Impact of Food Distribution Center traffic on health outcomes in Hunts Point

Food Distribution Center diesel truck traffic on residential city streets contributes to poor air quality in Hunts Point, ultimately influencing the prevalence of asthma and cardiovascular disease among residents. Hunts Point is responsible for 80% of New York City's fresh food and is a key player in freight transportation in New York, New Jersey, and Connecticut.[1] Given the area's important role in food distribution, Hunts Point is used by over 10,000 trucks daily.[1] The Sheridan Expressway is an important road for food-distributing trucks in Hunts Point because it connects the Buckner Expressway south of the Bronx to the Cross Bronx Expressway north of the Bronx.[2] For food-distributing trucks to collect food from the Hunts Point peninsula and then transport this food to the rest of New York City, these trucks must exit the Sheridan Expressway and drive over one mile on Hunts Point's residential city streets.[2] Of all the truck traffic that travels on these residential city streets to collect and distribute food from the Hunts Point peninsula, diesel trucks have been identified as the primary contributor to elemental carbon truck emissions in Hunts Point.[1] It is estimated that 9.3 to 276.5 diesel vehicles per hour use these primarily residential streets in Hunts Point.[1] Because they have been identified as the largest carbon emitter and heavily use residential city streets, diesel trucks used in food transportation from Hunts Point to the rest of New York City are a key component of the Hunts Point ecosystem. Elemental carbon is the most harmful air pollutant and makes up 52% of total particulate matter with a diameter of less than 2.5 μm.[1] The levels of particulate matter with a diameter less than 2.5 μm in Hunts Point and Longwood, a neighboring area, is 8.5μm/m^3.[1] These levels are higher than both the Bronx (7.8 μm/m^3) and New York City as a whole (7.5 μm/m^3).[1] Particulate matter emissions do not only impact outdoor air quality, though. It has been established that diesel exhaust particulate concentrations are equivalent for both the outdoors and indoors in New York City.[1] Therefore, we can conclude that any air pollution from elemental carbon created by these diesel trucks on residential streets is equally present in the outdoors and in residential homes, and therefore has powerful implications on the health of Hunts Point residents.[1]

The disproportionately high levels of respiratory and cardiovascular health issues among Hunts Point residents are well reported. It has been established that the amount of diesel exhaust particulate required to produce a negative physiological response in an eight-year-old child is 396 μg over 14 days.[1] The diesel exhaust particulate concentrations observed in Hunts Point result in an estimated exposure of 949 μg over 14 days.[1] This estimate in Hunts Point is over twice as large as the threshold required to produce immunoglobulin E and cytokine release, so it is not surprising that this poor air quality results in asthma and cardiovascular disease among Hunts Point residents. For children aged 5 to 17, the asthma-related emergency health department visitations rate is almost double that of the rest of New York City.[3] More specifically, 432 per 10,000 children have had asthma-related emergency health visits in Hunts Point and Longwood as compared to 223 per 10,000 children in New York City as a whole.[3] Shockingly, the asthma hospitalization risk in Hunts Point is twelve times more than the national average risk[1] and, in Hunts Point's Burrough, there is a 30% increase in the likelihood of asthma hospitalization among residents compared to non-residents.[4] The air quality in Hunts Point being disproportionately worse than surrounding areas influences their disproportionate burden of asthma. Asthma is not the only major health concern among Hunts Point residents. Data suggests that particulate matter from poor air quality increases blood vessel plaque formation, ultimately influencing cardiovascular efficiency.[5] This impact of particulate matter on cardiovascular efficiency is observed in Hunts Point data. Although heart disease is a primary contributor to premature death throughout New York City, the rate of premature death is higher in Hunts Point and Longwood than in the rest of New York City.[3] In fact, the number one cause of death in Hunts Point and Longwood is heart disease, whereas, in the rest of New York City, this number one cause of death is cancer.[3] Furthermore, 38% of Hunts Point and Longwood adults report having hypertension whereas only 28% of people in New York City as a whole report hypertension.[3] Hypertension is the leading cause of heart disease and thus is indicative of the cardiovascular health of Hunts Point residents.[4] From these data, it is concluded that the poor air quality in Hunts Point due to diesel traffic influences the cardiovascular and respiratory health among residents.

