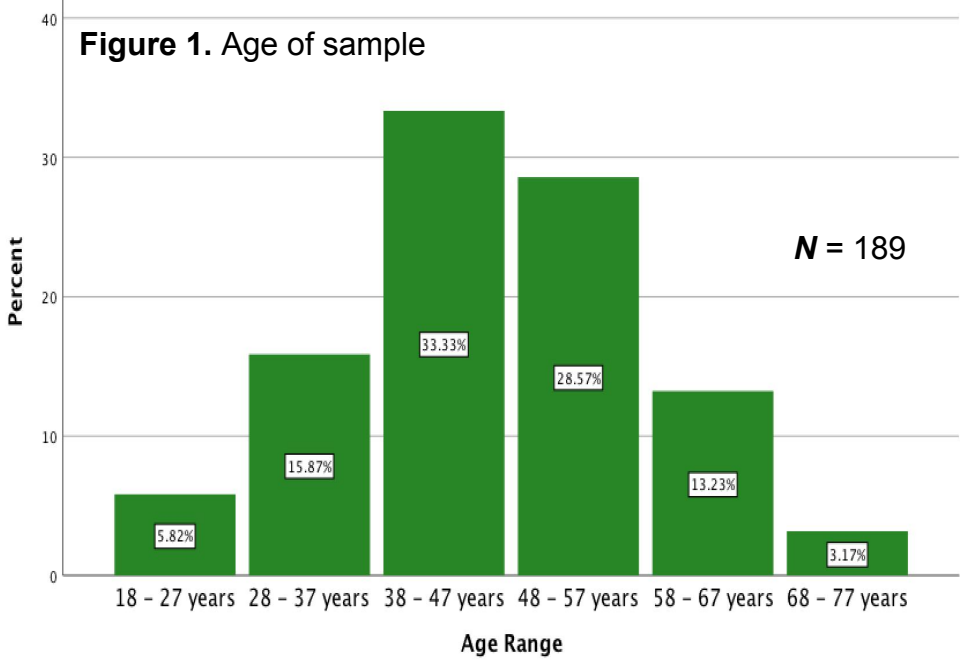
Inclusion Criteria

- ≥ 18 years old
- Diagnosis of
 - thyroid cancer
 - hypothyroidism
 - hyperthyroidism
- Staten Island resident
- No / limited radiation exposure
- Completed survey

Exclusion Criteria

- < 18 years old
- No diagnosis of thyroid diseased
- Non-Staten Island resident
- Occupational radiation exposure
- Incompleted survey

RESULTS



Figures 1, 2, and 3. Demographic data of sample

Table 1. Thyroid diseases and distance to Fresh Kills Landfill

ZIP codes	Distance	Thyroid Cancer	Hypothyroidism	Hyperthyroidism
		n = 69 (Percent)	n = 133 (Percent)	n = 41 (Percent)
10301	6.37 miles	2 (3%)	7 (5%)	1 (2%)
10302	5.16 miles	2 (3%)	3 (2%)	3 (6%)
10303	4.81 miles	2 (3%)	2 (2%)	2 (4%)
10304	5.62 miles	0 (0%)	3 (2%)	0 (0%)
10305	6.17 miles	6 (9%)	8 (5%)	0 (0%)
10306	3.75 miles	7 (10%)	14 (9%)	8 (17%)
10307	4.81 miles	8 (12%)	12 (8%)	5 (10%)
10308	2.08 miles	6 (9%)	14 (9%)	2 (2%)
10309	2.82 miles	10 (14%)	16 (11%)	9 (19%)
10310	6.01 miles	3 (3%)	5 (3%)	2 (4%)
10312	1.61 miles	16 (23%)	26 (17%)	3 (6%)
10314	2.55 miles	7 (10%)	23 (15%)	6 (13%)

Table 1. No statistically significant correlation ($p > 0.05$) was found between residential distance from the Fresh Kills Landfill and thyroid diseases.

Table 2. Thyroid diseases and years living in Staten Island

Years Living in SI	Thyroid Cancer	Hypothyroidism	Hyperthyroidism
	n = 69 (Percent)	n = 133 (Percent)	n = 41 (Percent)
5 years or less	0 (1%)	0 (0%)	0 (0%)
6 -10 years	3 (3%)	4 (3%)	1 (2%)
11-15 years	4 (6%)	7 (5%)	5 (12%)
16 - 20 years	4 (6%)	11 (8%)	3 (7%)
21 - 25 years	3 (8%)	11 (8%)	0 (0%)
26 - 30 years	6 (16%)	21 (16%)	6 (15%)
31 - 35 years	11 (12%)	13 (10%)	6 (15%)
36 - 40 years	6 (10%)	12 (9%)	3 (7%)
41 - 45 years	13 (13%)	20 (15%)	4 (10%)
46 - 50 years	5 (10%)	15 (11%)	4 (10%)
51 or more years	14 (13%)	19 (15%)	9 (22%)

Table 2. No statistically significant correlation was found between years lived on Staten Island and thyroid disease.

Table 3. Spearman's correlations between variables

Variables	n	Spearman's rho	p value
Thyroid cancer x Distance to the FKL	69	0.016	0.823
Hypothyroidism x Distance to the FKL	133	0.138	0.089
Hyperthyroidism x Distance to the FKL	41	-0.116	0.154
Years lived in SI x Age at diagnosis	189	-0.240	0.003
Thyroid cancer x Years lived in SI	69	0.092	0.207
Hypothyroidism x Years lived in SI	133	-0.009	0.911
Hyperthyroidism x Years lived in SI	41	-0.039	0.630

Table 3. A weak correlation that was not significant was found between thyroid diseases and distance to the Fresh Kills Landfill as well as years lived in Staten Island. However, a significant negative correlation between length of residency and age of diagnosis on Staten Island was found ($p = 0.003$).

CONCLUSIONS

- In our study, we found that respondents who lived the closest to the Fresh Kills Landfill of 1.61 miles away had a higher frequency of being diagnosed with thyroid cancer and hypothyroidism (23% and 17%, respectively).
- Although our study showed no significance between diagnosis of thyroid disease to distance and duration of residency to the Fresh Kills Landfill, further research must be done to understand the alarming increase in incidence that is limited to Staten Island.

PUBLIC HEALTH RELEVANCE

Our results may help raise awareness of the potential environmental risks that affect Staten Island residents. Our study can also stimulate further research into improving environmental safety precautions related to health care.