

Implementing Smoke-Free Laws in the Context of the Tobacco Retail Environment in Allegheny County: A Geospatial Analysis

by

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Abstract

Introduction: Low-income populations have a disproportionately high exposure to smoking and secondhand smoke. In 2018, a federal rule required all local public housing agencies (PHAs) in the U.S. to implement a smoke-free policy. Public housing is designed to provide rental assistance to low-income populations, and in theory, the smoke-free housing policies should increase smoking cessation and reduce secondhand smoke exposure. However, characteristics of the macroenvironment can affect residents' smoking behaviors and compliance. For example, the high concentration of tobacco retailers in Allegheny County poses challenges to smoke-free policy implementation.

Objective: This research will assess the tobacco retail environment around public housing buildings in Pittsburgh and Allegheny County, PA, as the smoke-free policy is implemented.

Methods: In 2018, 16 Pittsburgh Summer Institute interns collected data on tobacco retail locations using the Standardized Tobacco Assessment for Retail Settings (STARS). 1,467 licensed tobacco retailers and 990 public housing buildings in Allegheny County were geocoded and mapped in ArcMap Version 10.6.1 for spatial analysis. ArcMap was also used to perform point pattern analyses and create a multi-distance spatial buffer around Murray Towers. The Optimized Hot Spot Analysis tool was used to aggregate tobacco retailer points and map statistically significant hot spots using the Getis-Ord G_i^* spatial statistic.

Results: Out of 130 total municipalities in Allegheny County, 33 (25%) had hot spot features at 99% confidence intervals. Hot spots were largely concentrated in the city of Pittsburgh. Using Pittsburgh as the study area, 18 (20%) of 90 neighborhoods had hot spots at 99% confidence intervals. Neighborhoods with hot spots include those on the North Side, Central Business District, East End, and Southside.

Conclusions: This research demonstrates the public health significance of lessening public housing residents' exposure to the tobacco retail environment and the potential of using geographical information systems (GIS) as a tool for tobacco control policy research. To ensure resident compliance with the smoke-free policy, the city of Pittsburgh and other municipalities with zoning authority may need to consider laws that prohibit tobacco from being sold within a certain distance of public housing buildings.

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1.0 Introduction

Tobacco use kills approximately 500,000 Americans annually, making it the leading cause of preventable disease and death in the United States.¹ Currently, 16 million Americans suffer from one or more smoking-related disease. Smokers are at a greater risk than nonsmokers for developing cardiovascular disease, respiratory disease, stroke, and many types of cancers.¹ Additionally, tobacco use costs the United States \$300 billion dollars a year in medical expenditures.^{1,2} One in four nonsmokers, or 58 million people, are exposed to secondhand smoke (SHS), and certain groups of people are at an even greater risk.³ Among nonsmokers who live below the poverty line, 40% are exposed to SHS.³ Approximately 80 million Americans, including children, the elderly, and people with disabilities, live in multiunit housing and face unwanted exposure to secondhand smoke in their home.³

The Department of Housing and Urban Development (HUD) issued a final rule requiring all local public housing agencies (PHAs) in the U.S. to adopt a smoke-free policy by July 30, 2018 (18 months from the effective date of the final rule).⁴ Public housing was established by the U.S. government to provide rental assistance to low-income populations. The rationale behind HUD's policy is to protect the health and safety of residents and staff; improve indoor air quality in public housing; reduce the risk of fires; and lower overall maintenance costs.⁵

While the policy establishes the minimum requirements for PHA smoke-free policies, each PHA has a unique set of characteristics. Tobacco retailers (e.g. grocery stores, mass merchandisers, convenience stores and gas stations) near public housing may threaten resident compliance and ultimately affect the sustainability of smoke-free public housing policies.

This research will assess the tobacco retail environment around public housing buildings in Pittsburgh and Allegheny County, PA, as the smoke-free policy is implemented. We will use data collected by the Allegheny County Health Department on nearly all the tobacco retailers in the county, combined with location data on public housing buildings and schools. This research will provide baseline data to inform how the characteristics of the tobacco retail environment surrounding PHAs might affect implementation of smoke-free policies.

2.0 Background

2.1 Secondhand Smoke

Approximately 80 million people, or one-quarter of U.S residents, live in multiunit housing.³ Despite the fact that many residents do not allow smoking in their own home, an estimated 36 percent of multiunit housing residents have experienced cigarette smoke infiltration in their living unit that originated from somewhere else in their building.⁶ Ventilation cannot control the spread of cigarette smoke, nor can it eliminate associated health risks.⁵ There is no safe level of exposure to secondhand smoke (SHS) and smoke-free indoor environments are the only way to protect individuals from SHS.⁷ Exposure to SHS causes cancer, heart disease, and other lung diseases in adults.¹ Children are especially susceptible to secondhand smoke and can suffer adverse health effects such as asthma, ear infections, and Sudden Infant Death Syndrome.¹ Low-income and minority children are more likely to have asthma and suffer worse health outcomes compared to children from high-income families.⁸ In addition to protecting residents from adverse health outcomes caused by SHS, smoke-free policies also reduce the risk of fires and property maintenance costs.⁵

2.2 Public Housing

Public housing was established under the United States Housing Act of 1937 to improve living conditions for low-income populations. According to the Act: “It is the policy of the United

States— (1) to promote the general welfare of the Nation by employing the funds and credit of the Nation, as provided in this Act— (A) to assist States and political subdivisions of States to remedy the unsafe housing conditions and the acute shortage of decent and safe dwellings for low-income families; (B) to assist States and political subdivisions of States to address the shortage of housing affordable to low-income families; and (C) consistent with the objectives of this title, to vest in public housing agencies that perform well, the maximum amount of responsibility and flexibility in program administration, with appropriate accountability to public housing residents, localities, and the general public.”⁹

Public housing is a program of HUD but is administered locally by 2,900 public housing agencies. Types of public housing include single family homes, multifamily housing, and high-rise apartments for the elderly and persons with disabilities. HUD funds public housing by providing federal subsidies to local public housing agencies (PHAs).¹⁰ Eligibility for public housing is limited to low-income families, the elderly, and persons with disabilities. Income limits vary by area and are developed by HUD. The Housing Act of 1937 set extremely low maximum income requirements for residents that led to high concentrations of poverty within public housing.¹¹ In order to be considered low-income, an individual or family’s income cannot exceed 80% of the local median income.¹² Each year, a minimum of 40 percent of new individuals or families must be considered extremely low income, where their income does not exceed the poverty line or 30 percent of the local median.¹² Currently, 2.1 million Americans live in public housing.¹² Public housing is located in both urban and rural areas, with 40% of all units located in areas with low or moderate poverty rates.¹²

2.3 Smoke-Free Public Housing

Under HUD's final rule, all PHAs administering public housing were required to adopt a smoke-free policy by July 30, 2018. The rule excludes public health buildings classified as mixed-finance, Section 8, tribal housing, and PHA properties that have converted to project-based rental assistance contracts under the Rental Assistance Demonstration Program.^{5,13} Under the rule, prohibited tobacco products include cigarettes, cigars, pipes, and waterpipes (hookahs).⁵ The rule does not cover electronic cigarettes (e-cigarettes) or electronic nicotine delivery systems (ENDS), but individual PHAs have the authority to prohibit the use of e-cigarettes and ENDS in their smoke-free policies if they choose to do so.⁵ Each PHA policy must prohibit the use of tobacco products in all public housing units, common areas, administrative offices, and in outdoor areas within 25 feet of the restricted areas. Individual PHAs also hold the authority to make their entire grounds smoke-free.^{5,13}

It is important to note that the policy is focused solely on the smoke, not the smoker. Residents who smoke are still allowed to live in public housing units so long as they avoid smoking in the restricted areas.⁵ However, some residents who smoke may be motivated to quit and providing those residents with resources to help them do so will improve policy implementation.¹⁴ HUD provides suggestions on compliance and enforcement, but PHAs must individually determine how they will offer cessation resources to their residents. At the Boston Housing Authority, residents who engaged with resident health advisors had higher cessation rates than residents who were only referred to state quitlines.¹⁵ Some residents may decide to quit only after experiencing difficulties complying with the policy, so resources should be made available not just before policy implementation, but also throughout.¹⁴ PHAs should also

consider offering nicotine replacement therapies (e.g. patch, gum, lozenge) to make ensure that residents are comfortable, especially those with limited mobility.

