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#### Recommended Citation

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**Agribusiness, Food Security, and Chronic Diet-Related Ailments in Worcester,**

**MA: Toward a Nuanced Narrative**

Adam Wriggins

March 2018

**Community Development & Planning (CDP)**

**International Development, Community, & Environment (IDCE)**

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**Abstract**

The following research paper begins with an acknowledgement of the global food crisis and, more specifically, the agribusiness model of food production and distribution in the United States. It then zeroes in on the fundamental issues with many of the United States food movements. It then outlines a narrative with the frame that food security is a human right by elucidating concepts of food justice and food sovereignty. Once this foundation has been laid, the paper examines chronic food-related ailments (diabetes and coronary heart disease) in Worcester, Massachusetts, and how these ailments are related to racial/ethnic minorities (Black and Hispanic/Latino populations) and median household income. Through an analysis of both the existing literature and the spatial patterns evident in the city of Worcester, MA, this paper aims to understand the components of food insecurity and how they are related to chronic diseases in Worcester, MA. Finally, this paper builds upon the theoretical foundation for structural change by offering models of initiatives which could be implemented in Worcester and beyond.

## 1. Introduction

The fuel that we put in our bodies is a significant cornerstone of our health. Just like humans need clean fresh water to survive, humans need healthy food to stay alive and maintain a healthy lifestyle free of disease. When an individual has the ability to reliably and consistently access sufficient, safe, nutritious, and culturally preferred foods, that individual can be considered food secure.<sup>1</sup> In other words, a food secure individual has one of the most basic needs to survive. Today, there are a slew of variables which can influence a person's level of food security. When any or all of the components of food security are not actualized in an individual's life, that individual can be considered food insecure.

There are three primary dimensions of food security: availability, access, and utilization. Availability refers to the amount, type, and quality of food a person or a community has access to.<sup>2</sup> Availability is analyzed in terms of availability from local production, the efficiency of distribution systems, and the vulnerability of those distribution channels to supply and disruption.<sup>3</sup> Access can be defined as the ability of each person to procure foods that are available. There are many components to access, including physical and logistical access, the affordability of foods, and how food allocation mechanisms such as subsidies, trade agreements, and other government policies work.<sup>4</sup> Food utilization is slightly more elusive. It refers to a person's ability to derive all potential and needed benefits from the foods they have access to. This includes food safety,

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<sup>1</sup> Philip Loring and Craig Gerlach, "Searching for Progress on Food Security in the North American North: A Research Synthesis and Meta-analysis of the Peer-Reviewed Literature," *Arctic*, Vol. 68, No. 3, (September 2015): 381.

<sup>2</sup> Philip Loring and Craig Gerlach, "Searching for Progress," 382.

<sup>3</sup> Ibid.

<sup>4</sup> Ibid.

nutritional quality, food consumption patterns, cultural preferences, and knowledge of food preparation skills.<sup>5</sup>

The global food crisis has many dimensions. Worldwide, 870 million people were undernourished from 2010 to 2012, comprising 12.5% of the world's population.<sup>6</sup> Perhaps the most significant and defining element of the crisis is that the world's poor are becoming increasingly hungry and food insecure at a time when both harvests and profits for major agribusiness corporations are higher than ever.<sup>7</sup> In the United States, 50.1 million people—15% of households—were food insecure at some point in 2011.<sup>8</sup> The current capitalist, industrial food system, which is often controlled by these major agribusiness corporations, systematically exploits disadvantaged groups as well as the environment.<sup>9</sup> The food system model in the United States today can be referred to as the agribusiness model.<sup>10</sup> The agribusiness model is characterized by the principles of neoliberalism, monopoly market power of corporations, large-scale grain-fed meat production, giant retail, growing links between food and fuel, vertical integration, technological advances, and deregulation of food production and distribution.<sup>11</sup> The following paper seeks to answer the following questions:

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<sup>5</sup> Philip Loring and Craig Gerlach, "Searching for Progress," 382.