Impact of poor greenspace access on health outcomes in Hunts Point

Poor urban planning has resulted in decreased access to greenspaces, causing poor air quality and poor physical and mental wellbeing among Hunts Point residents. New York City's Urban Design principles emphasize the need for community resources to be accessible to community members and for communities to be built intentionally such that community members are confident in the safety of their neighborhood.[6] These design principles are not reflected in the urban planning of Hunts Point. As illustrated in **Figure 1**, Hunts Point is primarily used by transportation and manufacturing services due to the peninsula's Food Distribution Center.[7] Because this Food Distribution Center is at the end of the peninsula, residential streets must be used for over one mile by truck traffic traveling to the distribution center from the Sheridan Expressway.[2] Given that over 10,000 diesel trucks travel to the Food Distribution center daily, residential communities are significantly affected by this poor organization of land use.[1] Truck traffic in residential communities has resulted in community resources, such as greenspaces, not being accessible nor safe to travel to. There are only three parks in Hunts Point (**Figure 1**).[7] Of the three parks shown in **Figure 1**, only one is in the neighborhood's residential district.[7,8] The other two parks are inaccessible to the residential community because they are landlocked by industrial, manufacturing, and transportation industries.[7] Furthermore, the use of large trucks on residential streets results in poor safety, as Hunts Point and Longwood, a neighboring area, have an elevated pedestrian injury hospitalization rate (36 per 100,000 people) as compared to New York City altogether (23 per 100,000 people).[3] This poor urban planning has resulted in decreased access to greenspaces because not only are the greenspaces inaccessible to community members, but there are also so few greenspaces available. In fact, only 9% of the neighborhood is unpaved surfaces, with 91% of surfaces being paved.[8] From these data, it is concluded that Hunts Point has poor urban planning, which has resulted in decreased greenspace access among residents.

Limited greenspace access for Hunts Point residents leads to poor air quality and poor physical and mental wellbeing. A review has demonstrated that out of seven studies that evaluate the effect of urban greenspaces on air quality improvement, all seven conclude that air pollutants can be reduced by the presence of urban greenspaces.[9] Of these studies, five studies conclude that urban greenspaces significantly reduce small particulate matter concentrations and four studies conclude that NOx and SOx pollutant concentrations are decreased by greenspaces.[9] Thus, limited greenspace access results in poor air quality. This poor air quality as a result of low greenspace access is well documented in Hunts Point and Longwood, as these areas have a particulate matter with a diameter less than 2.5 μm level of 8.5 mg/m^3, which is higher than the Bronx (7.8 mg/m^3) and New York City altogether (7.5 mg/m^3).[3] Poor greenspace access also leads to poor physical and mental wellbeing, as the presence of trees directly reduces hospital admissions and mortality.[10] In the United States, it has been estimated that per hectare of greenspace, the value of health benefits is $1,600.[10] In New York City, the health benefits value from particular matter intervention is estimated to be $6.2 billion.[10] Furthermore, it has been estimated that a 1% improvement in air quality from greenspaces can result in the prevention of 850 deaths and 670,000 incidences of respiratory illness nationally.[11] These poor health outcomes due to lack of greenspace is well documented among Hunts Point residents due to high rates of premature death.[3] In Hunts Point and Longwood, the rate of death before 65 years old per 100,000 people is 261.6, which is higher than the rate in New York City altogether (169.5 per 100,000 people).[3] Furthermore, the rate of psychiatric hospitalizations among adults is 868 per 100,000 residents in Hunts Point and Longwood, which is higher than both the Bronx (797 per 100,000 people) residents and New York City as a whole (684 per 100,000 people).[3] From these data, it is evident that in order to address poor air quality and physical and mental wellbeing in Hunts Point, better access to greenspaces through improved urban planning is required.