2.4 Challenges to Implementation

While there is clear rationale for smoke-free public housing, it is not guaranteed that the policy will be implemented successfully. Certain challenges in implementation apply to all PHAs, but some challenges are specific to the unique environment surrounding each PHA. A settings approach to health promotion is a framework that can be used to look at policy in a local, place-specific context.¹⁶ The framework largely focuses on understanding settings, with a specific emphasis on *localized determinants of health*; such determinants include factors of the physical, built, and psychosocial environments.¹⁶ Building infrastructure, demographics of the resident population, staffing, and the macroenvironment are all factors that can affect residents' smoking behaviors and compliance. HUD's policy restricts smoking in outdoor areas within 25 feet public housing buildings. It will be especially challenging for PHAs in dense urban environments where the PHA property boundaries may be less than 25 feet from the building. Seasons and weather patterns are aspects of the macroenvironment that should be considered locally when implementing smoke-free housing policies. In colder areas, beginning policy implementation during the warmer months can foster compliance. Boston Housing Authority residents, for example, reported higher rates of socializing and smoking outside rather than inside their units during the summer months¹⁴. Smoke-free policies will be more sustainable if they are implemented in a context that facilitates residents' compliance.¹⁴

2.5 The Tobacco Retail Environment

2.5.1 Retailer Proximity and Density

Assessing the macroenvironment can provide baseline information on what factors should be considered alongside smoke-free policy implementation and what challenges those factors present. Tobacco retailers that are densely-clustered and in close proximity to public housing may limit the potential for successful smoke-free public housing policies. Findings from a 2011 study in Houston indicated former-smokers were more likely to relapse if they lived closer to a tobacco retailer.¹⁷ Prior studies have found a relationship between tobacco retailer density and income, where lower-income areas have higher concentrations of tobacco retailers.^{18,19} A 2016 study compared density of tobacco retailers between two communities with the same racial demographics but differing income-levels and still found an inverse relationship between income-level and tobacco retailer density. Findings were that Prince George's County (67.5% Black population and higher income-level) had an average of 3.94 tobacco outlets per 1000 persons per tract, whereas Baltimore City (65.3% Black population and low-income level) had an average of 7.95 tobacco outlets per 1000 persons per tract.²⁰ Low-income neighborhoods also have higher densities of tobacco retailers near schools. In Philadelphia, tobacco retailers per capita was 69% higher in low-income zip codes than in high-income zip codes.²¹

2.5.2 Marketing

In 2016, tobacco companies spent an estimated annual amount of \$443.9 million dollars on marketing alone in the state of Pennsylvania.²²⁻²⁴ The state of Pennsylvania is only estimated

to have spent 11.8% of the \$140 million dollars that the CDC recommended for tobacco prevention programs—resulting in a 26.3 to 1 ratio of tobacco industry marketing to state prevention spending.²⁵

To improve tobacco control efforts, public health practitioners must understand tobacco industry marketing practices. It is not just coincidence that tobacco retailers are more densely concentrated in low-income areas. Tobacco companies have historically used advertising to target low-income areas, where smoking prevalence is higher.^{1,26} Additionally, a greater presence of tobacco advertising at the point-of-sale has been found at stores in predominantly African American neighborhoods nationwide.²⁷ As a result, African American and low-income populations face greater exposure to tobacco marketing at the point-of-sale. Exposure to tobacco marketing at the point-of-sale has also been linked to higher cravings among current adult smokers.²⁸ This suggests that public housing residents who are current smokers may face higher exposure to tobacco marketing, and therefore, experience difficulty quitting.

3.0 Methods

3.1 Data

The state of Pennsylvania requires all retailers who wish to sell tobacco products to obtain a license from the Pennsylvania Department of Revenue. In 2018, sixteen graduate interns (Pitt Public Health master's students) at the Allegheny County Health Department visited 924 licensed tobacco retailers (75.6% of Allegheny County's tobacco retailers) to collect data about the availability, placement, promotion, and price of cigarettes, cigars, chew, and electronic cigarettes. Data collectors assessed tobacco retail locations using the Standardized Tobacco Assessment for Retail Settings (STARS)²⁹. Retailer addresses were then geocoded using ArcGIS software.

Approximately 95% of retailers (n=1467) were included in the present spatial analysis. Licensed tobacco retailers for which data were not collected because they were no longer in business (n= 83) were excluded from analyses. Median income spatial data for municipalities were retrieved from the 2012-2016 American Community Survey 5-Year Estimates³⁰. Geocoded locations for public housing authority buildings (n=990) in Allegheny County were obtained from the U.S. Department of Housing and Urban Development website³¹. Public housing data included locations for all buildings in both the Pittsburgh and Allegheny County Housing Authorities. Geocoded locations for Allegheny County Schools grades K-12 were obtained from the Allegheny County Private Schools Locations and Allegheny County Public Schools / Local Education Agency (LEAs) Locations datasets from the Western Pennsylvania Regional Data Center website^{32,33}. Public and Private School location data were merged into a single shapefile layer for analysis.

3.2 Geospatial Analysis

Multiple geographic information software systems were used to look at clustering of tobacco retailers. QGIS version 3.6.0 was used to create 0.25-mile-radius, 0.5-mile-radius, and 1-mile-radius buffers around each individual housing point and school point³⁴. A count was obtained for the number of licensed tobacco retailers within each buffer. Selected counts were then saved into a separate spatial layer (e.g. Tobacco retailers within ¼ mile of a public housing building). The ¼ mile distance has been used in public health literature on the basis that an average adult can walk ¼ mile in 5 minutes³⁵. The ½ mile radius from a central point has been used to show how environmental characteristics contribute to cigarette smoking³⁶. The ½ mile radius has also been cited as a walking distance in studies of transportation to and from school^{37,38}. Point pattern analyses were performed using ArcMap version 10.6.1. ArcMap is product of ArcGIS, a geographic information system software produced by ESRI³⁹.

The Point Density tool calculates the density of point features around each output raster cell. A raster is a matrix of cells organized into a grid where each cell contains a value with information. Digital photographs or scanned maps are examples of a raster. The tool defines a conceptual neighborhood around each raster cell center. The total number of points that fall within each neighborhood is then divided by the area of each neighborhood. Map units were set to feet and density was calculated as points per square mile using a scale factor of 5280.

The Optimized Hot Spot Analysis Tool is part of the Mapping Clusters Toolset. The Optimized Hot Spot Analysis automatically aggregates incident data and identifies an appropriate scale of analysis. Incident data are points where the focus is on the presence of absence of the point rather than on a value or measure associated with that point. Given incident points, the tool identifies and creates a map of statistically significant hot and cold spots using the Getis-Ord Gi*

spatial statistic.⁴⁰ The G_i^* statistic requires a value to be associated with each feature. When only incident data is provided, the tool aggregates the incidents and the incident counts to serve as the values for analysis. Tobacco retailers ($n = 1476$) were used for incident point data and a fishnet polygon aggregation method was selected to create weighted features for analysis from incident point data. The fishnet polygon mesh overlays the incident point data and counts the number of incidents within each fishnet polygon cell. The tool was run two separate times: first, using Allegheny County as a study area, and second using the city of Pittsburgh as a study area.

The Average Nearest Neighbor Tool calculates spatial statistics using a nearest neighbor index based on the average distance from each feature to its nearest neighboring feature. The tool requires three inputs: input feature class, distance method, and area. The tool was run a total of four times using a separate input feature class each time: all tobacco retailers in Allegheny County; tobacco retailers within $\frac{1}{4}$ -mile distance of public housing; tobacco retailers within $\frac{1}{2}$ -mile distance of public housing; and tobacco retailers within 1-mile of public housing. Euclidian distance, the straight-line distance between two points, was selected for distance method. Allegheny County boundary area (207041130000 feet) was used as the value for the study area size. The output returns five values: Observed Mean Distance, Expected Mean Distance, Nearest Neighbor Index, z-score, and p-value. The Nearest Neighbor Index statistic is expressed as a ratio of the Observed Mean Distance to the Expected Mean Distance based on the null hypothesis that points are randomly distributed. If the index value is less than 1, the pattern is clustered. If the value is greater than 1, the pattern is dispersed.

4.0 Results

Spatial analysis showed the highest densities of tobacco retailers in the city of Pittsburgh. Results from the Average Nearest Neighbor Spatial Analysis revealed statistically significant clustering of tobacco retailers across Allegheny County and within ¼-mile, ½-mile, and 1-mile distances of public housing buildings.

4.1 Descriptive Results

4.1.1 Tobacco Retail Environment in Allegheny County

Table 1 shows the total number of tobacco retailers and public housing buildings overall in Allegheny County and the 10 municipalities with the highest counts of tobacco retailers. Average median income is included for descriptive purposes. Twenty-eight percent of all tobacco retailers and 62% of all public housing buildings are located in Pittsburgh.