<sup>6</sup> Carolyn Sachs and Anouk Patel-Campillo, "Feminist Food Justice: Crafting a New Vision," *Feminist Studies*, Vol. 40, No. 2, Special Issue: Food and Ecology (2014): 396.

<sup>7</sup> Geoffrey Lean, "Multinationals Make Billions in Profit Out of Growing Global Food Crisis," *The Independent*, May 4, 2008.

<sup>8</sup> Carolyn Sachs and Anouk Patel-Campillo, "Feminist Food Justice," 396.

<sup>9</sup> Eric Holt-Giménez and Yi Wang, "Reform or Transformation? The Pivotal Role of Food Justice in the U.S. Food Movement," *Race/Ethnicity: Multidisciplinary Global Contexts*, Vol. 5, No. 1 (Autumn 2011): 91.

<sup>10</sup> Holt-Giménez and Wang, "Reform or Transformation?" 91.

<sup>11</sup> Shane Hamilton, "Agribusiness, the Family Farm, and the Politics of Technological Determinism in the Post-World War II United States." *Technology and Culture*, Vol. 55, No. 3 (July 2014): 561-62.

1. What are the characteristics of the agribusiness model of food production and distribution, and how do the concepts of food justice and food sovereignty relate to these characteristics?
2. What are the characteristics of the food landscape in Worcester, MA and how do the concepts of food justice and food sovereignty relate to these characteristics?
3. What are the quantitative connections between chronic diet-related ailments in Worcester, MA and socioeconomic variables?

## **2. Framework: A Narrative of the Basic Human Right to Food Security**

### 2.1. A Brief History of Agribusiness

Essential to understanding the agribusiness model is an understanding of the history of agriculture in the United States. In the 1950s and 60s, a neoliberal approach toward agriculture started to take hold. The Secretary of Agriculture under president Eisenhower, Ezra Taft Benson, replaced New Deal era price supports for farmers throughout the country with the invisible hand of the free market; technology and corporate power began to dominate the farm economy.<sup>12</sup> Even the most conservative farmers didn't like this, as they depended on the price supports. New Deal programs had enabled farmers to earn a living on par with that of urban workers.<sup>13</sup> Depending on the free market was especially troublesome for farmers because the farm economy was

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<sup>12</sup> Shane Hamilton, "Agribusiness," 562.

<sup>13</sup> Wenonah Hauter, *Foodopoly*, 22.

unstable—accurately predicting supply and demand was more difficult than in other business settings. Agribusiness was the antithesis of the family farm. Family farm became a term that referred to non-exploitative labor relations. Agribusiness critics saw work on a family farm to be rewarding and fulfilling comparing to the underpaid wage labor of industrialized agriculture controlled entirely by finance capital. A key piece of agribusiness at this time was the consolidation of farms. Farmers had to enlarge their operations and submit to the forces of efficiency, or quit farming. From 1945 to 1960, the proportion of the population living on farms dropped by half.<sup>14</sup> In the early 1960s, representatives from Ford Motor Company and Sears headed a think tank that decided there were too many farmers. This launched an initiative to get farmboys to urban vocational schools.<sup>15</sup> At the same time, Benson's administration was doing a remarkable job at "directing federal dollars toward scientific and technological research that directly benefited agricultural chemical producers, food processors and distributors, agricultural-implement manufacturers, and other agribusiness corporations."<sup>16</sup> Where research funds were going and what the research was supporting played a vital role in promoting agribusiness. As the number of farms decreased and the size of farms increased, market power was becoming increasingly concentrated in the hands of a few large firms. Key players in agriculture became the corporations: meatpackers, food processors, supermarket chains, and multinational grain-trading conglomerates.<sup>17</sup>

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<sup>14</sup> Shane Hamilton, "Agribusiness," 579.

<sup>15</sup> Wenonah Hauter, *Foodopoly*, 14.

<sup>16</sup> Shane Hamilton, "Agribusiness," 567.

