A Bite of the Big Apple: The Anthropology of Pesticide Use in New York City

by

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Submitted in partial fulfillment
of the requirements for the degree of
Master of Arts Anthropology, Hunter College
The City University of New York

2018

Thesis Sponsor:

January 2, 2019

Date

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January 2, 2019

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**Thesis Question:**

How is pesticide exposure produced and experienced in New York City?

**Preface:**

The true cost of long-term, synergistic chemical exposures on human health and well-being is not easily measured. My research aims to explore the myriad ways in which pollution - specifically pesticides - infiltrate New York City’s environment, and how that infiltration is ordered within cultural, gendered and economic structures. I shall explore how women and men living in the Bronx and Brooklyn assess their pesticide exposure and examine the ways in which governance and economics contribute to pesticide use and exposure in New York City.

In October 2017, The Lancet Commission on Pollution (LCP) (Landrigan et al. 2017) confirmed that more people die every year from pollution than malaria, HIV and tuberculosis combined; annually, pollution kills three times more people worldwide than violent conflict. According to the LCP, since 1950 more than 140,000 new chemicals and pesticides have been developed, many of which have become deeply embedded in the environment and human body, regardless of global location.

Pollution is arguably one of the greatest threats to human and planetary well-being, is woefully underreported as a cause of death, notoriously difficult to quantify, and usually attributed to discrete, historical events rather than pervasive and daily exposures (McMichael 2000; Sze 2006; Hough 2013; Davis 2003). Exposure to pollution is a universal human experience that should be analyzed within spatial, temporal, and cultural contexts of exposure and experience (Dürr and Jaffe 2010). Less than half of the 5,000 most common chemicals have been individually tested for safety or toxicity, and the daily impact of a synergistic chemical cocktail on human health is unknown. Pre-market evaluation of chemical development is
unequal; regulation exists in a limited number of high-income countries, and only within the last decade or so. Regulation exists in many developing countries, although often with inadequate enforcement. The LCP notes that chemical and pesticide releases in low-income and middle-income countries receive minimal international attention. I would further argue that these substances receive minimal attention in New York City, the largest city in the world’s wealthiest nation.

Johan Galtung defined structural violence “as the cause of the difference between the potential and the actual” (Galtung 1969), the measurement between avoidable and unavoidable deaths. The long-term consequences of pesticide exposure are very difficult to measure and avoidable deaths attributable to indirect pesticide exposure are vastly underreported in New York City and beyond. For the purposes of this research, I shall focus only on Galtung’s definition of structural or symbolic violence. Structural or indirect violence occurs when no identifiable person or “concrete actor” is responsible for harm caused to others. Examples of structural violence abound within the fabric of New York City’s governance such as unequal access to healthy habitation, the justice system and degree of exposure to common stressors associated with low-income living in high cost urban areas. Could structural violence also describe the partitioned experience of pollution and pesticide exposure in New York City? In their ethnography of Californian drug users, Bourgois and Schonberg described structures of “inequality and politically imposed suffering” (Bourgois & Schonberg 2009). Applying a comparable analytical framework to New York City begs the question: could the all-encompassing term “culture” - frequently used to compartmentalize communities - inadvertently mask similar structures of inequality in New York City when considering pesticide exposure that is ordered by neighborhood, gender, national origin and socio-economic status?
The New York City Department of Health and Mental Hygiene (DOHMH) is one of the world’s oldest and largest public health agencies. In recent years, DOHMH has attempted to mitigate some of New York City’s common structural harms, and so far, has been the only local government agency to investigate pesticide exposure among New York City’s populations.

The NYC Health and Nutrition Examination Survey was a cross-sectional biomonitoring study conducted among adults 20 years of age and older in 2004 that explored the relationship between pesticide load, diet, occupation and socio-economic status as a proxy for living conditions. High incidence of pesticide exposure is traditionally associated with intensive agriculture, but DOHMH’s biomonitoring study demonstrated that notable pesticide exposure also occurs in urban areas. These data showed that New York City participants demonstrated higher levels of organophosphate pesticides in their bodies compared to any other U.S. urban population in the survey (McKelvey et al. 2013).

It is not easy to measure the pervasive problem of chronic urban pesticide exposure, much less identify the communities at greatest risk from pesticide exposure without more research among New York City’s wider population. Testing the body for pesticide residue is an intimate exploration that has only been partially undertaken by DOHMH, and only under limited circumstances among a select group of people. Thus, the true cost of pesticide exposure among vulnerable communities remains unknown until the impact is more fully understood and measured among New York’s least vulnerable communities. Given the development of luxury properties adjacent to federally designated super-fund sites in New York City, and lax regulatory enforcement generally, it is certainly reasonable to question whether higher levels of income and/or education insulate against the effects of pesticide exposure and pollution. Gender,
income, zip code, diet and cultural identity likely shape the severity and frequency of pesticide exposure in New York City.

Uneven resource distribution in healthcare, income, neighborhood affordability, education, clean air, access to nutritious food grown without pesticides or simply proximity to green space are enmeshed in social and cultural structures that create pesticide signatures within the body.

Considering the information gleaned from DOHMH’s biomonitoring study, is pesticide exposure in New York City yet another indicator of structural violence, “as natural as the air around us” (Galtung 1969)? Stressors such as continued exposure to environmental hazards are compounded by racial, social, economic and cultural inequalities that have certainly proven difficult to measure longitudinally (Morello-Fosch and Shenessa 2006; Checker 2005).

Using qualitative tools of social inquiry supported by a review of DOHMH records, local, national and international legislation and scientific data, I will analyze New York City’s relationship with pesticides. Twenty-six Bronx and Brooklyn residents agreed to speak with me about their experiences with pesticides and urban pollution. The Bronx Belmont community is located in one of New York City’s poorest and most culturally diverse neighborhoods and also happens to be the neighborhood I work in. This proximity provided me with a more nuanced understanding of the general challenges faced by Belmont residents and also enabled ongoing engagement with the community throughout my research.

Situated next to a Superfund site, the Greenpoint community in Brooklyn commands some of the borough’s highest rents and is yet representative of New York City’s social and economic inequalities. Within Greenpoint’s borders, there is extreme variance in education, rent-income ratio and general income yet Greenpoint residents still have a median income three
times higher than that of Belmont residents (New York City-Data 2016). In both communities, people were generally very receptive to my research and happy to discuss their experiences.
Chapter 1: A Brief History of Pesticides

“The study of man is confronted with an unprecedented situation: never before have so few, by their actions and inactions, had the power of life and death over so many members of the species.” Laura Nader (1977)

According to the United Nations Food and Agricultural Organization, pesticides are defined as:

‘insecticides, fungicides, herbicides, disinfectants and any substance or mixture of substances intended for preventing, destroying or controlling any pest, including vectors of human or animal disease, unwanted species of plants or animals causing harm during or otherwise interfering with the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feedstuffs, or substances which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as a plant growth regulator, defoliant, desiccant or agent for thinning fruit or preventing the premature fall of fruit, and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport.’

The Sumerians were the earliest users of pesticide, and documented their use of sulphuric compounds to protect crops from insects in 2,500 BC, some 6,500 years after the dawn of agriculture. By 1500 BC, the Chinese discovered that sulphur could also control bacteria and fungi. In 400 A.D, Chinese alchemist King Ho advocated for the application of arsenic as an effective means of pest control in rice paddies, although arsenic had already been used to control body lice for quite some time (Stewart et al. 2009). Sophisticated pest control methods continued to evolve and 12th-century agricultural scientist Ibn Al-Awwam produced a 1,000-page agricultural encyclopedia that devoted several chapters to pest management (Imāmuddin 1962).
Pesticides ameliorated human discomfort by controlling lice and biting insects, and improved crop yields, though the mechanisms were not well understood until later. Arsenic, a naturally occurring element found in rocks and certain soil types, is difficult to trace in the human body. It became the Victorian poison and murder weapon of choice and its sale and use was subsequently regulated by Great Britain under the Sale of Arsenic Regulation Act 1851, the earliest incidence of governmental pesticide regulation.

State control in the eighteenth and nineteenth centuries moved from a position of “sovereignty” exacted through repressive means to one of “bio-power,” which promoted nation state control of people through structuring paradigms of the health and well-being of its citizens (Foucault 2012; Foucault 2008; Harvey 2003).

Arsenic continued to be used liberally in orchards and farms around the world prior to the development of synthetic pesticides in the 1930s and 1940s, and it is still used in cotton fields to control boll weevils, and as an additive to animal feed today. In the United States as recently as 2003 arsenic was used to pressure treat wood and other construction materials, posing a little-known health risk to construction workers, laborers and DIY-ers (Agency for Toxic Substances and Disease Registry Public Health Statement 2007). Rice grown in the Southeastern U.S. also contains high levels of arsenic due to its natural occurrence in the soil. The water intense method of rice cultivation also creates natural pathways for arsenic, long present in the soil, to readily transmit to rice plants via their root system, even when the rice is grown and sold as “USDA certified organic” (Flint and Van den Bosch 2012).

Other than arsenic, rice receives very heavy pesticide applications particularly in the tropics and sub-tropics. Rice consumption certainly represents a culturally bound, pervasive
nutritional entryway for pesticides in the New York City urban biome; many Latino, Caribbean, and Asian communities are likely to consume rice on a daily basis (Dacosta 2018). Rice syrup is also a common sweetener, and rice flour a ubiquitous component of common breakfast cereals, snacks and fillers in processed foods often marketed as “healthy”, “gluten free” or “corn-syrup free” (Blum 2016).

In the 20th century, the Green Revolution (1930-1970s) was an era of technological and agricultural advancement that resulted in increased crop yields around much of the world and stymied increasing food shortages in a post-World War II era. Inarguably, pesticides have contributed to human well-being, primarily through disease control, sanitation and improved crop yields capable of sustaining growing populations. Uneven power struggles are also represented through the use, access and exposure to pesticides, which have thrived as a market-driven commodity under a neoliberal framework.

The commercialization of agriculture created a market for new seed purchases, pesticides, fertilizers, water pumps and sophisticated machinery, tools to keep pace with the intensification of crop rotation and commercial farming practices, a novelty to traditional farmers who previously relied on subsistence farming methods.

The Green Revolution was extremely successful in less developed countries such as India. Fitzgerald-Moore and Parai discuss the increase in annual tractors sales in Punjab, for example, which increased from 1,392 in 1960 to over 260,000 in 1990. As the incidence of cash-crops grew in India, so too did pesticide use. Fitzgerald-Moore and Parai also tracked the proliferation of annual pesticide use in India, from approximately 2 000 tons used in the mid-1950s to more than 80 000 tons by the mid-1980s, applied to 6 million hectares of increasingly pesticide reliant monoculture cash crops (1996). Mass produced synthetic pesticides and petroleum based fertilizer
coincided with significant population growth, urbanization and public health initiatives driven in large part by the World Bank, the International Monetary Fund and neoliberal economic policies promoted by national elites, the United States and the United Kingdom. These policies recast global citizens as “consumers” who would benefit from engagement with a market economy where freedom has really come to mean the suppression of wages, squashing of trade unions and unfettered corporate pollution rights (Harvey 2007; Monbiot 2016).

The ‘Green Revolution’ was a technological response originally driven by public-sector management and research that eventually led to the “genetically modified” era marked by increased corporate involvement in the agricultural sector. This coincided with the gradual, wholesale replacement of diverse and locally adapted crops with high-yielding seed varieties that require expensive investments of proprietary chemicals, fertilizers and machinery in order to flourish.

The Food and Agriculture Organization of the United Nations (FAO) has written extensively about the paradigm shift from dwindling public-interest research to the private transnational sector which is concerned with specific, for-profit product development usually aimed at farmers in high income countries (Chang 2009; Herdt 2008). Companies like the former bio-tech corporate giant Monsanto, Bayer, Dow and DuPont moved to patent seed types or otherwise apply alternative ownership regimes through “breeders rights” in Europe.

The European Union (EU) grants a form of intellectual property rights to new plant varieties that are similar to patents, restrict plant stock and seedling use, are valid throughout the EU and legally binding on third parties. These actions have formalized a system that enables legal action for noncompliance such as unauthorized seed collection (European Commission, Plant Variety Property Rights 2018).
There is a correlation between the growth of industrial agriculture, corporate power, the introduction of chemicals and decreasing seed diversity; oftentimes industrial systems are imposed on local, indigenous and poor populations who had well established agricultural practices in place (Warman 2003; Sonnenfeld 1993; Escobar 2011). Some estimates indicate that agricultural advances have saved millions of lives from famine but the alleviation of global food insecurity is questionable (Edelman 2014).

The New Alliance for Food Security and Nutrition, launched in 2012 by the United States when it chaired the G8 meeting, offers but one example of the industrial agricultural system imposed on vulnerable, global populations (Monbiot 2013). African countries were strongly encouraged to improve their agricultural industry in part to attract more private investment. The alliance did not improve nutrition, adequately address gender or facilitate resilience in its target areas (De Schutter 2015). Instead, foreign companies have ultimately grabbed land, patented seeds and monopolized food and agricultural markets which includes an increase in pesticide use – and market access for these companies - globally. Six African governments struck deals with Monsanto, Cargill, Dupont, Syngenta, Nestlé and Unilever, all in return for promises of aid by the UK and other G8 nations (Monbiot 2013).

Agricultural advances have enabled the development of the industrial food chain and supported the emergence of an ultra-urban population, which in turn facilitated neoliberal power re-structuring and global trade agreements that flourished in the developed world at the expense of the developing world’s economies (Escobar 2011). Calculations indicate that the amount of nutrients lost in the conversion of plant to animal based foods would feed many millions more people than the converted animal-based diet, forcing one to ponder the industrial food system’s
ultimate failure in addressing global food security and environmental degradation (Warman 2003).

Corporate profit increases and shareholder satisfaction among pesticide manufacturing companies like Dow, DuPont, the former Monsanto and are easier to measure against negative indicators. The growth of industrial agricultural has almost singlehandedly contributed to biodiversity loss in an increasingly globalized world; though outside the scope of this research the intricate relationships between pesticides, the industrial food chain, and every person living in New York City should be considered when weighing urban pesticide exposure.

Global wilderness is disappearing at an unprecedented rate. In just one example, the palm oil industry in Indonesia (Cargill majority owned) is responsible for the displacement of local people and livelihoods, profiteers from child labor and is fast-tracking the extinction of endemic species such as the orangutan (*Pongo pygmaeus*) and Asian rhinoceros (*Dicerorhinus sumatrensis harrissoni*). Palm oil, cheaply available in monetary terms is manufactured at a terrible human and environmental cost. It has become a ubiquitous in a short period of time and is found in thousands of personal care, cleaning and manufactured food products in New York City, and global, markets; notably palm oil crops rely heavily on paraquat, a highly toxic and widely banned pesticide.

In Indonesian palm oil plantations, women are largely responsible for the application of pesticides like paraquat. In 2015, Indonesian non-governmental organization, Sawit Watch, interviewed 22 female workers across three plantations where it found women toiling in fields without protective gear though their work daily involves spraying fertilizers, pesticides, and herbicides in the plantations (Yan 2017). Their health has suffered, and as Farmlandgrab.com has reported, women married to men who harvest the palm oil fruit regularly labor in the fields, their work unpaid (Indonesia: Exploitation of women and violation of their rights in oil palm plantations
Short term health problems among the women vary from respiratory and vision problems. Long term health implications have not been measured and are purely “anecdotal”.