Table 1 Number of public housing buildings and tobacco retailers, by municipality

	<i>No. Public Housing Buildings</i>	<i>No. Tobacco Retailers</i>	<i>Avg. Median Income</i>
<i>Allegheny County</i>	990	1467	--
<i>Pittsburgh</i>	614 (62%)	412 (28%)	31,833
<i>Outside Pittsburgh</i>	376 (38%)	1055 (72%)	--
<i>Penn Hills</i>	8 (<1%)	46 (3.1%)	\$37,885
<i>Bethel Park</i>	4 (<1%)	45 (3.1%)	\$102,857
<i>McKeesport</i>	2 (<1%)	41 (2.8%)	\$43,841
<i>Monroeville</i>	55 (5.5%)	41 (2.8%)	\$37,292
<i>West Mifflin</i>	8 (<1%)	40 (2.7%)	\$48,958
<i>Ross Township</i>	8 (<1%)	37 (2.5%)	\$51,786
<i>Bellevue</i>	5 (<1%)	30 (2.0%)	\$63,189
<i>Shaler</i>	4 (<1%)	27 (1.8%)	\$53,450
<i>West View</i>	5 (<1%)	25 (1.7%)	\$36,548

4.1.2 Public Housing and Schools

Table 2 shows the number of public housing buildings that have tobacco retailers in close proximity. Eighteen-percent of all public housing buildings in Allegheny County have at least one tobacco retailer within $\frac{1}{8}$ of a mile. Almost half (49%) of all public housing buildings have at least one tobacco retailer within $\frac{1}{4}$ mile, or within a 5-minute walking distance. A comparison of public housing buildings and schools was made on the basis that tobacco retailers are often

located near schools. Table 3 presents the total number of tobacco retailers within ¼ mile, ½ mile and 1-mile of both public housing and schools. The mean is the average number of tobacco retailers found within each spatial distance buffer. The range reflects the minimum and maximum number of tobacco retailers found in each buffer. A greater percentage of total tobacco retailers are within ¼ mile, ½ mile, and 1 mile of schools than of public housing in Allegheny County. Schools also have a higher average number of tobacco retailers within ¼ mile and ½ mile. Public housing has a higher average of tobacco retailers within 1 mile (18.76) than schools (16.25).

Table 2 Number of public housing buildings near at least 1 tobacco retailer, by proximity

	<i>Proximity</i>			
	1/8 mile	1/4 mile	1/2 mile	1 mile
<i>No. public housing buildings</i>	175 (18%)	489 (49%)	766 (77%)	984 (99%)

Table 3 Number of Tobacco Retailers (n = 1467) near public housing buildings and schools, by distance buffers

	<i>Public Housing (n = 990)</i>				<i>School (n = 582)</i>			
	No.	Mean	SD	Range	No.	Mean	SD	Range
<i>Tobacco within 1/4 mile</i>	279 (19%)	1.21	±1.73	0-10	587 (40%)	1.77	±3.26	0-28
<i>Tobacco within 1/2 mile</i>	625 (43%)	4.92	±4.83	0-30	1047 (71%)	5.55	±7.18	0-40
<i>Tobacco within 1 mile</i>	998 (68%)	18.76	±13.37	0-64	1395 (95%)	16.25	±14.79	0-72

4.2 Geospatial Analysis

4.2.1 Point Density

Figure 1 shows tobacco retailer points per square mile displayed over Allegheny County municipal boundaries. The darker green shows areas with the highest densities (~21 to 23 points) per square mile. The highest densities of tobacco retailers are located within the city of Pittsburgh.

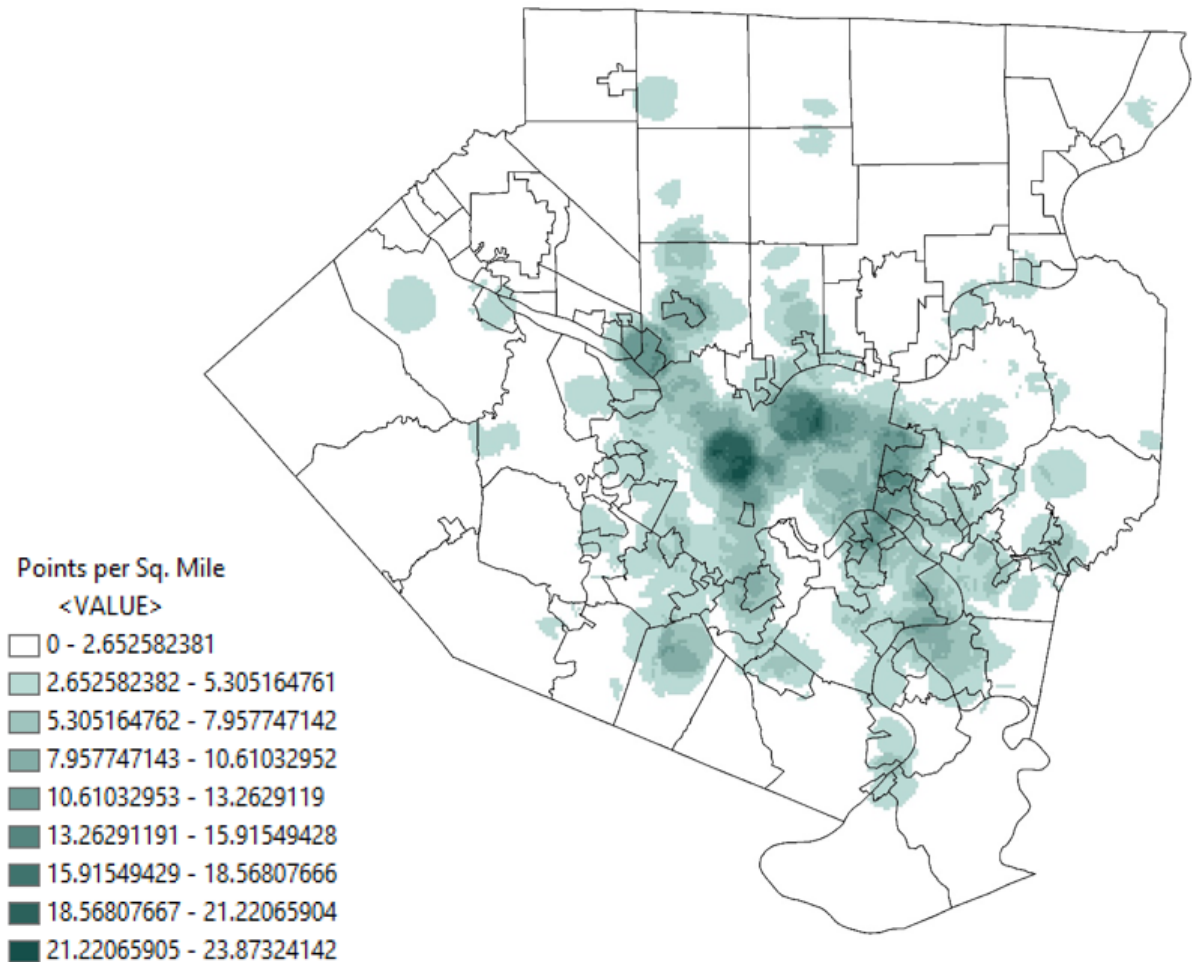


Figure 1 Density of tobacco retail locations per square mile

4.2.2 Optimized Hot Spot Analysis

The Optimized Hot Spot Analysis Tool was run first using Allegheny County as the study area (Figure 2). The aggregation process returned 8124 weighted polygons (1624 feet each) and assessed a total of 1467 tobacco retailers (incidents). Within each polygon, the range of tobacco retailers was 0-12 (mean = 0.18, standard deviation = 0.75). Based on the GI* statistic for spatial dependence, 814 output features were found to be statistically significant. Red output features are hot spots with counts of tobacco retailers. Out of 130 total municipalities, 33 (25%) had hot spot features at 99% confidence intervals. Hot spots were largely concentrated in the city of Pittsburgh. Other municipalities featuring at least one hot spots at the 99% confidence interval include Mccandless, Ross, West View, Avalon, Belleview, Stowe, McKees Rocks, Ingram, Dormont, Mt. Oliver, Brentwood, Whitehall, Bethel Park, McKeesport, Duquesne, West Mifflin, Dravosburg, Port Vue, Munhall, Homestead, West Homestead, Braddock, Whitaker, Rankin, Braddock Hills, Swissvale, Edgewood, Wilkinsburg, Penn Hills, Wilkins, Chalfant, and North Versailles.

The tool was also run using Pittsburgh neighborhoods as a specific study area (Figure 3). The tool created 2966 weighted fishnet polygons (each 774 feet) to use for tobacco retailer points and assessed 409 tobacco retailers. Within each polygon, the the range of tobacco retailers was 0-8 (mean = 0.14, standard deviation = 0.55). Using the GI* statistic, 132 output features were found to be statistically significant. Out of 90 neighborhoods, 18 (20%) have at least one hot spot at the 99% confidence interval. Neighborhoods with hot spots include Marshall-Shadeland, Central Business District, Crawford-Roberts, Southside Flats, West Oakland, Central Oakland, Greenfield, Hazelwood, Squirrel Hill South, Squirrel Hill North, East Liberty, Friendship, Shadyside, Central Lawrenceville, Lower Lawrenceville, Garfield, Polish Hill, North Oakland.