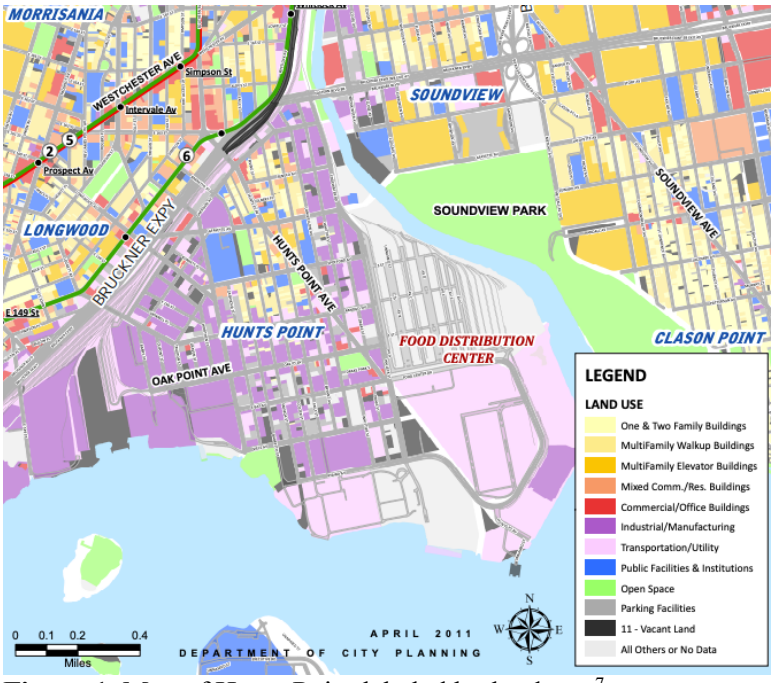

Figure 1. Map of Hunts Point labeled by land use.[7]

Impact of low access to healthy foods on health outcomes in Hunts Point

Despite the presence of the Food Distribution Center, low access to healthy foods as exacerbated by limited public health transit results in increased prevalence of obesity and diabetes among Hunts Point residents. Even though there is so much fresh produce in close proximity to the Hunts Point neighborhood due to the Food Distribution Center, low access to healthy foods in Hunts Point is evidenced by the neighborhood only having 1 supermarket for every 20 bodegas.[3] This ratio is higher than the city average of 1 supermarket for every 13 bodegas,[12] indicating lower healthy food access in Hunts Point versus the city as a whole because supermarkets typically contain healthy food options whereas bodegas are less likely to sell nutritious foods.[3] Furthermore, in Hunts Point and Longwood, a nearby neighborhood, 18% of adults reported not having any fruits and vegetables the previous day, which is 5.1% higher than that of New York City as a whole (12.9%).[12] This lack of nutritious food consumption is exacerbated by the lack of good public transport available to Hunts Point residents. Hunts Points residents are so isolated from New York City subway and bus lines that some employers must send vans to pick up employees who live in the area.[13] In fact, only 50% of Hunts Point, Jamaica, and Flushing residents combined use public transportation.[13] This poorly accessible public transportation means that Hunts Points residents are limited to the food stores available in the neighborhood.

Unsurprisingly, low access to healthy foods is associated with a higher prevalence of obesity and diabetes among Hunts Point residents. Supermarkets, which contain healthier food options, are associated with a lower risk of obesity prevalence (obesity prevalence ratio of 0.83, 95% confidence interval of 0.75-0.92) and the presence of convenience stores, which are less likely to have healthier food options, are associated with a higher risk of obesity (obesity prevalence ratio of 1.16, 95% confidence interval of 1.05-1.27).[14] The consequences of this higher risk of obesity from low supermarket to bodega ratio described earlier is observed in Hunts Point, as the percentage of children in kindergarten through eighth grade with obesity in Hunts Point and Longwood is 26%, which is higher than both the Bronx (24%) and New York City entirely (20%).[3] Additionally, in the same two neighborhoods, the percentage of adults with obesity is 42%, which is also higher than the Bronx (32%) and New York City as a whole (24%). These same trends observed for obesity are observed for diabetes. According to the CDC, those who do not experience nutrition and food insecurity are 2 to 3 times less likely than those who do experience nutrition

and food insecurity to have diabetes.[15] More specifically, the risk of diabetes may be increased due to the nutritional content of unhealthy foods increasing AIc glycemic load.[16] Higher rates of diabetes among those nutritionally insecure are documented in Hunts Point, as in Hunts Point and Longwood, 20% of adults have diabetes, which is higher than the Bronx (16%) and New York City as a whole (11%).[3] Additionally, the rate of premature death due to diabetes is 13.3 per 100,000 people in Hunts Point, which is over twice the rate of premature deaths due to diabetes in New York City (6.0 per 100,000).[3] Despite its close proximity to the Food Distribution Center, the Hunts Point neighborhood's low access to healthy foods impacts diet-related health outcomes in the area, conveying the urgent need for better food sources for residents.