Synthetic pesticides have optimized the production, processing and preservation of industrially produced food. Urban populations such as New York City rely on the long-distance travel and storage capabilities of food, part of a complex industrial food chain that could not exist without pesticide. Though banned in thirteen countries due to its toxicity, paraquat is still commonly used in the United States as a pre-harvest defoliant or desiccant (Beyond Pesticides, European Union Bans Paraquat 2007). One of the earliest entry points of pesticides into the urban biome is through an industrial food chain supported by potent pesticides and legal waivers that enable large-scale use of otherwise banned substances.

Herbicides also play an important role in the post-harvest production chain and are frequently applied as a grain desiccant to preserve integrity during transportation and manufacturing. Grains, potatoes, hops and oilseeds are stored and shipped to their ultimate destination thanks in large part to pesticides. Glyphosate, the world’s most ubiquitous herbicide, is commonly used for post-harvest desiccation and is applied liberally to foodstuffs pre- and post-production, even though it was recently labeled a “probable carcinogen” by the World Health Organization, to great controversy and amidst vehement denial of its ill-effects from the pesticide industry (World Health Organization, Glyphosate 2016).

Pesticide use undoubtedly protects humanity from widespread disease and ensures adequate production of food and potable water, but pesticide use has gone far beyond its original design. For decades, governments and autocratic regimes have also used pesticides as weapons of war. Arguably, pesticides have contributed to the industrialization and “success” of war in addition to the globalization of trade, economics and the development and support of industrial
food systems around the world. Hydrogen cyanide was first used as a pesticide in California in the 1880s and was later weaponized and manufactured in World Wars I and II. The derivative product Zyklon B facilitated World War II’s genocide with horrific efficiency. During the Vietnam War, the United States government used pesticides and chemicals (Agent Orange, Agent Purple etc.) to defoliate swaths of land, employing toxic exposure as a military tactic that have caused local communities multi-generational harm.

Autocratic regimes and the demographics of persecuted groups may change with time, but the rudimentary tools of oppression are similar. In 2017, the Syrian Assad regime used crude pesticide-based chemical agents on civilian populations (Khatchadourian 2017), and did so again in 2018, targeting vulnerable populations with early morning chemical attacks; in 2017 the Serbian government used aerosolized insecticide to forcibly evacuate refugees from ad-hoc tent cities forming along its borders; several people are still unaccounted for following the “evacuation” (Goddard 2017). Pesticides and pesticide exposure are certainly representative of uneven power struggles around the world beyond strong arming farming communities, harming migrant agricultural workers and pervasive exposures in dense urban cities like New York City.

Even when overwhelming evidence of corporate or governmental wrongdoing exists, environmental justice is difficult to obtain and victims purportedly difficult to identify. In 1948, a mysterious, toxic “smog” from a chemical plant blanketed Donora, Pennsylvania, facilitated by an atmospheric inversion that prevented the dissipation of toxic industrial gases. Though many people died in the aftermath, the official death toll was only twenty although these deaths, together with later deaths caused by thermal inversions in the 1950s and 1960s eventually resulted in belated legislation, the 1970 “Clean Air Act”. Culpability remained elusive in
Donora; deaths and illnesses attributable to the event were vastly under reported and the zinc and steel factories responsible for the toxic fumes did not cease production (Davis 2003).

Failure to acknowledge the link between toxic exposure, disease and illness happened even more recently in New York City, in the wake of the 2001 9/11 terror attacks. Even though the relationship between disease, asbestos and silicone dust exposure is well documented, first responders exposed daily to these toxic materials during search and rescue efforts have had to fight for recognition of the diseases caused by occupational exposure. It is even more difficult for residents and non-emergency workers to prove an occupational nexus even though they were also exposed to toxic dust in the weeks and months after the event. Many people - like office cleaners, temporary visa holders and temporary staff - have not been counted due to their immigration status, or the complexity of the health reporting system (Lippmann et al. 2015). Despite the preponderance of evidence and national awareness of the event, establishing causality with toxic exposure has been challenging. It is even more challenging to imagine a systematic recognition of the cumulative effects of omnipresent pollution in a meaningful way.

In modern urban society, pesticides are used in myriad ways and the “average” New York City resident encounters them daily. Pesticides become airborne when sprayed, foggers permeate apartment walls, pre-emergent herbicides contaminate the soil and groundwater through run-off, are ingested when produce is coated in them, or baked goods are made with flour that was desiccated by pesticide. Chlorine is added to water systems; rodenticide is applied in the subway, on streets and in parks and herbicide is frequently applied to parks, roadways, electrical systems, playgrounds, and on golf courses. Homeless shelters, jails, schools, offices, restaurants and shops are all common sites of pesticide applications. Pesticides control disease-
causing vectors and nuisance wildlife, and residential and commercial buildings are regularly fumigated to control cockroaches, mice and record-breaking bedbug populations.

Restaurants across New York City are treated regularly as a matter of course and necessity. Tasked with protecting utensils, glassware and plates from chemical residue, wait staff tape sheets of plastic over plates and cups, with minimal instruction. Training is generally not provided; staff are simply entrusted to “properly” protect the restaurant from “non-food use” chemicals applied monthly by exterminators. I was frequently involved in this late-night practice courtesy of the many restaurant jobs I held as a student, and my haphazard plastic hanging was never inspected by anyone. Invariably the late-night exterminators were male, Latin American immigrants for whom this was a second “shift” that supplemented daytime labors or studies.

In her research among migrant agricultural workers in California, Dvera Saxton notes the “Hispanic paradox” whereby people of Latin origin, despite limited means, limited healthcare and limited earning power live comparably, or even longer than, their white counterparts. This metric changes significantly when examining Hispanic, agricultural migrant workers in California. Migrant workers have an average life expectancy of 49 years, suffer increased disease burdens and occupational harms, undocumented and without any support (Saxton 2015; Holmes 2014). No comparable study appears to have been conducted among New York City’s “second shift” fumigators, an equally hidden group of workers.

Pesticide regulation is, on the other hand, easily measured in ecological if not human terms. Once used liberally, DDT prohibition has certainly been good for New York’s biodiversity. The peregrine falcon, once imperiled due to the liberal use of DDT, has returned to Central Park and Inwood Hill; beavers have returned to the Bronx River and, due to widespread
deindustrialization and effluent regulation, the Hudson River is cleaner today than it has been in two decades (Sanderson 2013).

Moreover, not since the depression has there been as much investment in green space and citywide park creation and maintenance (City of New York Parks & Recreation Annual Report 2013). Since 2005, greenhouse gas emissions in New York City have dropped by 19 percent, and since 1993, the City has invested billions of dollars in a federally mandated water table initiative that encourages farmers in upstate New York to engage in organic farming methods.

The 1989 Surface Water Treatment Rule seeks to implement the requirements of the Safe Water Drinking Act while avoiding the prohibitive cost of filtering the Catskill/Delaware water supply. This initiative is overseen by the New York State Department of Health (NYDEC) and is New York City’s attempt to save billions of dollars; by exerting control over upstate farming practices, pollution in the form pesticide seepage is stymied, obviating the need to install a comprehensive, mandate filtration system. The success of New York City’s measures is next subject to review in 2027. The nexus between farming methods more than a hundred miles away from New York City and environmental wellbeing is indicative of the chemical reach of pesticides, and their power to affect human bodies and public health systems.

In addition to the rudimentary survival needs of food, water and space, environmental health is one of the most important determinants of human health and well-being; it shapes the epidemiology of infectious and non-infectious diseases, food security, stress, human interaction and manipulation of the environment (Singer 2016). The World Health Organization narrowly defines environmental health as the “physical, chemical, and biological factors external to a person, and all the related factors impacting behaviors. It encompasses the …control of those
environmental factors that can potentially affect health” (World Health Organization, Public Health, Environmental and Social Determinants of Health 2018).

People often have minimal control over the health of the environment they live in, particularly in a dense city like New York, when the actions of a single apartment dweller improperly using pesticide foggers in a multi-apartment building unwittingly affects the air and level of toxicity in neighboring apartments. The urban environment in which most people live has changed significantly since the advent of pesticides, which are now readily available in stores and street markets and applied by people of varying skill and awareness.

In my thesis mentor’s uptown Manhattan neighborhood, for example, street vendors regularly sell an extremely toxic nerve poison from China that is effective at controlling New York City’s infamous cockroach populations. In Spanish it is often called “Dos Pasos,” because, according to the hawker’s selling the product, the roaches take “two steps” after encountering the poison, and then die. Though the cultural environment and epoch is very different, the average New Yorker’s reason for personal pesticide use doesn’t vary all that much from the reasons and methods employed by people living more than thousand years ago in China.
Chapter 2: Urbanization and a Brief History of The City

“The City…… is man's most consistent and on the whole, his most successful attempt to remake the world he lives in more after his heart's desire. But, if the city is the world which man created, it is the world in which he is henceforth condemned to live. Thus, indirectly, and without any clear sense of the nature of his task, in making the city man has remade himself. Robert Park, 1915

New York City has undergone various forms of land reclamation since its very beginnings - an enduring testament to the human ability to transform, destroy and recreate landscapes. Humans have modified 83 percent of the world’s surface. The remaining “untouched” landscape is still affected by human activity due to the extensive reach of pollutants and anthropogenic climate change (Sanderson 2013). It is appropriate to consider the history of the Western “city” when examining the pesticide-dependent lifestyle of today’s New York City resident.

Settlement near coastlines and freshwater historically offered many advantages. Proximity to water for consumption and agriculture, access to fish, sea vegetables and transportation contributed to early urban settlement patterns and urban growth. The Hudson and East Rivers, the Atlantic Ocean and a series of creeks and canals flank New York City, which is essentially a city comprised of connected islands. Bodies of water in a burgeoning city offered additional commercial advantages. Industrial processing of raw materials, the manufacture of sugar and molasses, slaughterhouses, tanneries and coal and coke-based industries all required massive amounts of water and generated tons of waste, much of which was simply dumped into New York City’s waterways. Low-lying areas closer to swampy, effluent offshoots, such as modern day Redhook and Battery Park, were of lower residential value and more vulnerable to environmental hazards such as flood and disease (Sanderson 2013). People of lower social and economic classes traditionally settled in these less desirable areas.
Geography, cultural identity, economics and industry have historically segregated entire communities in New York City (Harvey 2003; Leon 2015; Sanderson 2013; Susser 2012). In 19th-century New York City, areas closer to the swampy and reclaimed lowlands and shipping ports were more frequently associated with physical and moral corruption. People who lived in those areas were poorer and occupied a lower position in the social hierarchy. The implementation of sanitation systems, railroads, canals, and land-reclamation projects in the 19th-century heightened existing social divisions within the urban landscape. Brownstones built in what is now Park Slope and Bedford-Stuyvesant were well served by topography; thanks to gradation, residential effluent from the well-to-do houses flowed into the Gowanus Creek, through the poorer, swamp-based communities (Leon 2015). New York City’s settlement patterns perhaps embody the earliest iteration of environmental injustice in urban U.S. history that contributed to “interlocking structures of oppression” (Collins 1993).

The current pace of global urbanization is unprecedented; the 21st century’s urban expansion is one in which countless people leave familiar spaces and create new spatial attachments through the social, symbolic, and political culturalization and deculturalization of urban space (Sanjek: 187: 2014).

Growing urban populations require sustenance and urban environments, at least in the developed world, are less than amenable to crop cultivation; the delivery of unspoiled food from external sources is imperative. Though urban agriculture feeds millions of people in the developing world, urban cultivation usually satisfies only the needs of the poorest city residents (Edelman et al., 2014).

The 2018 Revision of World Urbanization Prospects produced by the Population Division of the United Nations Department of Economic and Social Affairs (UN DESA) notes
that, with cities and towns covering 82 percent of the region’s land mass, North America is the most urbanized region in the world followed by Latin America and the Caribbean (81 percent), Europe (74 percent) and Oceania (68 percent) (UN DESA 2018).

According to the FAO, only 36 percent of the world’s arable land is farmed, though the percentage of land dedicated to agriculture is expected to increase in tandem with the global population (World Agriculture: Towards 2015/2030 - An FAO Perspective 2015). This will have the curious effect of freeing rural land as people migrate to cities, confirming consistent patterns of global urbanization, largely due to migration from rural to urban landscapes. In 1950, 30 percent of the world’s population lived in cities; by 2050, it is projected that 66 per cent of the world’s population will live in cities, or their hinterland, otherwise known as “urban agglomeration”. This includes people living within a contiguous territory inhabited at urban density levels that incorporate suburban areas adjacent to city boundaries (UN DESA 2014).

The modern, western notion of “city” emerged largely as an homage to cleanliness and hygiene. Following a coup in 1852, France’s self-crowned Napoleon Bonaparte faced a country riddled with high unemployment and a surplus capital problem. He launched a responsive public works program overseen by Baron Haussmann, massive in scope and ambition, a nod to France’s greatness. The initiative absorbed surplus capital and labor, and arguably suppressed one of the most common causes of revolution: high unemployment, or more specifically, limited social mobility, earning power and opportunity for economic advancement (Harvey 2010; Dürr & Jaffe 2010).

Under Haussmann, Paris was reimagined on a grand scale as the clean lines of “modernity” created sweeping monuments to power while displacing the sick and poor from
their cramped, ad hoc living quarters. Disease was an accepted and recognized social affliction in Bonaparte’s Paris.

Community displacement was justified as necessary to progress, similar to Robert Moses’ later justification of policies that forcibly relocated entire communities to make way for “progress” – namely in the form of highway construction - in 1950s New York City, a pattern of forced re-location similar to today’s neo-liberalization of neighborhoods, or the gentrification in New York City (Contreras 2012).

In Bonaparte’s Paris, “progress” paved the way for arcades, places of commerce and widened boulevards, which according to common belief at the time, improved air circulation, theoretically stymying disease and urban congestion (Harvey 2010). The pursuit of urban hygiene evolved in the wake of epidemics and economic development – modern state governance requires a healthy population to sustain the workplace (Dürr & Jaffe 2010: 160-165).

In Great Britain, the industrial revolution spawned rapid urbanization, and crowded living conditions and in 1848 the Public Health Act regulated sanitation, plumbing, construction, drainage and street cleaning under a single administrative system mandated to improve urban hygiene. The ultimate impetus for the Public Health Act was the maintenance of a healthy working population that would be less reliant on welfare; the administration noted that welfare payments were highest to families of workers who succumbed to infectious, often waterborne, disease (Szreter 1988).

Modern progress is thus marked by the proliferation of successful urban systems that symbolize cleanliness and health in densely populated clusters; sanitation, refuse management,
and pest control are all executed on a massive, hidden scale that support densely packed environments.

Economic well-being relies on the well-being of a workplace population, and a successful city must preserve the life and well-being of its residents to ensure the continued grind of the City’s economic machine, regardless of long-term environmental well-being (Dürr & Jaffe 2010; Sze 2006).

Pesticides and the control of waterborne pathogens are thus essential to public health and urban progress. The health of a city is inexorably tied to the health of its inhabitants yet as discussed in the first chapter, the impact of pervasive chemical pollution on human health is poorly understood and its contribution to the global burden of disease is underestimated in urban areas (Landrigan et al. 2017).