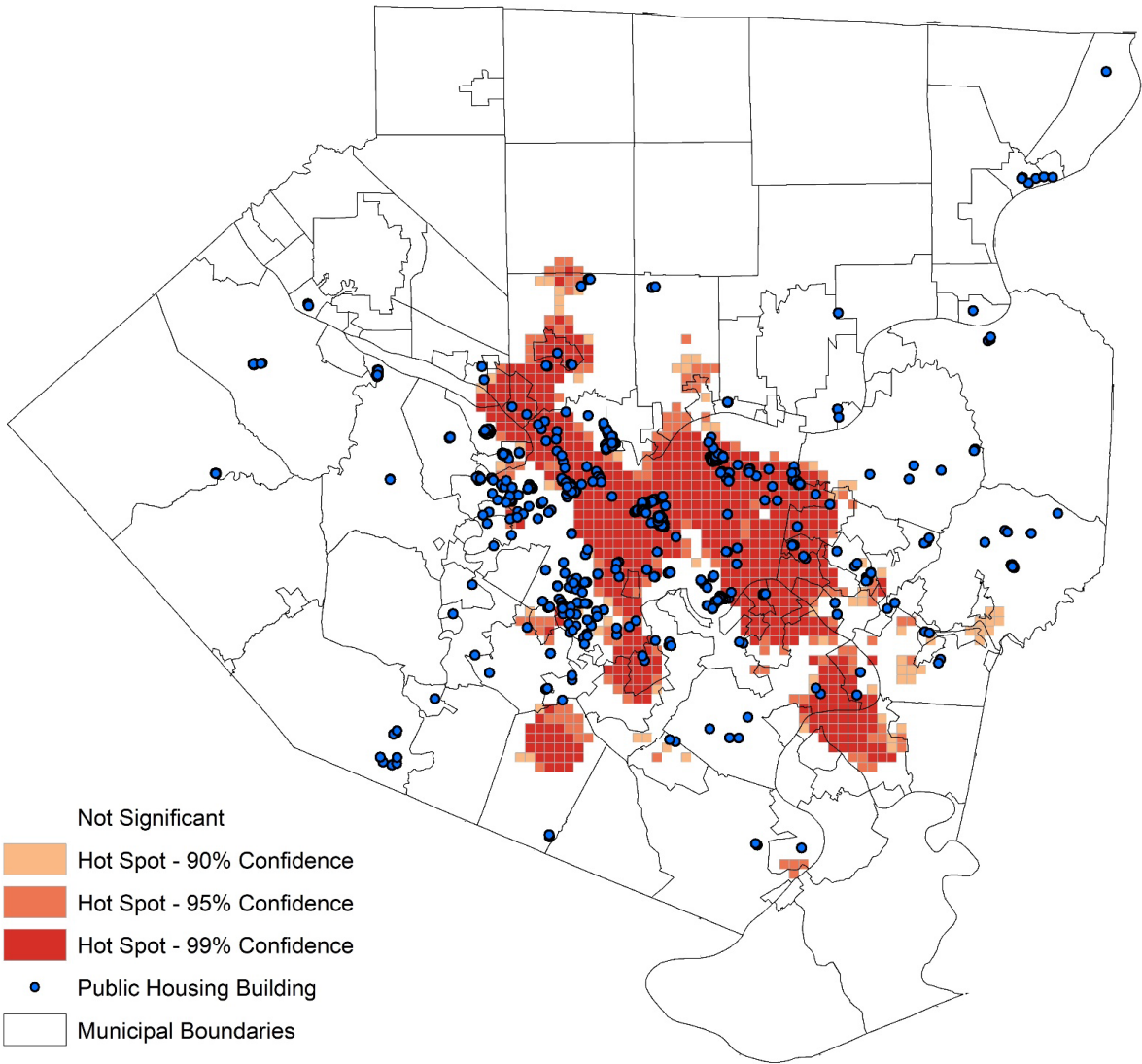


Figure 2 Tobacco Retail Hot Spots in Allegheny County

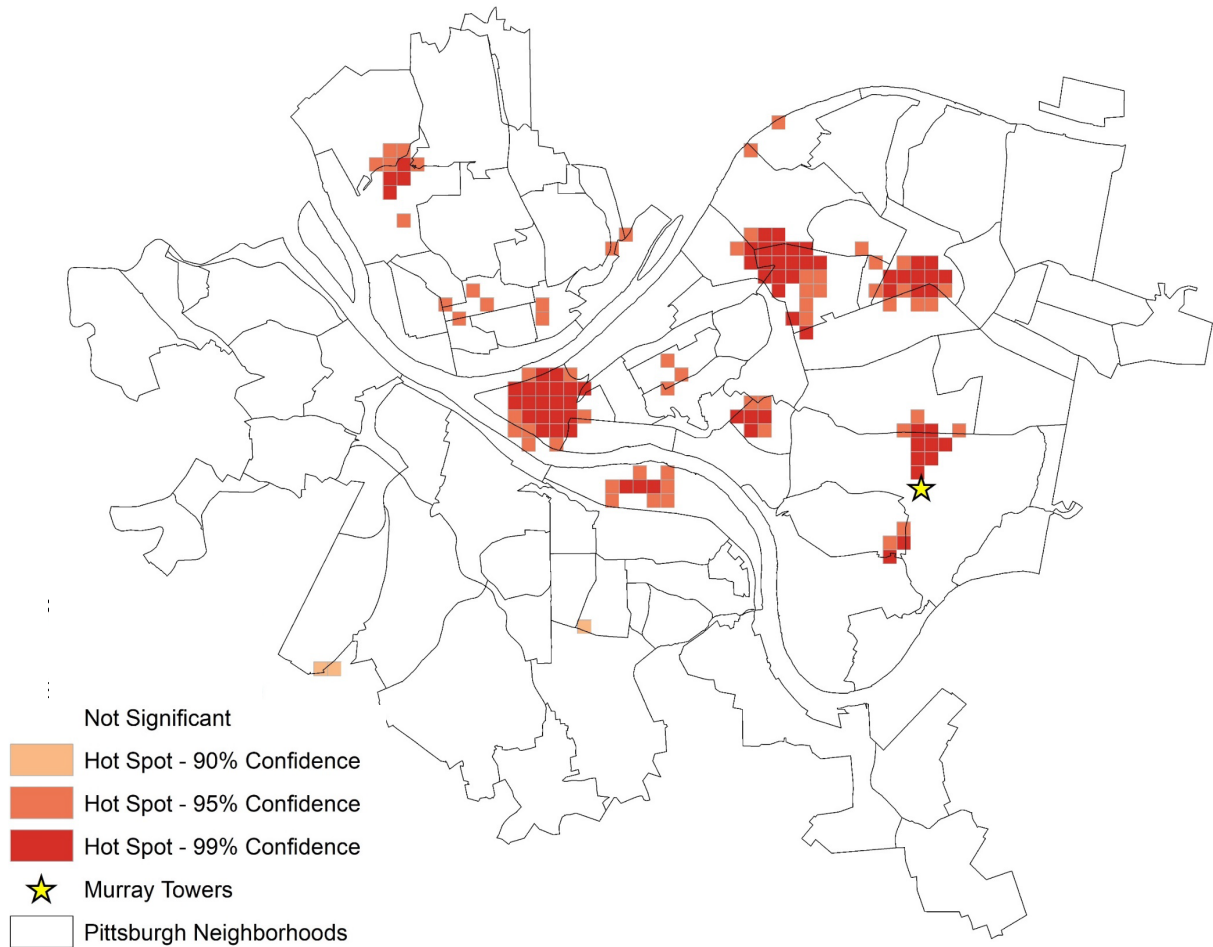


Figure 3 Tobacco Retailer Hot Spots in Pittsburgh

4.2.3 Murray Towers: A Case Study

Murray Towers is a high-rise public housing building in the Squirrel Hill South that primarily houses senior residents. Murray Towers was selected based on its close proximity to one of the hot spots identified in the Optimized Hot Spot Analysis (see Figure 2). Using a multi-ring buffer (Figure 3), individual tobacco retailers were counted at $\frac{1}{8}$ mile, $\frac{1}{4}$ mile, $\frac{1}{2}$ mile, and 1-mile distances from Murray Towers. Table 4 shows tobacco retailers near Murray Towers, by

proximity. A total of 33 tobacco retailers are within a 1-mile-radius of the building. Eleven of those retailers are within a ½-mile-radius of Murray Towers and six tobacco retailers are located within ¼-mile-radius or less of Murray Towers.