<sup>17</sup> *Ibid*, 580.

In his book, *A Concept of Agribusiness*, John Davis played on the height of technological determinism in American culture; he portrayed agribusiness as irresistible—we couldn't stop the forces of technology even if we wanted to. Davis envisioned the historical trajectory of food. He saw that in addition to changing on-farm production, the agribusiness model was about transforming diets and restructuring food chains. Neoliberalism—a political economic philosophy that asserts that human well-being can best be achieved if the so-called free market is allowed to function with little to no intervention from the state—combined with principles of vertical integration allowed corporate giants to stabilize profits and remain unhampered by government regulations.<sup>18</sup>

In 1994, the Coalition for a Competitive Food and Agricultural System (a broad-based group of over one hundred corporations benefiting from the agribusiness model) worked with the Clinton administration to slash the last remaining New Deal programs.<sup>19</sup> Rather than boosting prosperity from trade, the result of further deregulation was a massive increase in the production of commodity crops, causing prices to plunge for most of the past 15 years.<sup>20</sup> Industrialized livestock operations destroyed diversified farms. Farmers who were forced out of small-scale livestock operations and into the production of commodity crops, overproduction snowballed even more, and prices continued to drop.<sup>21</sup> In 2012, large-scale industrial operations comprised only 12 percent of U.S. farms, but made up 88 percent of the value of farm production.<sup>22</sup> The neoliberal principles of the

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<sup>18</sup> Alison Alkon, "Food Justice and the challenge to Neoliberalism," *Gastronomica*, Vol. 14, No. 2 (Summer 2014): 28.

<sup>19</sup> Wenonah Hauter, *Foodopoly*, 32.

<sup>20</sup> *Ibid*, 34.

<sup>21</sup> *Ibid*, 35.

<sup>22</sup> *Ibid*, 13.



agribusiness model afforded a handful of powerful multinational corporations the opportunity to concentrate ownership and control of the food production and delivery systems, in turn creating an unprecedented level of consolidation throughout the entire food chain.

## 2.2. Food Movements

There have been many movements toward a better food future. For example, Oakland is home to a number of organizations which promote food justice, including Phat Beets, Hayes Valley Farm, Alemany Farm, and City Slicker Farm.<sup>23</sup> These community organizations advertise local produce, workshops, and youth-run businesses.<sup>24</sup> These organizations actively strive to incorporate the concept of food justice. Other movements are less holistic, such as virtual marketplaces, the 100-mile diet, and the “vote with your fork” movement.<sup>25</sup> While doing important work to mitigate some of the ills of the agribusiness model, some of these movements have been fragmented and at times contradictory.<sup>26</sup> Many current modes of food activism explicitly oppose aspects of neoliberalism, but their practices tend to embrace it, often by relying on markets to pursue change.<sup>27</sup> For example, the Community Food Security Coalition (CFSC), which is comprised of over 250 affiliated organizations, aims to provide community food security within the

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<sup>23</sup> Jessica Clendenning, Wolfram Dressler, and Carol Richards, “Food justice or food sovereignty? Understanding the rise of urban food movements in the USA,” *Agriculture and Human Values*, Vol. 3, No. 1 (2016): 171.

<sup>24</sup> Jessica Clendenning, Wolfram Dressler, and Carol Richards, “Food justice or food sovereignty?” 171.

<sup>25</sup> B. R. Cohen, “Don’t Mono-crop the Movement: Toward a Cultural Ecology of Local Food.” *Gastronomica*, Vol. 14, No. 1 (Spring 2014): 5.

<sup>26</sup> Holt-Giménez and Wang, “Reform or Transformation?” 85.