In 1950, when New York City’s population first exceeded 10 million, inclusive of urban agglomeration, it became the world’s first “mega-city”; growing since the 1970s New York City is projected to have more than 9 million inhabitants by 2030 (New York City Population Projections by Age/Sex & Borough 2010–2040 2013). Population growth has modified the embodiment of space in a land-strapped city where settled coastal areas are under threat of rising sea levels and climate change. In a city fraught with housing shortages and aging infrastructure, land is a shrinking commodity whose fixed location confers monopoly privileges upon those who have the right to it; land and space enable the creation, storage and display of wealth in a city that has been shaped by neoliberalism (Harvey 2007; Harvey 2010; Brash 2004; Susser 1998).
Urbanization’s radical transformation of the physical and cultural landscape via urban migration has also occurred over a relatively short period, and developers have gentrified and “rehabilitated numerous New York City neighborhoods within the last two decades. Urbanism potentiates behavioral modifications (McMichael 2000) yet a city “is also rooted in the habits and customs of the people who inhabit it” (Park 1967).

In New York City, how pesticide is purchased, used and experienced is the product of social forces. Some people purchase regulated and unregulated pesticides in an attempt to control their domestic space in a packed urban landscape; others outsource pest control either directly or indirectly to third parties. In crowded apartments and buildings with stubborn pest problems, improper fogger use may permeate apartment or office walls, users unwittingly exposing their neighbors to toxicity. In “Towards an anthropological theory of space and place”, Setha Low describes the social construction of urban space as a “material expression” where city and body become a “social production … of global and collective social forces” (Low 2009).

This collection of social and material forces impacts daily pesticide exposure, depending on where a person lives, works, studies or eats. Low also describes the work of Nancy Munn and Stuart Rockefeller and their respective treatment of movements and patterns of travel and locality, noting that patterns of locality influence pesticide exposures in New York City. According to the City’s 2016 Pesticide Use Report, pesticides were applied a total of 237,812 times by New York City agencies in 2016, almost twice as many applications as 2015 due to amplified attempts to control roaches and mosquito larvae. Exposure depends on patterns of locality: in Brooklyn’s public libraries pesticide was applied at least 1,217 times in 2016; the New York City Housing Authority (NYCHA) employs a dedicated pest control staff of 75. They
applied pesticide to properties 150,382 times, noting this number excludes third party pesticide contractor applications and as such are not required to be listed in the Annual Pesticide Report.

Hunter college did not report its pesticide use to the City of New York in 2016 but 15 of CUNY’s 23 institutes did, reporting 1,465.0lbs of insecticide, herbicide and rodenticide use combined. Some of CUNY’s applications required use waivers for the application of products listed as potential, or suggestive carcinogens. Included in CUNY’s arsenal of pesticide use in 2016 was the controversial product, dicamba that is banned in Arkansas and Missouri (NYC Health: Pesticide Use by New York City Agencies in 2016).

Patterns of locality certainly contribute to pesticide exposure in New York City, given the density of common pests and urban density. The social production of material expressions such as pesticide exposure is commonplace in New York City. Could this ongoing, repeated failure to account for the harm urban pesticide use and exposure causes prove Henri Lefebvre’s hypothesis that urban complexity has far outpaced humanity’s ability to measure and comprehend urban phenomena (1996)
Chapter 3: New York City’s Sustainable Development Goals

How does a low-income Bronx community’s pesticide load compare to a desirable Brooklyn neighborhood adjacent to a superfund site? The Belmont section of the Bronx has some of New York City’s worst air quality, poorest building stock and lack of basic services, while Greenpoint in Brooklyn commands much higher rent, has an abundance of services and is located in a socially desirable area despite its proximity to one of the most polluted waterways in the city if not the nation? According to disaggregated data gathered and analyzed by the Furman Center, the Belmont/Tremont area of the Bronx is one of the poorest communities in New York City, if not the United States (The Furman Center Indicators and Definitions of Social Rankings Indicators 2016).

Belmont has undergone a demographic shift and a community of Puerto Rican, other Latino and African immigrant residents predominate in what was once an Italian and Italian-American neighborhood. Belmont still has an Italian-American population, albeit a shrinking one, and a small but measurable Albanian population. The DOHMH’s most recent Community Health Report finding supports this observation which could be surmised by simply spending time in the community (NYC Community Health Bronx: East Tremont and Belmont 2015).

Comparatively, European, mostly Polish, immigrants outnumber Latin American immigrants in Greenpoint where the median income is double that of Belmont/Tremont. Yet, more than half of the housing stock surveyed in Greenpoint had maintenance defects including “water leaks, cracks and holes, inadequate heating, presence of mice or rats, toilet breakdowns and peeling paint” (Community Health Report Greenpoint 2015).

In the updated 2012 edition of her book “Norman Street: Poverty and Politics in an Urban Neighborhood”, Ida Susser unpacks the demographic shifts in Greenpoint, from working-
class and artist communities in the 1970s, first and second generation Polish Americans, and the later influx of Eastern European immigrants following the fall of the Communism to community displacement and the arrival of “hipsters” and young professional. She notes that sharp inequality continues to flourish in Greenpoint, and though there has been extensive, tax-payer subsidized real estate development in the neighborhood, and social issues attached to absentee landlords, inferior housing and small-holder, immigrant owners persist, as is class and racial division (Susser 2012).

Air pollution in Greenpoint is the eighth highest in the city. Volatile and semi-volatile air-borne pesticides were not measured as part of DOHMH’s community health analysis even though the Environmental Protection Agency (EPA”) has identified significant levels of these substances in and around Newtown Creek’s sludge (Pre-assessment Screen for Newtown Creek, The United States Department of the Interior et al., 2013). The air in one of the more expensive areas in Brooklyn is comparable to the polluted air in one of the poorest Bronx communities, yet rent increases in Greenpoint have outpaced any other neighborhood in New York City, having risen 76 percent in a twelve-year period (The Furman Center Special Report on Gentrification 2016). Of note, income has not risen commensurately in this community.

DOHMH’s original biomonitoring report associated high levels of pesticide exposure with building defects. This begs an interesting question - how similar would the biomonitoring results would be if the tests were conducted among Greenpoint’s population given the level of housing stock disrepair?

Greenpoint’s data also obscures the reality of lived-experience: although 48 percent of Greenpoint’s residents are college educated, 1 in 6 has never completed high school, half the residents spend more than 30 percent of their gross monthly income on rent yet the number of
households earning $100,000 or more between 2000 and 2012 also grew, from 5,794 to 13,385, a 120 percent increase (The Growing Gap: New York City’s Housing Affordability Challenge: Office of the New York City Comptroller 2014).

A more recent report by the Furman Center echoes similar findings: neighborhoods that were rezoned under the Bloomberg administration – namely Manhattan’s newly coined “Hudson Yards”, Williamsburg and Greenpoint - have experienced the most dramatic increase in housing and rent price (The Furman Center State of New York City’s Housing & Neighborhoods 2017; Susser 2012).

Numerous evaluative and predictive tools have been developed for measuring progress and wellbeing among populations. Perhaps the most widely used tool is the United Nation’s Development Program’s “Human Development Index”, which is applied to national and sub-national entities and measures indicators such as poverty, income inequality and education. Though the United States has a high development index (UNDP Human Development Index 2016:198), gender and racial bias undermine well-being and opportunity, even in fields as progressive as science and education. The report found that prejudice and bias are instrumental to the most important aspects of life, which is very much bound “by social tradition of subordination and privilege” (UNDP 2016: 91). In New York City, choice of neighborhood, employer, diet and living conditions - if a choice is even possible - are shaped by similar forces such as affordability, and privilege.

Nobel Prize winner Elinor Ostrom developed a framework that operationalized key elements of social-ecological systems on multiple scales believed to influence social and ecological outcomes in situations involving common-pool resource sharing (Ostrom 2008; Ostrom 2009). It is difficult, if not impossible, to establish a framework that is locally relevant,
globally comparable and based on a series of practical and scientific indicators in urban environments, particularly in a city as culturally, linguistically, ethnically, environmentally and economically diverse as New York.

The sheer breadth of “block to block” diversity can easily be obscured by quantitative data, which I will clearly demonstrate by applying the United Nation’s “Sustainable Development Goals” (SDG) framework to various New York City populations. The SDG’s predecessor, the Millennium Development Goals (MDGs), were eight goals with measurable targets and aspirational deadlines that sought to permanently improve the lives of the world’s poor. The “2015 United Nations Millennium Development Goals Report” presented a partial portrait of modern progress within the paradigm. The MDGs were a “time-bound and quantified target for addressing .. education, poverty, hunger, disease, inadequate shelter and lack of inclusion..while promoting environmental sustainability” and were somewhat successful in their achievements (The UN Millennium Project Goals 2016). Fewer people were malnourished in 2016 than in 1990; even though the global population increased by 2 billion during this period, nutritional requirements for life were sustained.

Despite marked improvements in nutrition, however, more than 1 billion people are food insecure and the ongoing destruction of forests, land grabs, ocean acidification, climate change and the loss of biodiversity on land and water threatens not only human livelihoods but the survival of keystone species that have flourished and supported humanity since the Holocene. Unprecedented levels of industrial byproducts continue to exacerbate anthropogenic climate change and according to data gathered by The National Aeronautics and Space Administration (NASA), atmospheric carbon dioxide is 46 percent higher today than it was in 1990; current rates
are higher than they have been in several millennia (NASA: Global Climate Change, Facts 2018).

The 2015 Development Agenda marked the conclusion of the MDG era, which was somewhat successful in that extreme global poverty has abated, and infant mortality rates have improved. Seventeen SDG’s replaced the MDGs, described by then UN Secretary-General Ban Ki-moon at a press conference as a “to-do list for people and planet, and a blueprint for success…. our shared vision of humanity and a social contract between the world's leaders and the people” (Secretary General Statements and Messages September 2015).

Unlike the MDG’s which focused on the poor global south, the SDGs treat many of the problems as characteristic of both developed and less developed countries. Applying an SDG analytical framework to New York City in its current state is a provocative exercise that barely captures the complexity of a sprawling city situated in the one of the world’s most densely populated areas. The New York City’s Mayor’s Office produced “City with Global Goals” in order to align New York City’s needs, goals and vision with the SDGs (A City with Global Goals One New York: The Plan for a Just and Strong City 2016). In order to better understand the indicators that may influence pesticide exposure, I have reversed this strategic, theoretical blueprint and instead highlight the current state of New York City against the SDG’s. This provides a more holistic snapshot of urban inequality, which is quite likely a significant driver of toxic exposure.

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<th>1. NEW YORK CITY’S SUSTAINABLE DEVELOPMENT GOALS- CURRENT SNAPSHOT</th>
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<td>1. End poverty in all its forms</td>
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<td>2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture</td>
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| 3. Ensure healthy lives and promote well-being | • Overall life expectancy in NYC has increased since 2005, but health and well-being depend on race, gender, educational attainment and neighborhood. Among non-Hispanic Black New Yorkers, the infant mortality rate is three times higher than among non-Hispanic whites, an increase since 2005 (New York City Summary of Vital Statistics 2014)  
• Maternal mortality among NYC’s black mothers is 12 times higher than NYC’s white mothers (Waldman 2017) |
| 4. Inclusive and equitable quality education and promote lifelong learning opportunities for all | • The NYC public school system is the largest in the world  
• High school graduation rates are sharply divided by race, gender and income - children from primarily white affluent areas like Lower Manhattan’s Battery Park City enjoy graduation rates of 95% whereas areas in the South Bronx children’s graduation rates are as low as 61% (High School Graduation in New York City 2016). |
| 5. Achieve gender equality and empower all women and girls | • Females in NYC are more likely to experience poverty; in 2014, the poverty rate was 21.5 percent for females and 19.8 percent for males; Males own 1.5 times more businesses in NYC than females; there has never been a female Mayor of New York; females earn less than males, even adjusting for age, education and parental status (NYC Government Poverty Measure Annual Report 2017).  
• In 2016 Mayor DeBlasio and First Lady Chirlane McCray created the New York City Commission on Gender Equity, and in October 2017 it finally became illegal in NYC to enquire about past salary history, a common practice where future earnings were based on current earnings. This discriminatory practice primarily impacted
| 6. Ensure availability and sustainable management of water and sanitation | • NYC drinking water is among the cleanest in the country, but it still contains numerous unregulated pesticides and lead-leaching pipes commonly contaminate drinking water in NYC schools (Taylor 2017)  
• NYC is not actually compliant with federal filtration standards (New York State: NYC Filtration Avoidance Determination Report 2017) |
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<td>7. Ensure access to affordable, reliable, sustainable and modern energy</td>
<td>• New York City Economic Development Corporation (NYCEDC) has invested $7.3 m in Urbantech NYC, developed to help entrepreneurs and innovators address New York City’s most pressing urban challenges in systems such as waste, transportation, agriculture, and water management (NYCEDC Launches Urbantech NYC to Support Companies Building Smart And Sustainable Cities 2017)</td>
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<td>8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work</td>
<td>• Economic growth in NYC requires the addition of more high-paying and diverse industry jobs; a greater increase in the minimum wage; relief of rent burden in a high dollar cost environment. Yet the data shows that lower paying jobs are increasing at a faster rate than higher paying ones, an impediment to sustainable equitable growth</td>
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| 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation | • NYC’s infrastructure is crumbling at a faster rate than it is being repaired or replaced. 1,000 miles of water mains are more than 100 years old; 47 bridges were structurally deficient as of 2012; 6,400 miles of sewage mains are approximately 84 years old (Forman 2014)  
• The NYC subway is in dire need of modernization and has been the subject of public outrage for some time. |
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| 10. Reduce inequality within and among countries | • Extreme inequality exists within NYC counties e.g. in Manhattan, the average income of the top 1% ($8.1 million) was 116 times that of the remaining 99% ($70,500)
• New York State is the second most unequal state in the United States, and Manhattan is the most unequal county in New York State (Sommelier, Price and Wazeter 2016)
• According to the most recent analysis by the Comptroller’s Office, in 2016, Black women working full-time in New York City made 57 cents for every dollar paid to white, non-Hispanic men, or roughly $32,000 less per year |
| 11. Make cities and human settlements inclusive, safe, resilient and sustainable | • NYC only admits 500 refugee families a year (New York Department of Planning: The Newest New Yorkers 2016)
• Crime levels are at a historic low
• Pesticide containing by-products permeate NYC air
• Attempts to control city wide traffic congestion meet stiff opposition; though data shows moving bus stops away from junctions would decrease the amount of pollution transit riders are exposed to, no steps have been taken to do so (Choi et al., 2018)
• Bike lanes have been installed, improving transport alternatives, but according to an ongoing Columbia University study, the air is unhealthy for cyclists in terms of increased exposure to particulate matter through exercise induced inhalations (Zuurbier et al., 2010).
| 12. Ensure sustainable consumption and production patterns | • NYC purportedly produces more waste than any other megacity, approx. 33 million tons |
a year, and it spends $2.3bn in its disposal which was sometimes shipped as far away as China (Cohen et al., 2015). Since 2018 China has limited “trash imports”, refusing to accept plastic waste from cities like New York.