Table 4 Number of tobacco retailers surrounding Murray Towers, by proximity

<i>No. tobacco retailers</i>	<i>Proximity</i>			
	$\frac{1}{8}$ mile	$\frac{1}{4}$ mile	$\frac{1}{2}$ mile	1 mile
	4	6	11	33

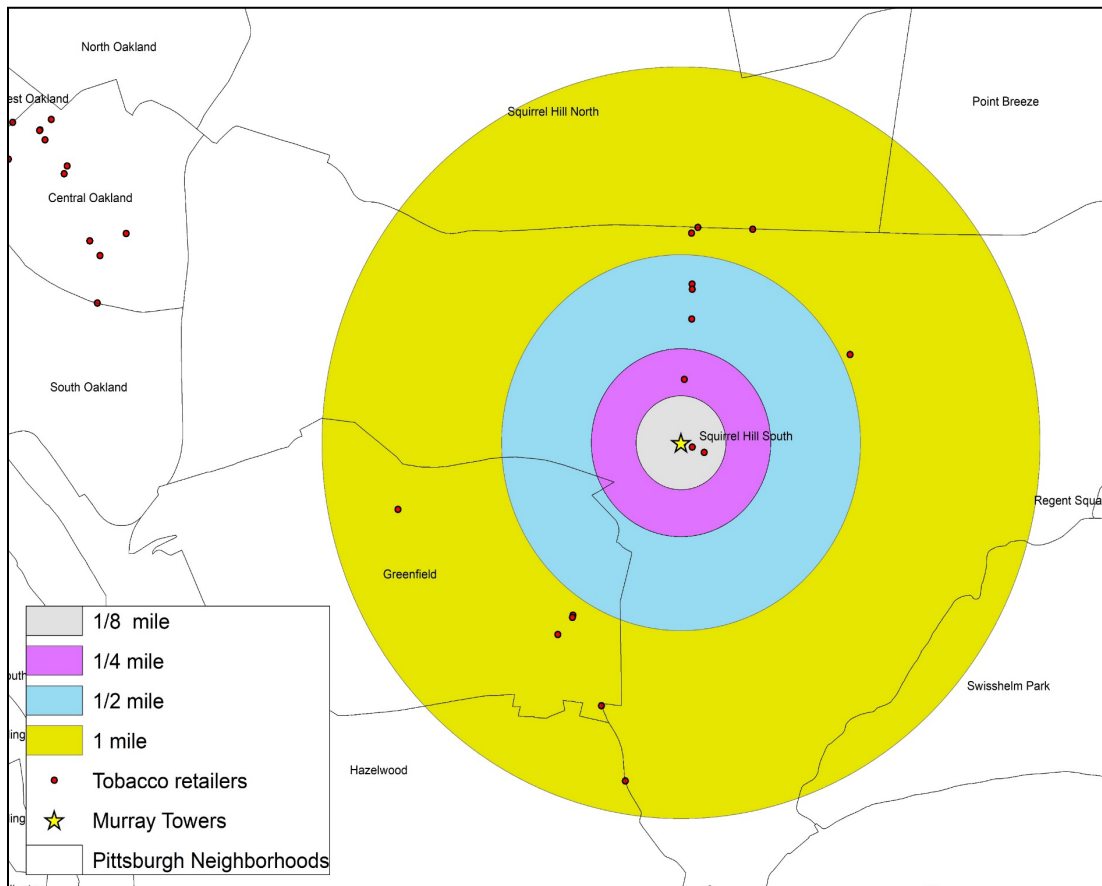


Figure 4 Close-up of Murray Towers and surrounding tobacco retail environment

4.2.4 Average Nearest Neighbor

Figure 4 is a graphical representation of the Average Nearest Neighbor Output. Table 4 shows significant statistical clustering of tobacco retailers in Allegheny County based on the Average Nearest Neighbor Output. The Observed Mean Distance from one tobacco retailer to another was 592 feet and the Expected Mean Distance was 5940 feet producing a nearest neighbor ratio of 0.099607. The ratio is less than 1, which indicates clustering of tobacco retailers in Allegheny County. Based on the Z-score of -65.97, there is a less than 1% likelihood that this clustered pattern could be the result of random chance. The p-value (0.0000) shows that clustering of tobacco retailers is statistically significant. Table 5 presents average nearest neighbor outputs for tobacco retailers within ¼-mile, ½-mile, and 1-mile buffers around public housing. Each has a ratio less than 1, and a p-value of 0.0000 which indicates statistically significant clustering of tobacco retailers around public housing within each distance buffer.

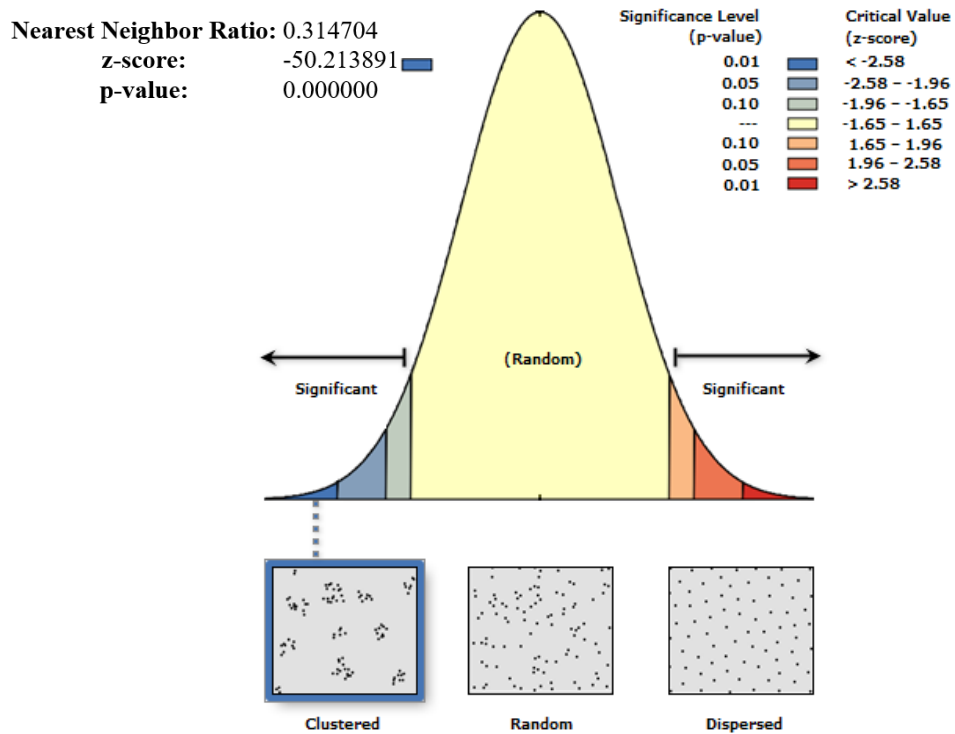


Figure 5 Average nearest neighbor output showing statistically significant clusters of tobacco retailers in Allegheny County

Table 5 Clustering of tobacco retailers, by distance buffers around public housing

	Observed Mean Distance (feet)	Expected Mean Distance (feet)	Ratio	Z-score	p-value
<i>Tobacco within ¼ mile</i>	521.04	4311.06	0.12	-28.09	0.0000
<i>Tobacco within ½ mile</i>	455.54	2880.36	0.16	-40.26	0.0000
<i>Tobacco within 1 mile</i>	458.66	2279.40	0.20	-48.28	0.0000

5.0 Discussion

Findings from this study suggest that additional local policy may be needed to address the concentration of tobacco retailers around public housing. While only 28% of all tobacco retailers are located in the city of Pittsburgh, they are more densely clustered in the city than in the rest of Allegheny County. Over half (61%) of all public housing buildings in Allegheny County are located in Pittsburgh. Furthermore, 49% of all public housing buildings have at least one tobacco retailer within a 1/4 mile, or a 5-minute walking distance. Previous research on tobacco retailers has used density and proximity to the point-of-sale to measure accessibility⁴¹. Restricting access to tobacco retailers has been shown to reduce smoking rates in adolescents⁴¹. Higher adolescent and adult smoking rates have also been significantly associated with lower neighborhood socioeconomic status and higher tobacco retailer density^{42,43}. In the Murray Towers case study, six tobacco retailers were located within walking a 5-minute walking distance of the property. Residents of Murray Towers and many other public housing buildings have high accessibility to tobacco products, which may present specific challenges to residents who are motivated by the smoke-free law to quit smoking.

Local policy efforts should aim to reduce the proximity and density of tobacco retailers in areas surrounding public housing. Time, place, and manner restrictions, for example, have been used to prohibit sale of flavored tobacco products within a certain distance of schools. In 2016, the Chicago City Council passed an ordinance on prohibited new tobacco licenses from being issued to any retailer within 500 feet of a school⁴⁴.