References

1. Lena TS, Ochieng V, Carter M, Holguín-Veras J, Kinney PL. Elemental carbon and PM(2.5) levels in an urban community heavily impacted by truck traffic. *Environ Health Perspect*. 2002;110(10):1009-1015.

2. City of New York. The Sheridan Expressway Study. https://www1.nyc.gov/assets/planning/download/pdf/plans-studies/sheridan-hunts-point/final_full_report.pdf. Published 2013. Accessed September 19, 2022.

3. Hinterland K, Naidoo M, King L, Lewin V, Myerson G, Noumbissi B, Woodward M, Gould LH, Gwynn RC, Barbot O, Bassett MT. Community Health Profiles 2018, Bronx Community District 2: Hunts Point and Longwood. https://www1.nyc.gov/assets/doh/downloads/pdf/data/2018chp-bx2.pdf. Accessed September 19, 2022.

4. Maantay J. Asthma and air pollution in the Bronx: methodological and data considerations in using GIS for environmental justice and health research. *Health Place*. 2007;13(1):32-56. doi:10.1016/j.healthplace.2005.09.009

5. Marshall J. Pm 2.5. *Proc Natl Acad Sci*. 2013;110(22):8756-8756. doi:10.1073/pnas.1307735110

6. Urban Design -- Overview. New York City Department of City Planning. Accessed October 19, 2022. https://www1.nyc.gov/site/planning/planning-level/urban-design/urban-design-overview.page

7. Sheridan Expressway -- Hunts Point: Land Use. New York City Department of City Planning. https://www1.nyc.gov/assets/planning/download/pdf/plans-studies/sheridan-hunts-point/landuse_map.pdf. Published April 2011. Accessed October 17, 2022.

8. New York City Mayor's Office of Resiliency. Hunts Point Resiliency Feasibility Study 2016-2019. https://edc.nyc/sites/default/files/2020-05/NYCEDC-Hunts-Point-Resiliency-Study-05-2020.pdf. Accessed October 19, 2022.

9. Konijnendijk CC, Annerstedt M, Nielsen AB, Maruthaveeran S. Benefits of Urban Parks: A Systematic Review. https://worldurbanparks.org/images/Newsletters/IfpraBenefitsOfUrbanParks.pdf. Published 2013. Accessed October 18, 2022.

10. Nowak DJ, Hirabayashi S, Bodine A, Hoehn R. Modeled PM2.5 removal by trees in ten U.S. cities and associated health effects. *Environ Pollut Barking Essex 1987*. 2013;178:395-402. doi:10.1016/j.envpol.2013.03.050

11. Nowak DJ, Hirabayashi S, Bodine A, Greenfield E. Tree and forest effects on air quality and human health in the United States. *Environ Pollut*. 2014;193:119-129. doi:10.1016/j.envpol.2014.05.028

12. Data2Go. NYC. Measure of America. Accessed November 5, 2022. https://data2go.nyc/

13. Mobility and Equity for New York's Transit-Starved Neighborhoods. Pratt Center for Community Development. December 2013. Accessed November 5, 2022. https://www.rockefellerfoundation.org/wp-content/uploads/Mobility-and-Equity-for-NYs-Transit-Starved-Neighborhoods.pdf

14. Morland K, Diez Roux AV, Wing S. Supermarkets, other food stores, and obesity: the atherosclerosis risk in communities study. *Am J Prev Med*. 2006;30(4):333-339. doi:10.1016/j.amepre.2005.11.003

15. Food and Nutrition Insecurity and Diabetes. Centers for Disease Control and Prevention. Published August 1, 2022. Accessed November 5, 2022. https://www.cdc.gov/diabetes/library/features/diabetes-and-food-insecurity.htm

16. Seligman HK, Laraia BA, Kushel MB. Food Insecurity Is Associated with Chronic Disease among Low-Income NHANES Participants. *J Nutr*. 2010;140(2):304-310. doi:10.3945/jn.109.112573