13. Take urgent action to combat climate change and its impacts

- 53 percent of NYC’s power plants are in a post-Superstorm Sandy 100-year floodplain.
- By 2050 97 percent will be within the 100-year floodplain.
- NYC residents are more vulnerable to extreme heat partly because of the “island effect” increases the heat index by almost seven degrees.
- Despite data that makes clear the critical importance of preserving the Rockaway Bay Estuary, New York’s largest contiguous natural area, and advice from the scientifically rigorous Science and Resilience Institute Jamaica Bay NYC (members include CUNY, Wildlife Conservation Society, Rutgers, Columbia University & NASA) developers are moving in, with permission from the City of New York, to re-shape and develop the landscape. (Sanderson and Parris 2016). “investors are flocking” to the area (Small 2018).

14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development

- NYC has some of the nation’s most polluted waterways (Gowanus Canal, Newtown Creek)
- In 2016, the Wildlife Conservation Society nominated the Hudson Canyon as a Marine Sanctuary and has been working to protect and reserve marine integrity (Wildlife Conservation Society Nominates the Hudson Canyon 2016)
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<th>15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss</th>
<th>• Investment in green space in NYC has exceeded pre-depression era levels; imperiled species once decimated by liberal use of DDT have returned to NYC</th>
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<td>16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels</td>
<td>• According to the Vera Institute, in NYC “Black and Latino defendants were more likely than similarly situated whites to be detained at arraignment, to receive a custodial sentence offer as a result of the plea-bargaining process, and to be incarcerated (Kutateladze, Tymas and Crowley 2014)</td>
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<td>17. Strengthen the means of implementation and revitalize the global partnership for sustainable development</td>
<td>• This final point is incomplete on the NYC SDG proposal, and is certainly beyond the scope of this paper. It is nonetheless worth noting that real estate developers and the financial sector wield tremendous political power in NYC.</td>
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If lower income and decreased food security are emblematic of increased risk to toxic exposures, women, children and seniors are at greatest risk, though the risk has grown overall for New York City residents in recent years. Certainly, environmental, societal and economic factors are measured somewhat easily and presented quantitatively as demonstrated above, but this does not capture the contextual subtleties of experience, and further fails to capture impacts from phenomena such as pesticide exposure that are not easily measured. As First Deputy Commissioner to NYC Health Department, Dr. Oxiris Barbot so succinctly stated in a 2017 Huffington Post op-ed:

“While scientific discoveries and evidence-based approaches form the foundation of medicine, they remain inadequate in wholly addressing the issues of the unquantifiable human experience. Letting data and test
results speak for themselves without context robs us of the imperative to bear witness to the brutality inflicted on our communities by repressive and oppressive policies. Environmental protections and climate change are health issues…. Isolating health from the movements that influence society results in a fractured system wherein communities and families pay the ultimate price”

Dr. Barbot highlights a gap in New York City governance that encompasses the cultural dynamics of pesticide exposure, and the inherent weakness of relying solely on quantitative data. Population growth daily exceeds prior records, and earth’s approximate 7.6 billion inhabitants (Roser and Ortiz-Ospina 2018) need food, water, shelter and space simply to survive. Space is essential to the human experience and population density has reshaped our lives. Population growth has increased competition for the most rudimentary components of survival and urban centers are the emergent loci of urban population growth. A city such as New York also provides a testing ground for better understanding the consequences of crumbling urban infrastructures, aging populations and longitudinal studies in extreme socio-economic inequality.

In Bloomberg’s New York, Julian Brash explores the history of neoliberal governance and liberal, minority driven policies in “a liberal city without liberalism”. Despite the outward appearance of a politically and socially progressive, or liberal, city, Brash deftly demonstrates how neoliberal policies have shaped - and harmed – New York City’s residents. The Britannica Encyclopedia defines liberalism as the belief that “government is necessary to protect individuals from being harmed by others” but also recognizes that government can conversely threaten an individual’s liberty and freedoms.

Conversely, neo-liberalism looks to the free market to propel progress. The existence of neoliberalism, and the global inequality launched by its right-wing ideology wasn’t formally
acknowledged by the International Monetary Fund until 2016 (Ostry, Loungai and Furceri 2016). Neoliberalism distills the essence of human wellbeing into a profit and loss and has re-ordered social reality quite profoundly. This paradigm shift has reverberated all the way to the Supreme Court as seen in the holding of Citizens United v. Federal Election Commission, 558 U.S. 310 (2010) (the court held that corporations are entitled to rights and personhood, thus, corporate political spending is protected speech under the First Amendment to the constitution of the United States. This has reshaped democracy in the United States).

In the late 1960s, accounting practices instituted by city mayors created the framework which has nurtured and supported New York City’s staggering inequality. In the 1970s, Mayor Robert Wagner borrowed heavily to pay operating expenses with loans underwritten by banks that also underwrote the City’s municipal bonds; during 1970-74, Republican mayor John Lindsay exponentially increased New York City’s indebtedness. The same banks that divested city-owned bonds kept underwriting City Hall borrowing. By 1975, the fiscal crisis was set in motion and the normalization of business-elite intervention in New York City governance became further entrenched as it relied on the private sector for cash injections and capital management.

In May 1975, the bond market implosion triggered a “reset” whereby private industry cash – provided mainly by banks and real estate developers - sought to limit the perceived overstretch of “liberal” minority groups in governance and policy, forever reshaping New York City in myriad ways. This coincided with the collapse of the post-World War II Bretton Woods framework and New York City, and the United States generally, careened towards massive social and economic inequality (Edelman 2018). The post-fiscal crisis era enriched the lifestyles of a select few and the ensuing decades have been marked by occasional social unrest- (in New
York City most recently, “Occupy Wall Street”) and slow general economic growth (McCall and Brash 2004; Brash 2011; Susser 2012).

How do these economic abstractions shape the current New York City experience, and what does this have to do with pesticide exposure? In 2013, 1,315 households reported incomes of $10 million or more and the number of households reporting an income of $1 million or more per annum increased by forty seven percent (Independent Budget Office New York City Residents’ Income and Tax Liability Data 2016).

In the Comptroller’s 2014 Housing Report, median citywide rents rose a staggering 70 percent between 2000 and 2012. Yet poverty is increasing despite the fact that more adults are in full time employment now than any time since the 2008 “Great Recession”. According to the most recent data analyzed by the City’s Independent Budget Office, 87 percent of New York City households reported total earnings under $100,000 in 2014. According to Baruch College’s “NYC Data” platform, in 2016 the average household in one of the nation’s most expensive cities earned $58,856 per annum. Half of New York City’s 3.6 million households reported wages at or under the city median and among the bottom percentile of earners there was a sustained drop in earnings from 2006-2014 (Independent Budget Office: NYC by the numbers: How has the distribution of income changed in NYC since 2006? 2016). The average family annual income in NYCHA project housing is $22,994. Thus, if lower income is indicative of poorer health outcomes and higher rates of pesticide exposure, as science has consistently demonstrated, cross-cutting research is required in order to fully understand current exposure levels and modes of pesticide consumption among residents (Evans and Krantowitz 2002; Holmes 2013; Nixon 2011). Yet, at this time, it remains unknown if relative wealth really does insulate against higher levels of pesticide exposure in New York City.
**Chapter 4: Regulation & Legislation**

This chapter will discuss the international, domestic, state and local regulations that govern the use, development and registration of pesticides in the United States.

**International Regulations**

The global pesticide market was originally controlled by a small handful of private sector firms, six corporations - Monsanto, Dow Chemical, BASF, Bayer, Syngenta and DuPont - collectively known as “the Big 6”. In addition to controlling the manufacture and development of pesticides, these companies controlled the global research agenda and the global pesticide trade (Pesticide Action Network GMOs, Pesticides & Profit). Pesticide manufacturing is big business, with global consumption expected to reach 3.2 million tons by 2019 with a projected value of USD$81.13 billion (Study shows global pesticide market to reach $81 billion in five years, AgProfessional 2015). Nation state-owned Chinese company ChemChina moved to acquire Syngenta and some months later, Bayer moved to purchase Monsanto. These mergers effectively created the “Big Four” and tightened control of the pesticide market.

There is no uniform international pesticide guidance and pesticide regulation is entirely the responsibility of nation states. The infamous 1984 gas explosion at a Union Carbide pesticide facility in Bhopal, India engulfed 600,000 homes and killed tens of thousands of people; the air, soil and water are still heavily polluted 30 years later. The Indian government estimates that 15,000 people died that day, but this number fails to account for the number of deaths caused by accident related toxic exposure, and ongoing exposure in a still-polluted area which brings the realistic death toll to more than half a million people. Union Carbide’s absolute failure to
rehabilitate the area has been ignored by the Indian government and the international community generally, and no-one is officially counting the lives lost or damaged.

The Bhopal disaster failed to elicit international outcry the way the 1986 nuclear accident in Chernobyl, Ukraine did. Bhopal related epidemiology is scant for the reasons outlined above but similar to Chernobyl’s nuclear fallout, and Vietnamese communities exposed to military grade pesticides “Agent Orange” et. al., during the US-Vietnam war, Bhopal’s harm is multi-generational. Children with cognitive and physical disabilities attributable to pesticide poisoning are still being born in Bhopal, more than thirty years after the accident (Brajendra 2015). Going forward, Union-Carbide pledged Western-style safety protocols, which gratified the international community and halted the pursuit of meaningful international pesticide regulation (Hough 2013: 163). Comparatively, the nuclear accident at Chernobyl was a catalyst for numerous multilateral agreements negotiated immediately in the accident’s aftermath. Prior to Chernobyl, reluctance to adopt international nuclear facility safety standards was widespread (International Labour Organization 2006).

The accident forced the international community to assess their nuclear emergency preparedness and implement a single global standard. The difference between the global reaction to pesticide-related corporate atrocities in the developing world and harmful nuclear accidents on Soviet soil is sobering. Each had the ability to impact wellbeing in the developed world, but one more immediately so than the other. Pesticide accidents do not immediately affect global health and food supply systems the way migrating clouds of Chernobyl’s radiation did; rather, the Bhopal impact was felt at local levels, far removed from the developed world. It may take more than a few generations to understand the human and environmental damage caused by pesticides, a slow-moving humanitarian disaster. As earlier discussed, The Clean Air Act (42 U.S.C. §
was signed into law in 1970 in response to a cluster of environmental disasters triggered by the aforementioned thermal inversions, such as the 1948 Donora Pennsylvania event, and New York City’s 1966 thermal inversion.

Methyl Bromide: A Cautionary International Tale

Reliance on robust international intervention has been ineffective, as the following discussion regarding methyl bromide will illustrate. Methyl bromide is a potent, ozone depleting pesticide that poses a well-established risk to planetary and human health. Under the terms of the 1987 Montreal Protocol on “Substances that Deplete the Ozone Layer”, the international community agreed to phase out its use and production. The Montreal Protocol was widely regarded as the one of the most successful multilateral environmental treaties at the time, and the United States was one of 193 signatories. The United States pledged to curtail and eventually suspend use of the chemical, but it is still widely used, in contravention of both the terms of the Montreal Protocol and the Clean Air Act.

The first Bush Administration applied for a series of “critical use waivers,” citing the absence of a viable alternative, thus paving the legal way for the application of a universally banned substance like methyl bromide. Applications for "critical-use exemptions" were not capped and are regularly submitted to the EPA by “agricultural groups and businesses as varied as chrysanthemum and strawberry growers, flour millers, universities, and golf-course groomers” (Revkin 2003).

Exemptions are also prominent in New York City pesticide governance as will be later discussed. Whether a pesticide becomes a matter of toxic concern depends on its impact and persistence within the human body and/or environment. Methyl bromide is a widely used insecticide, herbicide and rodenticide, a potent broad-spectrum pesticide that sterilizes the soil
and depletes the ozone. **Even** though California phased out the use of methyl bromide on strawberry crops in 2017, the fumigant may still be legally used on seedlings and nursery stock. Berries sold as “USDA organically grown” are thus very likely to have been treated by methyl bromide early in their lengthy growth cycle (Guthman 2017).

Under CFR 205.204, federal law allows non-organically treated seed and plant stock to produce a crop that may be later sold as organic assuming the plant materials or seed were grown in accordance under the appropriate waiver, or under the organic growing conditions during the latter part of the lengthy growing cycle. Due to certain berries multi-season growing cycle and vague federal regulations, the health of farm workers, unwitting consumers and the environment are endangered thanks to a legal loophole that may provide a way for pesticides to enter more well-off homes that might customarily purchase higher priced organic berries. Based upon the number of use exemptions granted by the EPA, methyl bromide is still one of the most widely used pesticides in the US, namely as a “grain and storage facility fumigant, post-harvest desiccant, as a methylating agent, as a refrigerant, as a fire extinguishing agent, as a dye solvent, wool degreaser, and in the extraction of botanical oils from flowers, nuts and seeds” (Balinova, Mladenova and Obretenchev 2006).

The substance is extremely toxic to human, animal and environmental health even in small doses and indoor use of the substance is prohibited in the United States (Schafer 1999). In 2015, Terminix, a licensed pest control company fumigated a United States Virgin Island vacation rental unit with methyl bromide. Unbeknownst to the exterminators, a family was staying in the unit above. The Esmond family suffered horrific injuries as a result of their exposure, including paralysis and nerve damage (Plesset 2017). No doubt the company, Terminix, erred gravely in its application and use of this substance but there was an absence of
general discourse surrounding the chemical’s toxic properties, even when “applied by certified users”.

Critical use waivers have been granted by the federal government ever since the substance was purportedly banned for use. On March 20, 2018 a new comment period was posted by the EPA on the federal register, paving the way for “tolerances of methyl bromide” through December 31, 2020 (Environmental Protection Agency: Methyl Bromide; Pesticide Tolerances for Emergency Exemptions 2018). The Food and Drug Administration (FDA) is responsible for enforcing pesticide tolerances for imported and domestically produced food in the U.S. Interestingly, in the FDA’s most recent Pesticide Monitoring Report (2015), methyl bromide did not appear once, despite being the one of the most prevalent pesticide used by berry growers in the United States that year.

Since no state or federal agency has ever set health standards for air-borne pesticides, government agencies do not measure airborne pesticide levels (Beyond Pesticides “State finds toxic insecticide in air samples” 2013). Of note, 90 percent of sprayed pesticides do not reach the intended target, and pesticide drift is yet another way in which pesticide exposure occurs and exposes unwitting populations (Saxton 2015). No-one has ever measured the presence of air-borne pesticides in densely populated New York City where millions of legal and illegal pesticide applications occur each year.

In Minnesota, residents of a potato growing community enlisted the expertise of the Pesticide Action Network (PAN) in the pursuit of a community-led air monitoring study. PAN subsequently authored “Pesticide Drift Monitoring in Minnesota.” According to the findings, chlorothalonil was present in 64 percent of the air samples taken near their homes, yet EPA regulations do not consider the health effects of inhaling chlorothalonil. According to PAN
“Regulations for chlorothalonil were set by EPA using studies based on ingesting the chemical, even though the agency considers chlorothalonil to be “slightly toxic to non-toxic” when ingested and “highly toxic or acutely toxic” when inhaled” (Pesticide Action Network, Pesticide Drift Monitoring in Minnesota 2013). One can only wonder what comparable studies in New York City would find, and if such hazards were identified, what recourse, if any, would be taken.

**U.S. Domestic Policy**

Pesticides were historically regulated in the United States under the Federal Insecticide Act of 1910 and until 1972, pesticide regulation narrowly focused on labeling requirements. Congress amended the Federal Insecticide, Fungicide, and Rodenticide Act of 1947 (FIFRA) and in doing so required the newly created EPA to monitor the use, sale and distribution of pesticides (US EPA 2013b). In 1996 the Food Quality Protection Act (FQPA) was unanimously passed by Congress. The EPA is tasked with the analysis of risk-benefit ratio of pesticide use and pursuant to FIRFA must ensure that the “economic, social, and environmental costs and benefits….will not generally cause unreasonable adverse effects on the environment” (FIRFA 408(b)(2)(D)(v) and (vi)).