The tobacco retail environment in Allegheny County is comprised of convenience stores (54%), pharmacies (12%), grocery stores (11%), mass merchandisers (10%), liquor stores (5%),

tobacco shops (4%), and other (4%). Because Allegheny County residents rely on many of these places for groceries and other necessities, it is not possible to outright eliminate such retailers. However, information gathered during qualitative interviews conducted with store owners suggest that other strategies may exist to reduce access and exposure to tobacco products. Key findings from interviews with 10 store owners are summarized below:

- Stores stock products based on customer preference and requests. Continued consumer demand for healthier products can influence the owner's decision to stock certain products over others, such as tobacco products.
- Tobacco companies determine interior advertisement placement but not exterior. Store owners have the autonomy to remove exterior advertisements.
- Many stores felt that eliminating tobacco products would hurt their business, but do not feel as strongly about eliminating advertisements.

Before implementing policy, it may be informative to interview owners of stores within ¼-mile (walking distance) of public housing buildings.

5.1 Limitations

A limitation of this study was the STARS survey data. The total number of licensed tobacco retailers in Allegheny County was 1553, but graduate students only visited 924 stores (75.6% of Allegheny County's tobacco retailers). Of the 924 stores visited, surveys were only completed for 572 stores (61.9%). Students were unable to complete surveys at 352 stores (38.1%). The most common reason stores could not be surveyed included the store being closed permanently or at the time of attempted survey (45.5%). Additionally, the data was originally

collected to measure youth exposure to tobacco marketing at the point-of-sale, so surveys were not completed for stores that did not allow individuals under 18 years of age to enter (30.1%). Locations missing data because the store is no longer in business (n=83) were excluded from geospatial analysis, but other locations that were missing data because data collectors did not visit them were still included in analyses. Due to missing values and incomplete data, only point pattern analyses were able to be performed in ArcMap. Point pattern analyses use incident data where the focus is on the presence of absence of the point rather than on a value or measure associated with that point. While these data limitations did not impact the present results, they limited the types of spatial analysis that could be performed.

6.0 Conclusion

All public housing residents are entitled to smoke-free housing. Public housing exists largely to provide low-income populations with safe and healthy housing. Tobacco companies have historically targeted and continue to target low-income populations. High-densities of tobacco retailers in Allegheny County challenge the implementation and sustainability of the newly-established smoke-free public housing policy. In order for the policy to be effective and for smoking cessation attempts to be successful among residents, local zoning laws must be considered. While Allegheny County does not have zoning authority, the city of Pittsburgh and individual municipalities do. Pittsburgh and other municipalities with high counts of tobacco retailers may consider zoning laws that prohibit tobacco from being sold within a certain distance of public housing buildings.