FIRFA requires the evaluation of both aggregate and cumulative health risks from chemical pollutants from a variety of sources, including residential, environmental, water, food and other non-occupational exposures. FQPA requires the evaluation of both aggregate and cumulative health risks from a variety of sources such as residential, environmental, water, food and other non-occupational toxic exposure. One of the ways in which human exposures are tracked nationally is through the implementation of the National Biomonitoring Program managed by the Centre for Disease Control and Prevention (CDC National Biomonitoring
Program 2018). The bio-measuring methodology tracks nutrition and environmental exposures through randomized blood and urine testing of subjects’ pesticide load and conducted though on a far greater scale than DOHMH’s bio-monitoring, only tests for a limited amount of pesticides.

Since the implementation of FIRFA, there has been a decline in organophosphate use, one of the most toxic though still readily available pesticide class of insecticides which are subject to federal review every fifteen years (PAN: Pesticide Use Reduction in Europe (PURE) campaign Newsletter 2005). Traditionally, federal regulations called for very limited public input throughout the registration process, though under the Obama administration the EPA theoretically allowed more input in the review of products submitted for residential use registration (EPA: About Pesticide Registration 2018).

The EPA under Donald Trump’s former appointee Scott Pruitt sought to undermine progress at the expense of human and environmental wellbeing with apparent impunity. Pesticide manufacturer Dow Chemical contributed USD$1 million to Donald Trump’s 2017 inauguration “festivities” (Ospina and Roser 2018) and a few months later Scott Pruitt reversed an Obama-era effort that sought to ban the use of Dow’s chlorpyrifos pesticide on crops, ignoring studies that demonstrated a negative impact on the development of children’s brain (Biesecker 2017).

Decades earlier, Dow also withheld information from Occidental America chemical factory workers in the San Francisco Bay area regarding the perils of occupational exposure to a potent agricultural pesticide known as DBCP (1,2- dibromo-3-chloropropane). The company exposed workers without providing them with the information that it caused sterility. Thanks to whistleblowing efforts of filmmaker Josh Cary and factory workers, the Occupational Safety and Health Administration (OSHA) issued emergency temporary use limitations in 1977 (Michaels 2008). The EPA has also proposed demolishing an exemption that bars teenagers from handling
“restricted use” chemicals like methyl bromide, or from allowing teenage agricultural workers to use or handle agricultural pesticides, despite the clear medical relationship between disease and exposure, and the vulnerability of children to toxic exposures (Jamieson 2017).

In February 2018, the EPA fined Syngenta a mere $150,000 for improper chlorpyrifos use in Hawaiian corn fields, a massive reduction from the proposed $4.9 million fine under an Obama led EPA. They also agreed to spend $400,000 on farmer training. Syngenta bet – correctly – that the fines would be significantly reduced under the Trump administration and it was in their best interest to slow the process down until the Trump administration took office. (McAvoy 2018).

In the United States, Washington D.C, based CropLife America is the trade and lobbying representation of pesticide companies. Formerly known as the American Crop Protection Association and the National Agricultural Chemicals Association, CropLife America spends unknown millions of dollars lobbying members of congress. The actual sums spent are difficult to quantify because this data does not have to be disclosed by law (CropLife America – SourceWatch 2017). Under Donald Trump’s administration, former CropLife Lobbyist, Rebeckah Adcock, now leads the Department of Agriculture’s deregulation team. A leading investigation by ProPublica and the New York Times publicly highlighted the inappropriateness of her appointment and a request for the release of all correspondence Adcock has exchanged with lobbyists or other representatives from her former industry since she started working for the government is pending (Faturechi and Ivory 2017). Under the current administration, more than 188 lobbyists, with minimal to no government experience have been appointed to regulatory roles in fields they sought to influence (Kravitz et al 2018).

According to Pesticide Action Network, in 2014, the self-identified “agricultural support
industry” spent $30 million lobbying Congress (Annual Lobbying by Agriculture, Open Secrets 2014). Corporations spend approximately $2.6 billion annually on lobbying, a far cry from the 1970s when few companies had lobbyists in Washington and wages were rising (Drutman 2015). Since recordkeeping began, biotechnology spent more on lobbying in 2016 – an election year in the United States- than any other year so far, at least as far as publicly available records indicate. (Annual Lobbying by Biotechnology, Open Secrets 2017). More recent reporting for financial year 2017 shows that agribusiness total lobbying costs were $131,957,200 (Open Secrets Agribusiness 2017).

How does spending millions of dollars in lobbying translate into pesticide exposure in New York State and New York City? There are many examples, of which I will offer just one.

The EPA allows industry-funded research to inform its decisions, which is clearly problematic considering the rampant conflicts of corporate interest and questionable scientific rigor characteristic of these reports. In 2015, lobbyists successfully convinced the EPA to allow the use and sale of known carcinogen “Enlist Duo” in 9 states, despite advocacy group protest which was grounded in data driven concerns (Wheeler 2015). Enlist Duo’s primary ingredient is familiar to many as “Agent Orange”, which was used by the U.S. government as a chemical weapon in the Vietnam War (Whiteside 1971).

A request is pending to expand the product to twelve more states, including New York. In the case of Enlist Duo, a single EPA scientist’s analysis paved the way for Enlist Duo to enter commercial markets. Democratic lawmakers raised concern when they learned of several reports that demonstrated high-level toxicity to humans. The EPA agreed that commercial use rights had been granted too hastily and made an application to rescind Enlist Duo’s approval for
use and sale. Federal court denied the EPA’s application thus allowing Dow to continue manufacturing and selling the product. According to Patricia Callahan of The Chicago Tribune:

the EPA approved Enlist Duo after the agency tossed aside evidence of kidney problems that Dow's own researchers said were caused by 2,4-D. Regulators ultimately decided that Dow — a company with a $1 billion product at stake — had been overly cautious in flagging those abnormalities. That cleared the way for the EPA to allow 41 times more 2,4-D into the American diet than was previously considered safe.

Moreover, despite the primary role pesticides play in agriculture, the Department of Agriculture (USDA) has no formal role in the EPA’s pesticide review or consultation process. The USDA merely gathers agricultural usage data for EPA reporting purposes.

In 1962 Dr. Rachel Carson’s groundbreaking research on the health consequences of systematic pesticide use, specifically DDT, was published. In her book, A Silent Spring, Carson lamented the lack of legal oversight in the introduction of pesticides and chemicals in the U.S. marketplace. In 1962, up to 500 manufactured chemicals entered the marketplace annually. Dr. Carson’s work laid bare the true cost of development in environmental terms, and unofficially led the awakening of a global environmental movement. Less than a year after the publication of her groundbreaking book, then President John F. Kennedy tasked the Presidential Science Advisory Committee with the analysis of national pesticide use. The committee concluded that more research was necessary and recommended a phase-out of “persistent toxic pesticides” (Michaels 2008).

By 2017, there were 80,000 chemicals registered for use in the United States, and approximately 2,000 new chemicals are registered annually (National Toxicity Program). 95 percent of these chemicals claim “ingredients secrecy” under trademark law (EPA Pesticide Labeling Questions and Answers).
Obscure labeling requirements limit corporate transparency and public awareness, and label language is yet another limiting factor. Inert pesticide contents are not subject to any kind of regulation. The only clue as to content lies with the allocation of “use”, as labeled. If a pesticide-containing product contains the words “non-food use”, like the pesticides sprayed in New York City restaurants, it is likely that the “inert” content includes unregulated hazardous waste. Sewage sludge or “bio-solids” and industrial by-products, including hazardous waste, constitute an indeterminate amount of inert pesticide ingredients sold in stores across the country. One example of biohazard waste commonly found in non-food use designated pesticides are the by-products of manufacturing, industrial sludge captured in pollution filters at steel manufacturing factories (EPA Introduction to Hazardous Waste under 40 CFR 261 2005).

Pesticides that are not approved - or registered - for use in the United States may still be legally manufactured for export on U.S. soil, inert industrial by-products of the manufacturing process can be legally incorporated into pesticide containing products, and these facts may remain undisclosed under the law. In his work on pesticide use and risk perception, Dr. Frederico Peres has written extensively about the barrier between technical pesticide labels and lack of education among Brazilian agricultural workers.

Brazil is the world’s second largest consumer of pesticides (Peres et al., 2006), and Brazilian agricultural workers have an annual pesticide load of up to 56kg in some parts of the country. In the United States, occupational pesticide exposure is responsible for more injuries and illnesses among agricultural workers than any other workforce in the population. Labels are usually written in English thus excluding Spanish, the second most widely spoken language in the United States, the most common language spoken by agricultural workers and by people employed in the night shift restaurant fumigations across New York City.
A recent *New York Times* article suggested that consistent use of illegal products like Tres Pasitos, also known as Dos Pasos, among New York City Latino communities is attributable to cultural preference (Semple 2011). This analysis fails to account for the challenges posed by pesticide labeling, linguistic limitations or contributory crumbling infrastructure and pest infestations as significant factors in illegal pesticide use. Though cultural familiarity may play a role in product choice, it is more likely that language plays an equal role – poor labeling solely in English ignores the market share of Spanish speaking residents in certain New York City neighborhoods who regularly use pesticide products in the home.

In Manhattan, boxes of pesticide products hawked on street corners are often in Chinese, not English or Spanish. The illegal product is often more affordable, and can be purchased in discrete application sizes, which may also influence frequency of use. Looking to the use of legally available pesticide product, a bilingual pesticide project among Hispanic agricultural workers in Colorado demonstrated the effectiveness of training; offering Hispanic workers occupational guidance in Spanish resulted in safer pesticide management and use (Acosta et al. 2005), for example.

The National Primary Drinking Water Regulations (NPDWRs) apply to all public water systems, including water systems on American Indian tribal lands. The regulations seek to limit levels of contaminants and ensure clean drinking water is available in all public water systems by. The EPA delegates primacy for public water systems though its scope is limited and many of the pesticides found in drinking water are completely unregulated. Production of synthetic organic pesticides in the United States tripled between 1950 and 1980, a rough increase from 400 million pounds in 1950 to more than 1.4 billion pounds in 1980 (Trautmann and Porter
1989). Most of these compounds appear in groundwater and some of these compounds have been associated with toxicity.

Aldicarb, a carbamate insecticide, the most toxic pesticide legally available in the United States, is available only for professional use. Aldicarb containing products are also imported illegally and sold in informal city street markets as “Tiempo”, “Dos Pasos” and “Tres Pasitos”. The chemical is highly regulated, does not easily biodegrade and is ecologically devastating yet it has still been detected in 30 percent of the seventy-six wells sampled upstate New York, a region that supplies drinking water to millions of people in the New York City metropolitan area. The chemical compounds in drinking water, including Aldicarb, have not been measured in non-laboratory conditions, and the epidemiological effect of chronic long-term exposure to trace pesticides is very difficult to define (Trautmann, et al. 1985).

The EPA’s limited analysis of the threats posed to human and environmental health both through isolated pesticide applications, presence in groundwater and the synergistic effect of numerous pesticides in food, water and environmental applications is lacking yet these products remain in the stream of commerce. The absolute numbers of residential pesticide use and the total land area affected remain elusive and pose great concern to the health of untold millions, including New York City residents (Kripke & LaSalle 2010). Dr. David Bellinger made headlines in 2001 when he testified before Congress stating that the EPA misled the public in the wake of 9/11 when it claimed that the asbestos particles blanketing lower Manhattan were too microscopic to cause harm; the EPA’s declaration stated that it was safe for people to return to work and homes in the area. In 2012, Dr. Bellinger co-authored a controversial paper with colleagues Dr. Grandjean and Dr. Ladrigan, that presented a clinical relationship between industrial chemicals and neurodevelopmental toxicity in human beings; they called it a “silent
“epidemic” caused by common chemicals. The doctors sounded this public health alarm in response to a broken system that allows billion-dollar corporations like Dow and DuPont to manufacture and market products whose toxicity has not been fully vetted (Hamblin 2014).

Like Dow, Du Pont has a long and ignoble history of malfeasance. Its Chamber Works plant in Clearwater, New Jersey, made headlines in the early 1920s when 300 workers were sickened and 8 died due to occupational exposure to lead-based gasoline. Traditionally seen as innovative industry leaders, Du Pont’s occupational scientists published prolifically on matters of occupational health in the early 1930s and were the first to notice clusters of occupational disease incidence, namely bladder cancer among Du Pont’s dye workers. The company gradually guarded growing evidence of cancer incidence among certain classes of its workers, making it harder to trace longitudinal adverse health outcomes. Thus, the true number of people who died due to toxic occupational exposure to will likely never be known (Michaels 1988).

In the European Union and a limited number of additional countries, the Precautionary Principle is a deeply embedded policy that enables an appropriate response to possible or suggestive threats to environmental well-being and human, animal or plant health, including the regulation of chemicals and pesticides. Legal scholars have analyzed the practical applications of the precautionary principle in both Europe and the United States, which was introduced in Europe as a food safety mechanism and codified in Maastricht Treaty.

The US has adopted a unitary precautionary approach that applies a financial cost-risk analysis to perceived threats which makes restriction difficult. Europe, as a supranational body, is unable to apply a unitary approach and is more likely to make assessments on anticipated social costs (e.g. the so called “Mad Cow Disease” response to beef from the United Kingdom in 2000) (McIntyre and Mosedale 1997; Bochi 2016). In a 2014 Pesticide Action Network
Germany briefing paper, the most widely accepted definition of the precautionary approach is discussed through the lens of the 1992 Rio Declaration and the 1998 Wingspread Conference on Implementing the Precautionary Principle whereby

“action should be taken to prevent harm to the environment and human health, even if scientific evidence is inconclusive. It permits a lower level of proof of harm to be used in policy making whenever the consequences of waiting for higher levels of proof may be very costly and/or irreversible”

PAN argues that more can – and should - be done to control the introduction of pesticides under Europe’s precautionary principle. Put another way, the threshold for legally allowable pesticide residues should be measured against the most vulnerable members of a population rather than the “standard”. In this case, the potential for harm should be measured against children’s vulnerability to pesticide exposure, as expressed by the Icahn School for Public Health, rather than “industry standards”.

In a fascinating economic report, the EPA estimates national pesticide usage based on data gathered from sales records from 2007 USDA census, woefully outdated but the most recent data available on this particular topic. The report cautions the reader to limit inferences drawn from the data and laments the lack of oversight. Neither the EPA nor any other federal agency has a program devoted specifically to estimating the overall pesticide market in terms of dollars spent and quantity of active ingredient used on an annual basis. Noteworthy from the EPA’s analysis is the exclusion of wood preservatives (e.g., arsenic as discussed in Chapter 1), specialty biocides, and chlorine/hypochlorites.