Appendix Figures

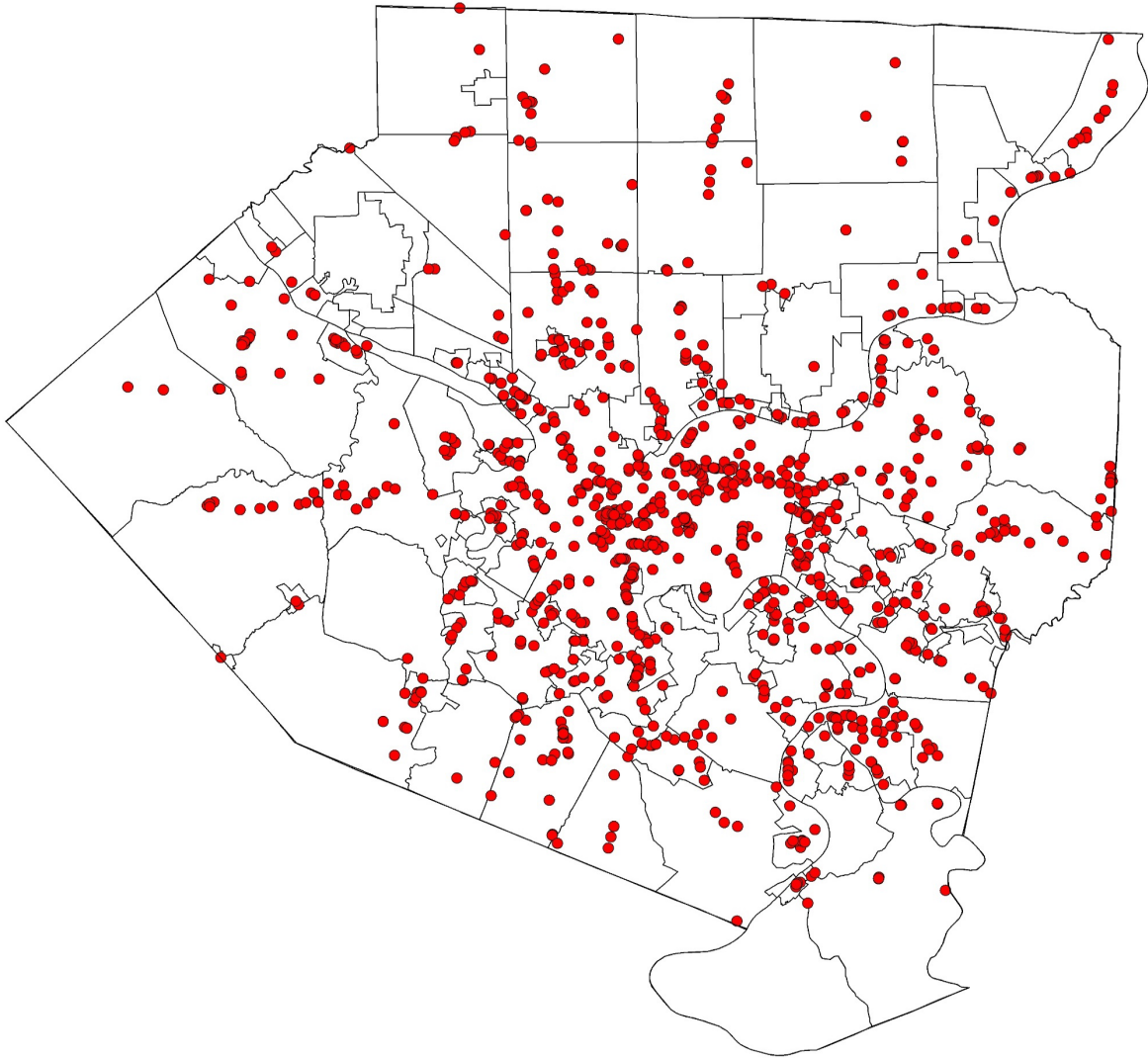


Figure 6 Tobacco retailers (n=1467), Allegheny County, PA

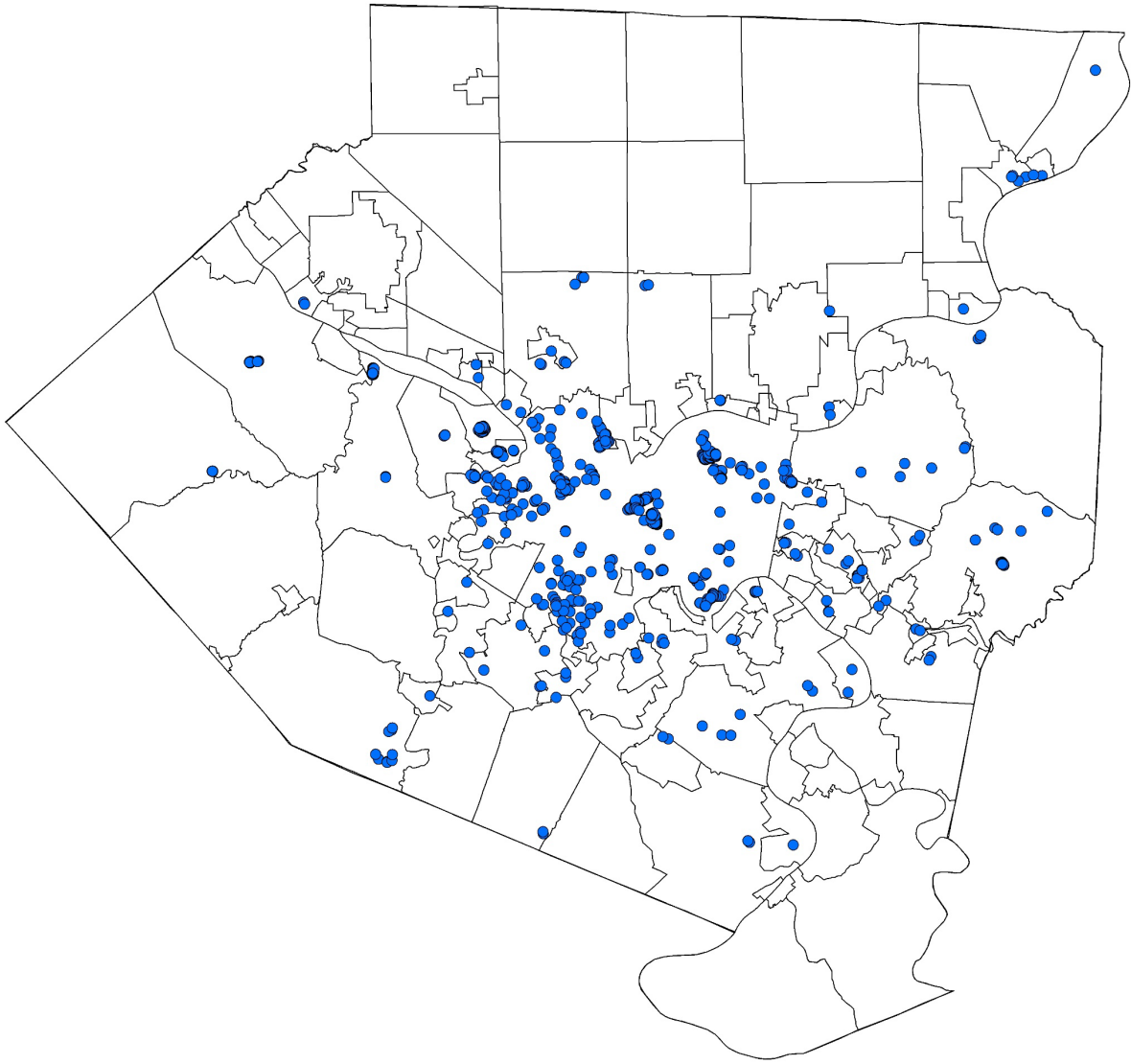


Figure 7 Public housing buildings (n=990), Allegheny County, PA

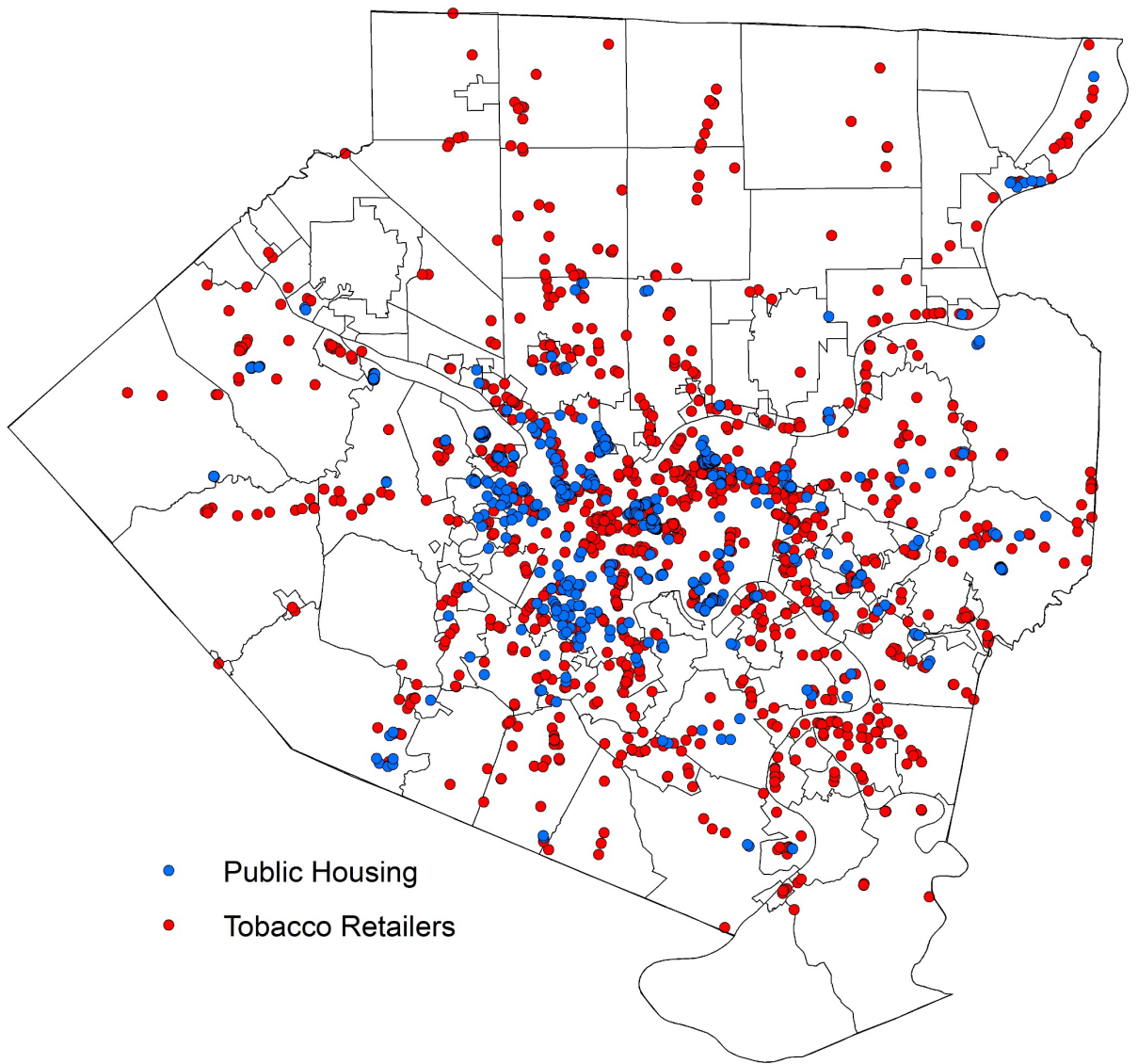


Figure 8 Public Housing and Tobacco Retailer Locations, Allegheny County, PA

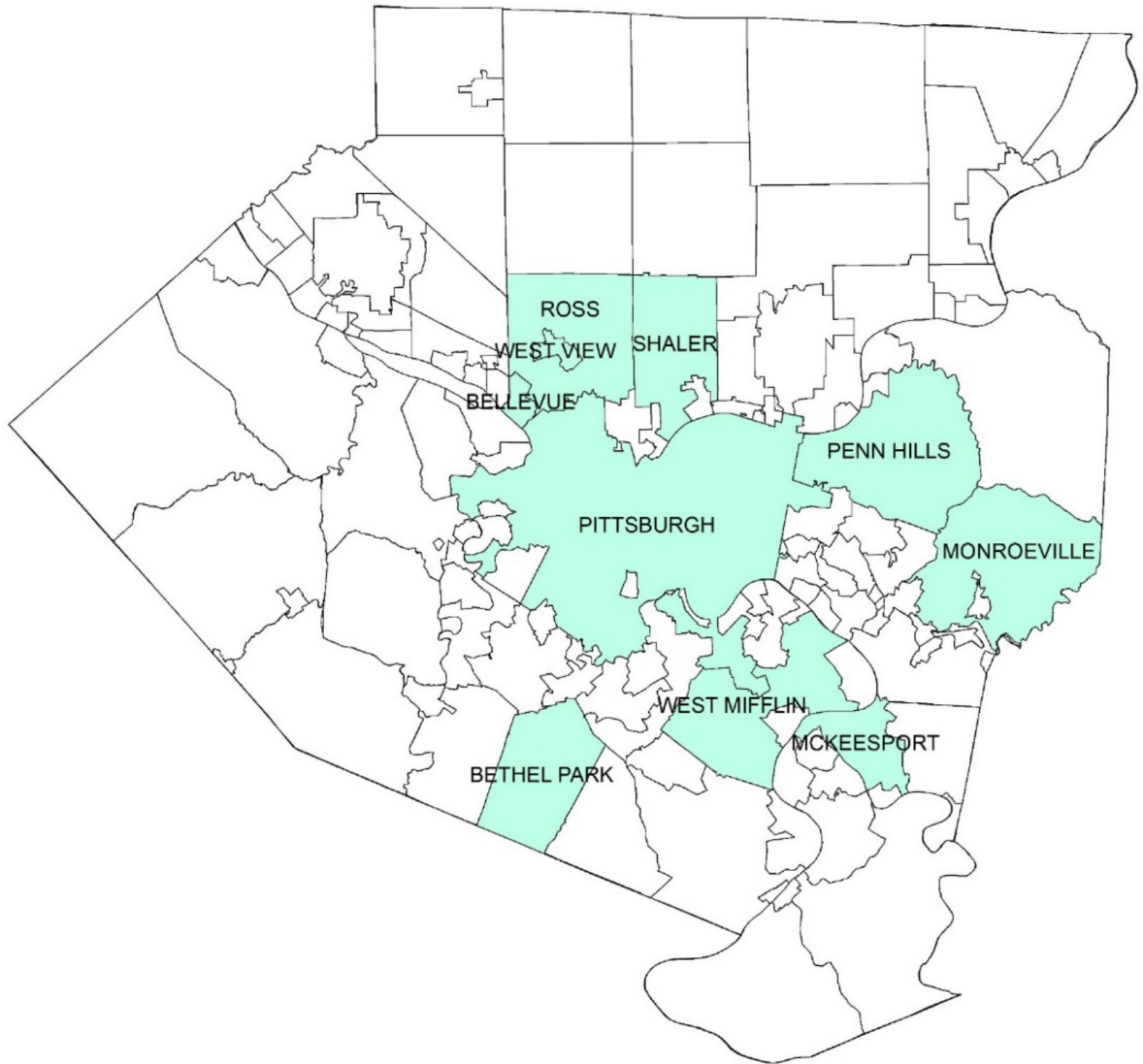


Figure 9 Municipalities with highest counts of tobacco retailers, Allegheny County, PA

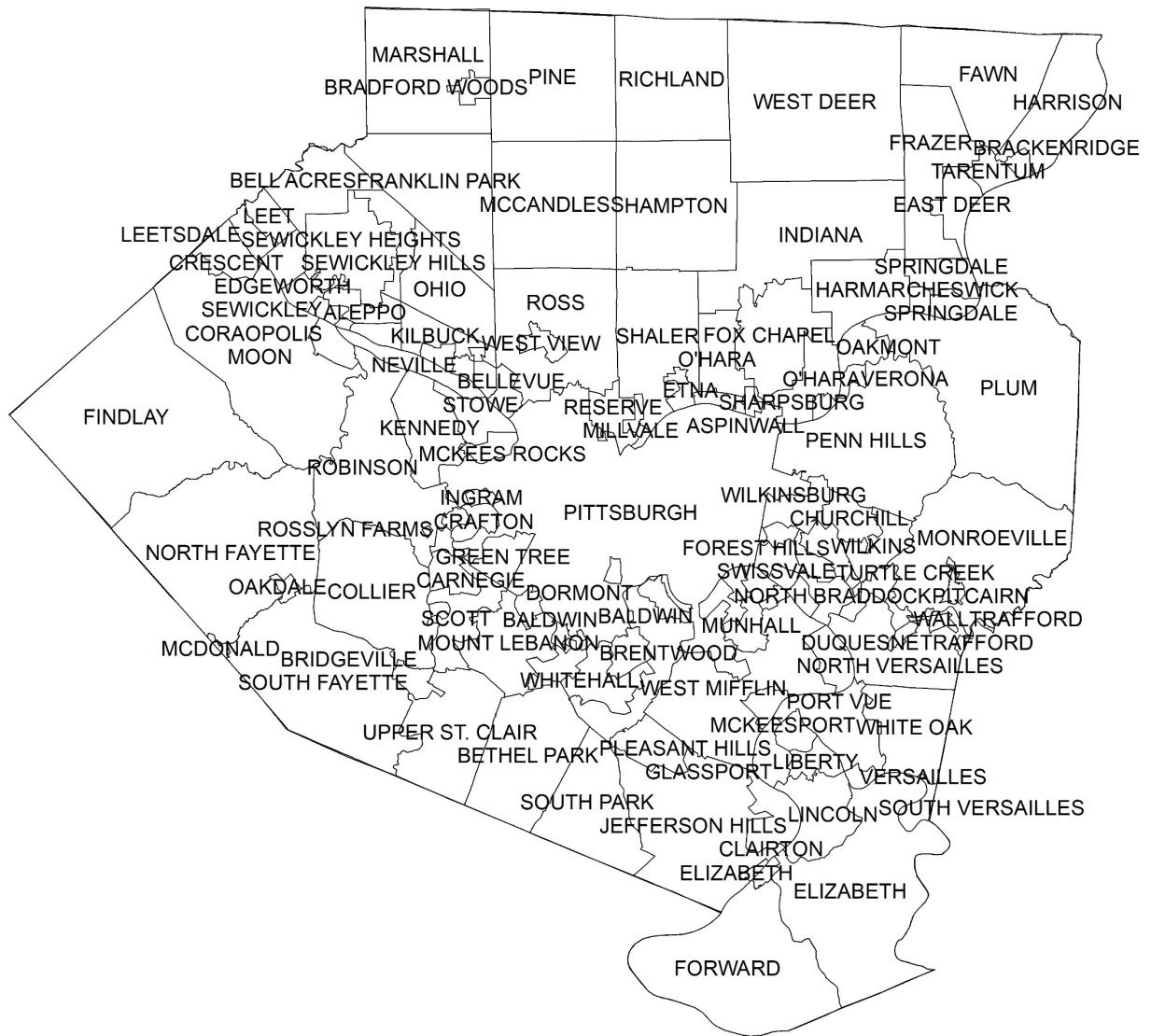


Figure 10 Municipalities, Allegheny County, PA

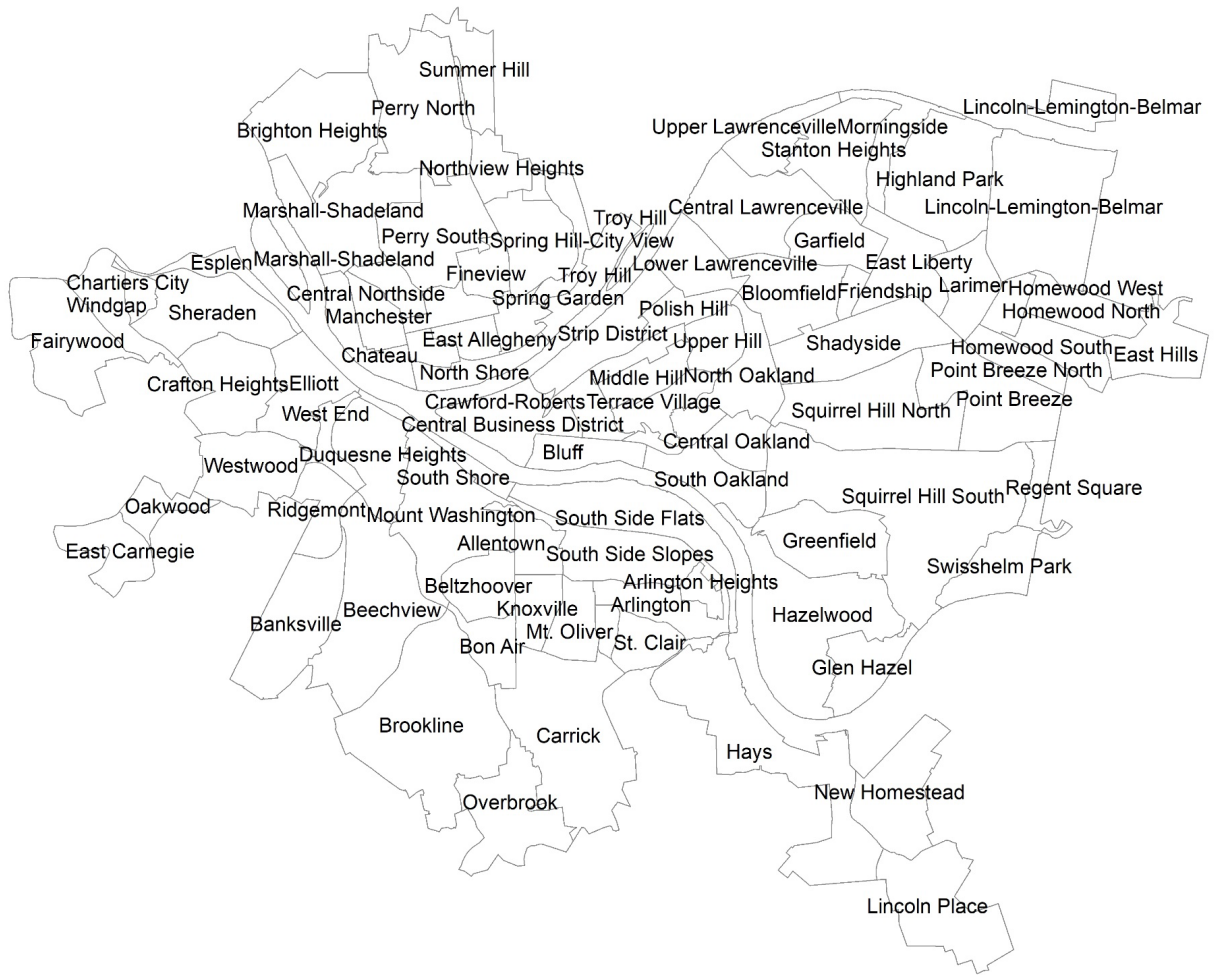


Figure 11 Neighborhoods, Pittsburgh, PA

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