2. **Number of U.S. Households Using Pesticides by Pesticide Type (EPA Market Estimates 2007)**

<table>
<thead>
<tr>
<th>Type</th>
<th>U.S. Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insecticides</td>
<td>59 Million</td>
</tr>
</tbody>
</table>
Fungicides 14 Million  
Herbicides 41 Million  
Repellents 53 Million  
Disinfectants 59 Million  
Any Pesticides 78 Million  

Although U.S. pesticide use declined 8 percent from 2000 to 2007, in 2008 U.S. households, companies and governments used 5.2 billion pounds comprising 22 percent of global consumption. Glyphosate is most frequently used, followed by atrazine (banned in the EU), metolachlor-s, acetochlor, 2,4-D, pendimethalin, and the fumigants metam sodium, dichloropropene, methyl bromide, and chloropicrin. Broad-spectrum organophosphorus insecticides still accounted for a large share of all insecticides used in the United States despite legislative action to limit their use (EPA Sales Usage 2007).

In LaSalle and Kripke’s ground breaking Cancer Panel and Environmental Toxins report, former director of the EPA’s Office of Prevention, Pesticides, and Toxic Substances noted that in a single year more than seven hundred untested products were introduced for market use while his staff capacity was commensurately reduced by 50 percent under the Obama administration (La Salle and Kripke 2016). How can a resource stretched department tasked with the health and well-being of the entire American population possibly fulfil its obligation with such limited resources? Simply put, it cannot.

Corporations benefit from lack of oversight while tallying the environmental and human health costs remain elusive. Since the EPA controls and implements the present regulatory system, DOHMH operates within the EPA’s paradigms, flawed as they may be. Like the federal government, City government frequently applies for use waivers on otherwise banned...
substances. The high levels of exposure to banned pesticides in New York State and New York City as will next be discussed next.

**New York State and City General Framework:**

Regulatory compliance is generally prosecuted on the state level, overseen by each state and its respective Department of Environmental Protection or Department of Agriculture. Cities and counties implement adaptive versions of targeted pest control programs tailored to local conditions. Regional and state bodies interface with EPA in the production and management of pesticide use. In this section, I examine New York City’s powerful regulatory mechanisms and the impact these institutions have on the lives of every New Yorker, regardless of socio-economic status, ethnicity or education.

The New York State Department of Environmental Conservation (DEC) and Cornell University are responsible for recording and analyzing pesticide sales data and the frequency of pesticide applications throughout New York State, including New York City. The gathering of these data is governed by the Environmental Conservation Law Article 33, Title 12, also known as the Pesticide Reporting Law (PRL).

Recorded data is analyzed and released in the form of an annual pesticide report supported by detailed spreadsheets that cite instances of pesticide purchase and use. Cornell and the DEC are unequivocal about these data weaknesses, which are “neither entirely accurate nor complete” (Cornell University Extension and New York State Department of Environmental Conservation Pesticide Annual Report Data). In other words, no one really knows how much pesticide is used each year in New York State, nor is there a way to provide accurate usage data for the type of pesticide applied. No mechanism adequately captures this information, including
New York City government, one of the largest users of pesticides and home to the nation’s most progressive and data transparent health department.

The Environmental Working Group is an independent watchdog organization that monitors water utility data across the United States. There are 2,317 water systems serving 17,300,092 people in New York State. More than 300 pesticide related pollutants were detected in the water table between 2004 and 2009; Eighty-five contaminants were detected above legal limits and 181 of the chemicals detected are completely unregulated. Of these unregulated chemicals, more than 50 percent of them contain varying degrees of pesticides including aldicarb. Despite widespread evidence of pesticide and other chemicals contamination, minimal resources are allocated to protecting rivers, reservoirs, and groundwater. Investment was made on a meaningful scale only when environmental stewardship could be measured in monetary terms that could save the City of New York from the prohibitive cost of installing a very expensive filtration system (Environmental Group EWG's Tap Water Database: What's in Your Drinking Water, 2017).

This reality contradicts perception among many of the people I spoke with during my research who referenced the pristine quality of New York City’s drinking water. Few people I spoke with filtered their drinking water at home or reviewed municipal water quality reports. Two women I spoke with in the Bronx used bottled water for drinking and cooking because they feared the integrity of their old building’s water pipes, and wanted to protect their children from lead exposure but no concern was expressed about pesticide contamination, or for their own health.

Local New York City government (the City) mandated pesticide use reporting shares similar capacity-related limitations with New York state. By its own admission, pesticide use
reported by City agencies does not represent the overall totals applied due to widespread non-
compliance with reporting regulations, and the City’s failure or inability to enforce the rules. 
Local Law 57 and Local Law 54 of 2007 require City agencies to report their annual pesticide 
usage to DOHMH. In 2015, 28 agencies reported their pesticide usage, a marked increase from 
prior years but in 2016, only 26 agencies reported use. 

Under Local Law 54, all NYC agencies are obligated to report their pesticide use to 
DOHMH, and DOHMH must issue a summary report to the City Council and the Mayor. 
Notably, there have been improvements in reporting since the enactment of Local Law 37 and it 
is recognized that change can be slow in large bureaucracies. Though an improvement, this 
process is still painfully slow and inefficient. 

Commercial records provide slightly more consistent albeit woefully outdated 
information. In 1998, the most current year for which there is information, commercial entities 
submitted 15 million reports, representing the sale or use of 29.4 million pounds and 4.5 million 
gallons of pesticide products applied statewide to land, buildings, and water. The commercial 
reports also highlighted the degree to which urban and suburban applications contributed to the 
overall use of pesticide, an unanticipated pattern of use (Orme 2002). 

New York City Regulation: 

Local Law 37 prohibits the government from using hazardous pesticides. Enacted in May 2005, 
New York City became the largest municipal authority in the country to prohibit use of pesticides 
if any one of the following criteria is present: 

1) Classified as Toxicity Category 1 by the United States Environmental Protection 
Agency (EPA); 

2) Classified as a known, likely, probable or possible human carcinogen by the Office of 
Pesticide Programs of the EPA as of April 1, 2005;
3) Classified as developmental toxins by California Office of Environmental Health Hazard Assessment (COEHHS) as of April 1, 2005.

Local Law 37 was seen as a great victory for advocacy groups and public health, an indicator of New York City’s progressive and forward-leaning agenda. DOHMH’s Bureau of Environmental Surveillance and Policy tracks pesticide use listed by the EPA as “Carcinogens or Developmental Toxins” (NYC DOHMH Pesticide Use Report 2014). However, reliance on the EPA and the Office of Pesticides of the EPA has raised concern among medical professionals, in large part because the prohibition lists are derived from data that is more than a decade old, and there has been no analysis of synergistic environmental and health effects (Singh et al., 2017). One branch of DOHMH seeks to, as per Dr. Oxiris Barbot’s earlier statement, “track disparities within indicators over time to learn more about the hardwired social conditions that perpetuate inequities” while another branch of DOHMH is tasked with vector control and arguably perpetuation of these very inequalities the agency seeks to address. Tracing the wellbeing of New Yorkers is undertaken by the very same agency that exploits a well-designed legal loophole that permits use waiver applications of the very substances it purports to stop using (Barbot 2017).

DOHMH Annual Reports purportedly log prohibited pesticide use among other city agencies, but the information is fragmented. The following table contains data which I compiled and aggregated from numerous DOHMH surveillance reports generated since 2005, the year Local Law 37 was enacted. The table only collates those chemicals deemed to be carcinogenic by the EPA or under California’s Proposition that were nonetheless used by City agencies. The reports do not list agency names, just the total number of pounds used. I gathered this information from DOHMH’s archived records, noting it is simply a representative sample rather
than an exhaustive list. DOHMH has no way of knowing if every agency application of pesticide was even reported because there is no centralized data tracking system in place.

### 3. DOHMH PESTICIDE SURVEILLANCE REPORTS & ARCHIVES 2005-2014

<table>
<thead>
<tr>
<th>Chemical</th>
<th>Toxicity Classification</th>
<th>EPA Report Date</th>
<th>Total Use Reported by NYC since EPA Report Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metaldehyde</td>
<td>EPA – suggestive carcinogen</td>
<td>6/23/05</td>
<td>44.14 lbs 2.4 gallons</td>
</tr>
<tr>
<td>Flonicamid</td>
<td>EPA – likely carcinogen</td>
<td>2/24/05</td>
<td>5.3 lbs</td>
</tr>
<tr>
<td>Avermectin</td>
<td>CA Prop. 65- developmental toxin</td>
<td>6/23/05</td>
<td>543.7 lbs 2.7 gallons</td>
</tr>
<tr>
<td>Penoxsulaum</td>
<td>EPA – suggestive carcinogen</td>
<td>2/24/05</td>
<td>1750 gallons</td>
</tr>
<tr>
<td>Resmethrin</td>
<td>EPA – suggestive carcinogen</td>
<td>2/24/05</td>
<td>9.02 gallons</td>
</tr>
</tbody>
</table>

As the above snapshot shows, Local Law 37 regularly fails to achieve its stated goal because it is continuously undermined by the aforementioned powerful waiver application, a legal device which renders the law’s protections essentially meaningless. From numerous sources and archives, I compiled a snapshot of pesticide use waivers filed by City Agencies seeking exemptions from Local Law 37 since 2005. Despite hours of record review, I didn’t find a single denial; every waiver I found had been granted, often at 6-month intervals (Local Law 37: Pesticides Used by City Agencies 2015-2016).

Moreover, none of the granted waiver data appears in DOHMH’s Pesticide Report summarized above when I cross referenced my findings against hard copies of government reports. I discovered that the City classified waivers “differently”, hence their absence from public records even though use of these pesticides still involves the application of an established
or “suggestive” carcinogen in contravention of Local Law 37. Records were retroactively converted to a uniform electronic format starting in 2016 and made available online in 2018 but the converted records do not match the original, signed waivers I reviewed prior to the conversion.

For example, use waivers for pendulum, a toxic herbicide, were granted but somehow pendulum use was not captured in any of the electronic records available online. The City acknowledges the limitation of its pesticide reporting, and cites poor compliance and incomplete record-keeping. 26 waivers starting appearing in pesticide reports in 2015, noting that many of the converted records don’t match earlier record requests.

How much pesticide used, or intended for use, is not listed in the waiver application, nor could I find that information in application sheets or tables going back through City records as far as 2005, see below list gleaned from older records (Local Law 37: Pesticides Used by City Agencies 2018):

<table>
<thead>
<tr>
<th>WAIVER APPLIED FOR THE FOLLOWING PESTICIDE/AGENCY (if indicated)</th>
<th>TOXICITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alamo fungicide</td>
<td>May cause damage to organs through prolonged or repeated exposure; caused cancerous tumors in mice; DANGER do not inhale</td>
</tr>
<tr>
<td>Arbotect 250 (Insecticide -FDNY)</td>
<td>Hazardous material, no inerts required to be listed, can impact lungs, liver and gall bladder, no cancer noted</td>
</tr>
<tr>
<td>Substance</td>
<td>Description</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Demon Max</td>
<td>Combustible liquid. Can release vapors that form explosive mixtures at temperatures at or above the flash point. Heavy vapors may cause headache, dizziness, numbness, nausea, incoordination, or other central nervous system effects. No antidote if ingested</td>
</tr>
<tr>
<td>Pendulum 3.3</td>
<td>May be fatal if swallowed and enters airways. Suspected of causing cancer. Very toxic to aquatic life, with long lasting effect</td>
</tr>
<tr>
<td>Phantom Termicide (Insecticide-NYCHA)</td>
<td>Toxic if inhaled or swallowed; not for spraying</td>
</tr>
<tr>
<td>Cynoff EC Insecticide</td>
<td>Banned in California; Highly toxic to aquatic life; not for use in areas of food handling, restaurants or other areas where food is commercially prepared or processed.</td>
</tr>
<tr>
<td>Maxifore</td>
<td>Hazardous to humans</td>
</tr>
</tbody>
</table>
| RB5C                              | Harmful if swallowed or inhaled                                                                                           
|                                   | Toxic to fish and aquatic invertebrates. Toxic to bees exposed to direct treatment on blooming crops or weeds. Bladder cancer noted in mice, possible carcinogen |

Analysis of scattered government records revealed interesting pest control methodology. Although West Nile virus was detected in several parts of the city, preliminary record review suggest that the Rockaways was the only region sprayed with “multicide -a suggested carcinogen”, at least as far as some of the older waivers I reviewed demonstrate. It is doubtful that the data on file is complete, but it is suggestive of public health partitioning of communities.
See below DOHMH map of West Nile detection for the 2015 season- not a single Rockaways zip code appear on this map (11690, 11691, 11693 and 11695) even though the presence of West Nile disease was cited on the use waivers applied for the multicude use. Lack of reporting does not indicate the absence of West Nile disease, but this data gap certainly warrants exploration. This indicates poor record keeping at best, concerning given the fact New Yorkers health and wellbeing is at play.

![Mosquito Populations of New York City, by Zip Code, July 19 to August 7, 2015](image)

*The lack of detection of West Nile virus in a zip code does Not mean that West Nile virus is not present. All New Yorkers should take precautions to avoid mosquito bites during peak season.*

**Figure 1: Mosquito Populations and Pesticide Use, DOHMH 2015**

Local Law 36, otherwise known as the Neighbor Notification Law requires a 48-hour advance warning notice be clearly posted before the application of pesticide. No New York City resident I spoke with recalled ever seeing “neighbor notices” posted in their buildings, whether by neighbors, property owners, management companies, parks or playgrounds, though people recall seeing notices in parks and near playgrounds.
The law designed to protect the health of residents is little known, invisible and largely unenforceable. Galvanized by letters and a campaign spearheaded by kindergarten teacher Paula Rogovi, in 2015 students of PS 290 compelled City Councilman Benjamin Kallos to introduce Local Law Intro 800. PS 290 is a high performing school located in a wealthy neighborhood with one of New York City’s highest percentage of private school enrollments, a school where public school grades are 60 percent higher than the NYC average (P.S. 290 Quality Snapshot 2017). This new law seeks to limit government use of glyphosate (common trade name in the United States is Round Up) on New York City owned land and parks and speaks directly to parental concerns about poor park signage indicating when areas are going to be, and have been treated, with glyphosate - a total failure of authorities to warn of recent pesticide applications where children play.

The Icahn School of Public Health supported this initiative and submitted “Written Testimony of the Children’s Environmental Health Center Icahn School of Medicine at Mount Sinai Before the New York City Council Committee on Health” which outlines the negative health consequences of glyphosate exposure. Since children are particularly vulnerable to pesticide exposure and have higher levels in their bodies for several reasons, including “age-appropriate hand-to-mouth behaviors, closer proximity to the ground, and higher breathing rates”, all of which place young children at increased risk for pesticide exposures when compared with adults, they support an expansion of Local Law 37 (2017).

The P.S. 290 children recently attended a City Council forum and the matter will be voted on before the end of the year. I reviewed the Intro 800 draft legislation and waiver language enabling exemptions, similar to Local Law 37’s waiver language enabling the continued use of banned pesticides, is still a key component. The initiative is a positive one but
due to continued waiver applications will likely result in a greater administrative burden to City agencies rather than improved health outcomes for New York City residents and environment, at least in the foreseeable future.
Chapter 5: People, Culture, Gender and the City

Cities are central to perceptions of progress, modernity, technological advances, political, cultural and financial power (Harvey 2006; Hannerz 2002). People, language, products and ideas move with ease throughout New York City neighborhoods. Urbanization’s radical transformation of the physical and cultural landscape via urban migration has occurred over a relatively short period of time. In a multi-cultural city such as New York City, place-based culture is less relevant than the origin and synthesis of cultural transmission; neighborhoods provide a context for cultural transmission, an urban space where memories and histories are shaped and remade in new locations (Sen and Silverman 2014). Communities within cities are places where material culture may be re-shaped as a reminder of “home” or simply “familiar.” There are many immigrant communities and individuals living in New York City who bring their traditions and practices with them, and in doing so create new cultures.

Certainly, New York City is a durable source of “new culture” as well as a global economic center. In the course of my research, I was randomly approached by a man, Miguel, who noticed a book I was reading, Peter Hough’s “The Global Politics of Pesticides: Forging Consensus from Conflicting Interests”; Miguel wanted to know if the author mentioned Nicaragua, his native country. Unsolicited, he recounted fleeing the Sandinista regime and subsequently immigrating to the United States. Originally from a farming background, he described his uncles’ toil in the banana fields and the frequent use of highly toxic substances. Fields were hand-sprayed with potent pesticides manufactured by American companies, and plant roots injected with what he described as “massive syringes.” Sometimes his uncles allowed him to “push the pump” to release the liquid, and he was thrilled to assist. They always ate lunch in the field, with the same hands that had worked with toxic substances.
He never saw anyone wear protection of any kind. Pesticide soaked clothes were cleaned at home, usually by his aunts and mother in a nearby river. The women’s pesticide exposure occurred within the domestic realm, traditionally a female space (Harvey 2017), marking just one of the ways gender played a role in toxic exposure in his community- men through agricultural work, women through domestic work. Each of his uncles died from cancer at remarkably young ages, long before Nicaraguan activists pursued justice for poisoned agricultural workers through U.S. courts (Justice for Nicaraguan Banana Workers, COHA 2010).

He strongly believes that his uncles’ untimely and painful deaths were a direct result of their repeated exposure to highly carcinogenic pesticides - corporate atrocities committed with impunity. Now in his late forties, he worries about his own health due to repeated childhood exposures and is angry at the perceived lack of pesticide awareness in the United States.

Setha Low’s essay “Place making and Embodied Space” explores the ways in which material space, objects, and the human body interact within social and political institutions; recognizing the human body as a vital and contributing component of urban living, its existence within built landscapes as “a moving, speaking, cultural space in and of itself”. By viewing the body as part of the cultural landscape, she acknowledges a radical integration from previously separated domains of material culture and human agency. For Low, as for Miguel, the recognition of the body “resolves many of the dilemmas that plague those of us who cross the micro/macro boundaries from individual body and embodied space to macro-analyses of social and political forces. This integrated notion of embodied space addresses both the metaphorical and material aspects of the body in space as well as space-time to communicate, transform, and contest existing social structures” (Low 2009).
Viewing the body within the context of power structures in New York City, how can I explore the material and cultural aspects of pollution within prescribed social and gendered structures? There have been limited studies on the relationship between pesticide accumulation, human biology and gender in the United States. Acknowledgement of gender’s role in the presentation of symptoms in disease is relatively recent, for example men and women exhibit heart attack symptoms differently; standard medication dosages are usually based on the “average” 180lb male; evidence is mounting that gender bias is common in women’s medical treatment including the dismissal of women who exhibit dangerous post-partum symptoms.

Women’s pain is also dismissed more frequently in emergency rooms (Nance 2018). A study found that female farm-workers not involved in the handing or application of pesticides were twice more likely to suffer from pesticide related illness and injury than males. Female injury and exposure was attributable to pesticide drift, exposed through their proximity as they worked in fruit and nut fields. However, the absolute number of males suffering acute pesticide poisoning among males was double that of females. The study also showed that both genders had minimal control over the workplace factors that contributed to their pesticide related illness and injury (Kasner et al. 2012).

Some studies indicate a correlation between pesticide exposure and decreased in fertility among both genders, and pregnant women may be at greater risk for negative outcomes if exposed to pesticide during pregnancy. In utero exposure has certainly been linked to a number of negative outcomes, including breast cancer, lung impairment and neurological damages among adults in later life who were exposed in utero; pregnant and breastfeeding women are often encouraged to choose pesticide free produce when possible.
In the ethnography “Flammable- environmental suffering in an Argentine shantytown,” (Auyero & Alejandra Swistun 2009) there is a clear, gendered division of household labor in a toxic, industrially polluted environment where lead, chromium and other pollutants harm the health of its inhabitants. The risks are widely known, largely accepted, and the poor health of children well documented. In “Flammable” women schedule doctors’ appointments, manage the health of children, parents, siblings and spouses who have been poisoned by toxic exposure; it is women who apply for benefits, manage calendars of meetings with experts, lawyers, journalists and doctors, medications, observation of symptoms or lack thereof. The female role of “mother” or “caregiver” is magnified in this environment.

Comparatively, women in the Bronx that I spoke with expressed concern over local environmental hazards but in reference to their children and not themselves. In her essay “Gender” in “A Companion Guide to Urban Anthropology”, Ida Susser describes a gendered urban experience where the exacerbation of inequality, racism and limited opportunity are viewed through prisms of poverty, homelessness, low-wage jobs and the differences between female and male use of space; in both the public and private sphere, women’s urban experiences are framed by the neoliberal forces of housing markets and labor markets (Susser 2014:183-188).

Anthropologist Melissa Checker’s ethnography of an upwardly mobile African American community in Augusta, Georgia explored the resilience of a community whose air, soil and water were contaminated by pollution while social services in the community, like education, police protection and healthcare were further “contaminated” by a history of racial discrimination. Even when social justice was pursued through class action lawsuits brought by communities adjacent to Hyde Park’s “industrial toxic stew” which included contamination from
pesticides such as arsenic, the African American community was excluded from participation. Through community advocacy led in large part by women, and mothers of chronically asthmatic children, the Hyde community was eventually relocated although though chronic illnesses and rare cancers have undermined quality of life and well-being (Checker 2005).

A pilot EPA study in Staten Island explored how deep misunderstanding of regulations, and a desire to adhere to the law, contributed to frequent pesticide over-use in childcare facilities, and that pesticide use was driven by a primarily female workforce. When day-care center owners and supervisors were properly trained in the rules and requirements, pesticide use and exposure declined. This represented a reduced risk to vulnerable populations of low-income female workers and children availing of the day-care services (US EPA 2013a). Misunderstanding the law both by business owners and pest control companies was a clear contributor to pesticide overuse in this study.

Ida Susser has asked what, exactly, is a “woman’s right” to a city? Opposition to neglect, which for the purposes of this research I will interpret to mean opposition to pollution and daily pollution exposures, and the sheltering of self and family from the consequences of pesticide exposure (Susser 1998; Purcell 2013; LeFebvre 1996).

New York State considered banning foggers a number of years ago although no legislative action was ever taken, and these products are freely available in bodegas, supermarkets and hardware stores all over New York City. DOHMH implores people not to use foggers in their apartments and stresses the likelihood of harm caused by chemical inundation due to their use; chemicals permeate walls and migrate through apartment doors; fogger misuse is rampant. In 2013, a woman caused a massive explosion in Chinatown when she set forty
foggers over a two-day period in an attempt to combat an infestation and forgot to turn off the pilot stove light in her kitchen (Santora 2013).

Families comprise just over three-quarters of the homeless shelter population, 45,000 of whom are children, and the number of homeless people under varying degrees of institutional care and assistance is 90 percent higher today than it was a decade ago. As of 2015, most of the people in shelter facilities come from the low-income zip codes (Coalition for the Homeless - Basic Facts About Homelessness in New York City 2017). Homeless shelters employ rigorous pest control given the reality of crowded conditions.

The NYC Department of Housing employs an external pest control company that applied pesticide in shelters, dormitories, family facilities and intake facilities a total of 9,064 times in 2015. According to the same pesticide report, the New York Housing Authority (NYCHA) applied pesticide 72,589 times to 2,644 residential buildings, 178,466 apartments, and office space and grounds equivalent to 2,502 city acres, or 5,848 pounds.

Pesticide exposure in homeless, family or women’s shelters is just one way the body is shaped due to social and economic processes. People living or staying in a property managed by NYCHA are very likely to encounter frequent pesticide exposure that is beyond their control, and as the Icahn School of Public Health made clear in its open letter to the City, children are far more vulnerable to the effects of pesticide exposure than adults. Health concerns have often informed state interventions, but these efforts also serve to partition and classify urban space, as seen by the spraying of low-income communities in the Rockaways, and NYCHA housing. This represents a classic case of a self-contained system in conflict with itself (Douglas 2013; Harvey 2010).
Merrill Singer (2014) highlighted three specific areas of “challenge” when analyzing environmental health and human wellbeing; his framework is appropriate to apply to an analysis of pesticide use and consumption in New York City:

1. **Challenge of Attribution: it is difficult to establish a clear nexus between pollution, disease, culture and specific health outcomes.**

The 2007-2017 New York City Community Air Survey report on air quality in, the only longitudinal study on urban air pollution found that though rates of particulate matter had declined, city air still had levels in excess of allowable regulations. Drawing upon data from 2005-2007 (the most recent years available) DOHMH determined that 400 premature deaths were attributable to ozone pollution and 3,200 deaths among adults aged 30 and above were attributable to particulate matter exposure. Children’s deaths were not counted. According to DOHMH’s report, cause of death is never listed as “pollution” on a death certificate yet air pollution killed more New Yorkers in 2005 – 2007 (the most recent data available) than homicide and vehicular accidents combined. Simply stating that 400 deaths were caused by ozone levels disguises pesticides’ contribution to pollution related deaths. Volatile organic compounds (VOCs) are a multi-source problem and derive from pesticides in addition to vehicle exhaust and other industrial effluent. VOCs readily vaporize in the atmosphere where they react with nitrogen oxides, high temperatures and sunlight to form ozone. Death from life-long exposure to long-term volatile organic compounds generally and pesticides specifically in food, air and water is difficult to quantify, difficult to prove and is not indicated on death certificates unless the poisoning has been an egregious and discrete event.

People I spoke with registered concern about air pollution in their neighborhoods. Traffic and diesel fumes were the number one priority, as were inefficient trash collections. No one
other than Miguel identified alternative sources of air pollution, such as superfund off gassing, pesticide spraying or even aged oil heating system effluent - likely because they are difficult to see, and public health messaging does not address these issues. Asthma plagues lower income communities in New York City and is endemic in the Bronx neighborhood where I work and conducted some of this research (Sze 2006). Yet, when DOHMH scheduled its first seasonal aerial spray of the area in mid-July 2018, warnings were confined to its website, advising people with asthma to close windows and doors during the spraying. There were no signs anywhere in the neighborhood that I could find warning of the imminent action. Personal pesticide use was also frequent in this community; reasons given for pesticide use by residents included infestations of cockroaches, mice, bed bugs, overcrowdings, poor neighbor hygiene and rats. These pests are common in older apartment buildings with unsealed cracks and holes in the foundation. Dietary preferences, immigration status, employment and gender also play roles in community exposure. People who work in shelters, day-care facilities or schools are far more likely to be female, and more likely to be exposed to the rigor of pest management than other occupations (Blau & Currie 2006; Naples 2012).

2. **Challenge of the Elite Contrarians:** powerful entities that contribute to pollution, and the ongoing exposure of populations to toxic materials.

This can be broadly applied to real estate developers in the Gowanus Canal or Greenpoint, the developers purchasing portions of the South Bronx betting on the next “gentrification” wave, urban planners, the dwindling number of increasingly powerful, merged multinational corporations who control the global production and distribution of pesticides, or politicians who accept lobbyist contributions from these companies. It can also, very broadly, apply to New York City Government and the annual use waivers it frequently applies for, or the inability of
New York State to allocate adequate resources to measure the true scope of pesticide use within
the State. Pesticide exposure is a class marker when examining those who immediately suffer.
Shelter residents, housing authority residents, residents of improperly maintained buildings,
agricultural workers, children of migrant farmworkers, immigrants working in an informal
economy, immigrants whose options are limited due to education or possibly discriminatory
hiring practices, or people with limited education- all bear proof of structural violence imposed
on them by a market driven economy bolstered by legislation that allows pesticide use, sale and
manufacture with impunity. One morning I encountered two Latin American subcontractors
working at the gates of Fordham University in the Bronx - close to where I conducted some of
my research on 183rd street and Southern Boulevard and along Prospect Avenue. The men were
spraying an unlabeled substance from containers affixed to their backs. They were not wearing
masks, protective eyewear or gloves. I approached them out of curiosity and introduced myself,
and told them about my research. They did not know what type of “bug control” they were using
they were simply provided with simple directions to spray “everywhere.” I thanked them for
their time and noted the wind direction; their clothing, lungs and hair were likely covered in the
substance, whatever it may have been.

3. **Challenge of governance: policy makers failing to respond to scientifically sound
data; challenge in disseminating this information beyond the scientific community.** This
also refers to the conflict within government when public health/scientists conduct research and
present findings that policy-makers flatly ignore, or suggestions that are impossible for people to
implement depending on their financial situation or proximity to fresh produce. The Soil
Organization is responsible for certifying organic food in the United Kingdom and at the 2017
Royal Society of Medicine Conference presented on the seventeen-fold increase of chemicals
found on supermarket produce in the last 40 years; the medical community recommends avoiding pesticides by “buying organic” at all times (Melchettt 2017). This recent finding is a proxy for the likelihood that a similar increase in chemical residue on produce occurred in the United States, which is supported by the Environmental Working Group’s online “Dirty Dozen” list identifying the most common sources of pesticide residue on produce sold in the U.S. Recognizing that fruits and vegetables are an important part of anyone’s diet, comparison of the quality of fruit and vegetables in lower and higher income communities is stark. There is limited access to organic produce in the Belmont section of the Bronx, and, where it is available, it is prohibitively expensive.

Ad hoc fruit markets appear for a few hours at a time, “stalls” operated from the back of vans appear on the streets in the South Bronx during summer, hawking produce of dubious quality and origin for under a dollar apiece. They sell out quickly. If diet is a primary source of pesticide exposure, it is likely that communities that are underserved with access to affordable, organic produce will be negatively affected, as will communities for whom rice is an important staple. But, what of people with access to organic produce but who also living adjacent to a green space that is regularly sprayed with pesticide that may be deemed a known carcinogen? No data exists in those instances.
Chapter 6: Risk

Long before the Sakishima Daiichi nuclear disaster, Mary Douglas explored risk perception in Japan, measuring local perceptions against international concerns regarding the location of Japan’s nuclear sites in an earthquake and tsunami prone region. Many of Japan’s nuclear sites are located on the coast, and the potential for catastrophic loss of life and environmental damage is significant. As Mary Douglas observed, there is no direct translation for the word “risk” - the potential for danger - in the Japanese language. When risk is described on the Japanese language, it is written as "リスク/risku" in *katakana*, which is a specific Japanese alphabet used for borrowed, foreign words. Pernille Rudin suggests the absence of the word “risk” in the native language of a country prone to natural disasters such as earthquakes, volcanoes and tsunami indicates a degree of numbness, acceptance and belief that risk is an accepted state of being (Rudlin 2018).

Mary Douglas found that the danger posed by nuclear sites in was described in moral and political terms, thus “danger” became politicized. Understating risk can be politically or financially motivated, and those in control of the messaging do not always prioritize the health and well-being of the public (Douglas 2013; Douglas 2003). This was especially true in the wake of the Chernobyl and Bhopal disasters, and in Lower Manhattan in the wake of the 9/11 terrorist attacks. The perception and management of risk is often interpreted in cultural and normative ways. Risk is commonly mentioned in relation to the environment, pandemics, terrorism, child-rearing practices, refugee resettlement, immigration, and even minimum wage increases. Risk is thus managed on personal, financial and political levels and is a distinct cultural phenomenon couched in local and symbolic meanings; risk assessment on the personal level is often irrational (Lakshminarayanan, Chen and Santos 2011). Is it simply “human” nature
to overestimate risk when traveling by plane, or underestimate risk when traveling by car? (Chen and Santos 2006). Only one person I spoke with throughout the course of my research was aware of DOHMH’s large-scale summer pesticide spraying.

A small group of young, well-educated Irish immigrants living in a predominately Polish/Polish-American settled Greenpoint expressed concern with neighborhood health insofar as it pertained to rat control and improved trash collections. No-one knew about the superfund site a block from their shared, crowded, drafty and expensive apartments. Everyone I spoke with had used some form of pest control in the last year, and all but one person was aware of commercial pest control programs implemented by building management. Six people had endured bedbugs, and as expected, mice and cockroaches were ubiquitous, regardless of neighborhood, whether renting or owning or paying high or low rent. It seems probable that high rents in socially desirable areas do not insulate New Yorkers from pests, or from exposure to pesticides through non-dietary means.

The City is a highly developed, artificial environment with very specific conditions that influence its population in measurable ways (Sze 2006). Growth is an increasingly ordered process in New York City in no small part due to spatial limitations. A 2010 mega-city study conducted by engineer Christopher Kennedy et al., found that New York City generated more solid waste and consumed more energy and water than any other mega city studied, even though New York City was neither the largest nor most densely populated. Mega-city living is associated with economic, environmental, geopolitical, societal, and technological risks in addition to the inherent risks associated with urban poverty, economic vulnerability, and social–spatial fragmentation. (Kennedy et al., 2013).
In addition to living in a resource hungry mega-city, New York City residents have the nation’s highest levels of measurable pesticide residue in their bodies and are among the nation’s heaviest pesticide users. Exposure to organophosphates and dimethyl is notably high in measured populations, making frequent exposure to pesticide yet another measure of risk associated with living in New York City (McKelvey 2014 et al.).

The journey from Greenpoint to the Gowanas Canal is a halting one along the Brooklyn-Queens Expressway (BQE), one of the busiest roads in the United States. Apartment buildings, houses and centers of commerce and industry hug the edge of the expressway, which, by the New York State Department of Transportation’s calculations, hosts an average of 155,000 vehicles per day. In some areas of the expressway, luxury LEED certified homes are mere feet from heavy traffic, residents unwilling to open windows because the air quality is so poor.

The BQE was one of Robert Moses’ post World War II initiatives, an arterial development that reshaped the city. Advocacy, wealth and power preserved Brooklyn Heights when the BQE was designed but poorer communities did not fare quite so well. Unlike the Bronx, which was divided by the construction of the Cross-Bronx Expressway (CBE), the BQE had a lesser impact in middle-class and wealthy communities. Simply known as “South Brooklyn”, neighborhood names quickly emerged as a form of protectionism, creating a sense of identity in Carroll Gardens, and even around the Gowanus Canal. The BQE destroyed some neighborhoods in the spirit of “slum clearance” – largely immigrant communities unable to negotiate favorable terms under the BQE redesign.

Long-time Brooklyn resident Joe Tomo explained to New York City Roads “these were mostly immigrants here who were afraid they might get deported if they protested. You can't fight City Hall.” (Brooklyn-Queens Expressway: A Historic Overview)
the BQE was completed fifty-three years ago, and today the BQE snakes through some of Brooklyn’s most coveted neighborhoods.

However, community activism thrived in Greenpoint in the 1970s. Women like Jan Peterson helped organize opposition to the destruction of neighborhood homes for the expansion of factories in the community, the building of which would have been subsidized by municipal funds, much like the recent subsidies granted to developers in Greenpoint more under Mayor Michael Bloomberg’s rezoning initiatives in Greenpoint and Williamsburg. Greenpoint’s community activism addresses a void, what Ida Susser describes is “the loss of democratic voice” in the global and political arena. Neighborhood organizations such as the People’s Firehouse, local churches, artists and Neighbors Allied for Good Growth represent the human component of Greenpoint’s urban environment, and the struggle for identity amidst neoliberal forces. It is with some bitterness that activists note that their successful opposition to industrial construction in the 1970s and 1980s paved the way for developers to enrich themselves today on waterfront space, though parks have been carved out for community use, a small but relevant victory (Susser 2012).

In Greenpoint, the fair market rental value of a three-bedroom apartment on Humboldt Street, less than a block from the BQE, is $6,000 a month. Rent is hardly affordable. Greenpoint’s Newtown Creek became a designated superfund in 2010. In the same year, the New York Department of Environmental Conservation identified the presence of a large, toxic plume under a former factory on DuPont street, located across the street from a children’s playground. Twelve underground storage tanks containing a mix of toxic chemicals had been left behind by the factory owner in 2004.
DuPont Street Realty LLC purchased the “Nu-Pont Plastics” building in 2014 for $23 million and will construct an apartment complex at the site when federal remediation is complete. There is no evidence that this new development will have any affordable units within the projected 400-apartment complex that will have waterfront views and 200 parking spaces (Real Estate Weekly 2014); the system that manages New York City’s industrial “dirt” is ultimately one of neoliberalism.

Other developers such as L & M Realty have started construction on the same street and are building 103 affordable units. The Bloomberg administration had originally promised developers a $136,000 affordable unit housing subsidy per unit, which was reduced by 50 percent, to $68,000, by the De Blasio administration. This is part of massive development expected to take more than a decade to complete and will add more than 5,000 apartments to the area, a fifth of which will be “affordable”. Rehabilitated super-fund sites thus serve as vehicles for profit for the select few, noting that affordable units come with prohibitive regulations regarding resale and market value deductions for lottery winning residents.

Greenpoint’s Irish immigrants were transient, living in New York City for a year on graduate visas, with imminent plans to return “home”. They shared a cramped, poorly insulated apartment and had low paying jobs but enjoyed the opportunity to live and work in New York City. Few people I spoke with were aware of Greenpoint’s toxic history and superfund designation, the most knowledgeable being a 65-year-old, third generation Italian-American woman who was a life-long Greenpoint resident. In light of the most recent wave of gentrification where long-term community members, and community advocates have been displaced, the lack of knowledge attached to the issue of toxic pollutants in the neighborhood was not all that surprising (Susser 2012)
Interested in perceptions of risk among Greenpoint residents, I asked everyone I spoke with about seat belt and bike-helmet use. Those who cycle regularly wore helmets, and seatbelt use was a given when riding in the front but less likely to be worn as a back-seat passenger in taxis. Though organic food was preferred, the reasons given ranged from “it just tastes better” to “concern about the industrial food chain” to worry about pesticide residue on “conventionally” grown produce.

Figure 3: Neighbors Allied for Good Growth Map [http://nag-brooklyn.org/toxicity-map/] overlays highly regulated sites, EPA sites, polluted and remediated sites with median income. This project was funded by the NYS Department of Environmental Conservation. GIS and interactive mapping consultation from the Spatial Analysis and Visualization Initiative (SAVI) at Pratt Institute.

One man in his 40s undergoing chemotherapy raised concern about pesticides due to his compromised immune system. Others ate “organically” when possible, citing expense and availability as prohibitive factors. In the Fordham Heights/Belmont section of the Bronx, three stores and one supermarket sold fresh produce, none of which was labeled “organic”, and the ad-hoc fruit stalls that mushroom on 187th street during the summer months sell uncategorized
produce at reduced rates from the back of their trucks. In this neighborhood, “Tres Pasitos” is available for purchase periodically from street vendors that set up shop for an hour before disappearing.

In the Bronx, people were less optimistic about their neighborhood, more critical of landlords and neighbors and less accepting of the condition of their rented apartments. On 187th street in the Bronx, an older Puerto Rican woman pointed at the holes in the building’s foundation building, calling them “puertas para ratas”. She was not wrong, I certainly spotted dead rodents on the street on Prospect Avenue in the Bronx. Belmont residents decry the superintendent’s futile rat control efforts and blame poor neighborhood hygiene on the bodegas, assisted living facility or “dirty” neighbors.

Figure 4: apartment building: foundation with holes and cracks
Prospect Avenue, Bronx (Faye O’Brien 2017)

Figure 5 Condemned house being fumigated next door to a school on Prospect Ave, Bronx (Faye O’Brien 2017)
CONCLUSION

“a maze of hybrid squalor near the ancient waterfront opposite Governor’s Island, with dirty highways climbing the hill from the wharves to that higher ground ……. a babel of sound and filth and sends out strange cries to answer the lapping of oily waves at its grimy piers and the monstrous organ litanies of the harbor whistles.” The Horror at Red Hook, H.P. Lovecraft

Habitus provides a pre-reflexive framework that enables New York City residents to navigate social and physical environments without having to consciously reflect on each experience (Sinclair 2017). Experiences are simply accepted within certain spaces- the discomfort of travel in packed subway trains, littered subway stations, the stench of trash in the summer heat, cockroaches, traffic, large rat populations and crowding.

Every person I spoke with was concerned with traffic and New York City’s air-quality, but no one questioned pesticide spraying in apartment buildings, parks, subways or children’s schools. Pollution and pesticide use in New York City is about control- control of vectors, control of health, control of environment and space on micro and macro levels. Residents in poorly maintained buildings exert control over their homes – purportedly a feminine space—by using foggers, traps and sprays to deter and control pest intrusions. The health of a residential building depends in part on an integrative sophisticated level of pesticide use that not all residents implement. Notably, the overarching residential concern pertained to neighborly hygiene standards, not improper pesticide uses by either the building management, neighbors or the government.

Most people I spoke with blamed neighbors for the existence of pests in their building: poor hygiene practices in the home invited pests into the building. Assigning blame on the
individual level fails to capture the structural issues at play—dense populations, poorly maintained buildings, poverty, and the regular struggle of life in New York City.

Infestations were blamed on lack of hygiene or overcrowded apartments, rather than building mismanagement, inferior infrastructure or an unlivable city where rent increases annually outpace the average income. In “Flammable”, the burden of pollution constantly shifted to “others”. When interviewing long-time residents in the “old” part of the town, which sits directly opposite Shell, the most prolific polluter in the area, an elderly couple asserted that it was not their neighborhood but rather the nearby shantytown that bore the brunt of pollution (Auyero & Alejandra Swistun 2009).

In dense urban centers, green space reduces noise pollution, neutralizes the “heat island effect”, provides some degree of refuge for wildlife and grass absorbs rainwater run-off. It also provides an easily consumed aesthetic. Parks are social and recreational loci that have been shown to reduce stress and provide a sense of wellbeing and relaxation upon visiting them (Chiesura 2004). Rents near parks tend to be higher, enabling property owners to extract capital from natural resources (Harvey 2010).

Parks and green space also require maintenance. Nationally, the use of artificial chemicals and pesticides in gardens, parks, schools and golf courses have a profound impact on watersheds. Grass covers approximately 163,800 km² in the United States, an area three times larger than land dedicated to corn cultivation, the next most dominant national crop. Land dedicated to “grass” in New York City includes 1,700 parks and twenty-two public golf courses, all of which are exempt from the protections afforded under Local Law 37. Nearby residents have no control over the pesticides used to maintain golf courses, including the exemptions for
methyl bromide use. No one has measured the residue in the bodies of people who live next door to tax-payer, government subsidized Trump Links, for example.

Throg’s Neck real estate values are high, and the median income is double that of Belmont’s. No data captures a totality of green space in New York City including residential lawn space and/or rooftop gardens so calculating pesticide use based on available green space and likelihood of chemical use is difficult. Athletic fields, cemeteries, strips of land along highways, commercial and residential properties all contribute to green space in addition to the 29,000 acres of New York City parks (New York City Department of Parks & Recreation, FAQ 2018).

Figure 6: Google Earth Trump Links Golf course and proximity of to residential community

Pesticide exposure in New York City is produced through dietary exposure, whether rice consumption or consumption of pesticide contaminated produce or grain-based goods, dining at expensive or inexpensive restaurants, utilizing the many take-out choices that New York City is so famous for, or buying large bags of US grown rice in Price Chopper. My fellow Nicaraguan commuter, Miguel, who so generously shared his experiences with me, always purchases
organic fruit and wishes people would pause to consider the human cost of street-corner fruits and vegetables.

The developing world disproportionately bears the burden of global toxicity burden; a combination of corporate malfeasance, lack of training and access to education, and poor enforcement, of regulatory standards -where they exist- ensure the flow of agricultural produce and goods sold in grocery stores around the United States and Europe. Meanwhile, existing industrial systems generate massive corporate profits for those involved in the manufacture and design of these chemicals although Europe has the earlier discussed “precautionary principle” and stricter regulation. Chemical stockpiles abandoned in developing countries, and industrial and unregulated pesticide use continues to break the bodies of agricultural workers and the poor around the world (Pesticide Action Network Production and Dumping).

In “Fresh Fruit, Broken Bodies”, Seth Holmes details the structural violence agricultural migrant workers experience in the United States. New York City does not have much agricultural industry within its city limits, but similar components of structural violence exist in those communities at higher risk of pesticide exposure, including people living in NYCHA housing, shelters, neighborhoods with buildings that have a high percentage of foundations that have cracks or holes, and people living in large, dense apartment buildings or in cramped conditions such as the Irish immigrants who spoke me lived in Greenpoint.

Through the course of my conversation with Miguel, he complained about his neighbors in the Wakefield section of the Bronx. In his building residents frequently use – and misuse- “foggers”, which triggers his asthma. Fogger use increases during the summer, attributable he thinks to summertime pest proliferation. National origin may also contribute to pesticide exposure, as people seek their fellow country people to live among in a new city, sharing similar
living conditions and, like the Irish immigrants I spoke with, lacking detailed historical and environmental knowledge about specific areas in new countries. Linguistic limitations are another likely pesticide exposure factor, but more importantly, intellectual property protections that shelter corporations in the sale and manufacture of pesticides in the United States may cause greater harm to people and the environment.

Two people in the Bronx mentioned apartment neighbors who used “Tres Pasitos” in an effort to combat cockroaches. Off-label pesticide use harms human health, and pesticides, even if used according to the label, can have far-reaching health and ecological consequences. According to Mary Douglas, in order to understand pollution, one must first conceive of a pre-polluted condition (Douglas: 26: 2003). Risk mitigation and pesticide legislation is applied sparingly to pesticides use and consumption, and it may be that targeting illegal use is a ‘low-hanging fruit’ that obscures the greater structural problem. It may be prohibited to apply certain pesticides indoors, in certain quantities or combinations; without providing advance notice to neighbors or to store pesticides in unlabeled containers. As shown through my research, many of these pesticide protection measures are not enforced, or have loophole countermeasures so frequently exploited that legislation, as a means of control is essentially meaningless despite the evidence demonstrating how harmful these substances are. People paying a premium to live adjacent to golf courses or parks may be unwittingly exposed to methyl bromide. Occupational exposures are organized along gendered roles- women may have greater second-hand exposure through domestic work, support and service industries in addition to agricultural work, but men are exposed in the course of their work, too.
The intersection of environmental health and the material and cultural components of city dwelling is an emergent field, particularly in anthropology, and is just one of the components at play in the complex chain which calls for far greater scrutiny.


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