<sup>27</sup> Alison Alkon, “Food Justice and the challenge to Neoliberalism,” *Gastronomica*, Vol. 14, No. 2 (Summer 2014): 28.

existing food system across North America.<sup>28</sup> To do this, the CFSC calls for increased funding to the Supplemental Nutrition Assistance Program (SNAP). While this aid is necessary to help disadvantaged communities cope with the immediate effects of the food crisis, the approach does nothing to transform the existing food system at its roots. The Supplemental Nutrition Assistance Program (SNAP) helps over 45 million people in the United States obtain much needed food. Many of these people depend on SNAP benefits to feed their families. Holt-Giménez and Wang (2011) explain how this type of reform ultimately serves to strengthen the existing food system. The cycle of liberalization and reform does little to change the neoliberal direction of food and the agribusiness model. Increasing funding to SNAP stems a particular crisis within the framework of the existing agribusiness model. This ultimately leaves the existing model without a crisis, thus restoring its stability and reinstating the fundamental imbalance of power.

Further, many food movements use market based strategies for reform. These reforms attempt to utilize the principles of supply and demand to change the landscape of food security. A classic example of this type of movements is the adage “vote with your fork.” The idea is that if there is an increase in demand for healthy, local foods, an increase in supply will follow, thus increasing availability of healthier food for all. This approach assumes that nothing inhibits demand; however, due to inequalities in purchasing power and food access, demand is often inhibited.<sup>29</sup> Similarly, supply can be inhibited. For example, food pantries may not have enough fresh, healthy food to meet the demands of

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<sup>28</sup> Holt-Giménez and Wang, “Reform or Transformation?” 86.

<sup>29</sup> Hillary Shaw, “Food Deserts: Towards the Development of a Classification,” *Geografiska Annaler: Series B, Human Geography*, Vol. 88, No. 2 (2006): 236.

the community in which the pantry is located.<sup>30</sup> Similar to increasing the funding for SNAP, though it is less disguised, this strategy for reforming the food system functions to strengthen the existing agribusiness model: “the notion that the food system can be transformed through individual acts of consumption . . . fits nicely within the prevailing neoliberal economic rhetoric: that unregulated capitalist markets yield the most efficient allocation of resources.”<sup>31</sup> It ought to be noted that the “vote with your fork” strategy has also served to widen the gap between the “quality food” that higher-income families enjoy and the “other food” (processed, prepackaged, high-calorie food) that much of the population is forced to eat.

Some of the approaches listed above toward creating a better food future are contradictory in that they ultimately serve the needs of the corporate agribusiness food system<sup>32</sup>; some are fragmented and isolated in ways that reduce their impact.<sup>33</sup> There are many ways that community actors work to improve the future of our food system on a local/regional level, including farmers’ markets, food hubs, community supported agriculture (CSA), co-ops, urban gardens, dieting regimens, and many more. Most of these initiatives aim to reduce farm-to-fork miles. However, partnerships between organizations and collaboration between initiatives rarely occur. B. R. Cohen argues for a cultural ecology of local food: “here, the various approaches to building a healthier food and farm network overlap, rather than stand alone. In this configuration, the distances that matter are less

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<sup>30</sup> Yue Zhang, “Understanding Food Access in Main South Community, Worcester, Massachusetts, USA,” Clark University (May 2011): 34.

<sup>31</sup> Holt-Giménez and Wang, “Reform or Transformation?” 86.

<sup>32</sup> Holt-Giménez and Wang, “Reform or Transformation?” 85-86.

<sup>33</sup> B. R. Cohen, “Don’t Mono-crop the Movement: Toward a Cultural Ecology of Local Food.” *Gastronomica*, Vol. 14, No. 1 (Spring 2014): 7.

about those between farms and forks and more about how closely the different approaches complement one another.”<sup>34</sup> Cohen stresses productive interplay between members of the cultural ecology of local food. This approach pushes back against the mono-cropping of the agribusiness model. It strives to weave together organizational parts into an interdependent whole to combat food insecurity. Indeed, the food system is a system of mutual dependencies, not scattered individual projects. Further, productive collaboration can be a tool to build alliances and gain political viability.<sup>35</sup>

### 2.3 Toward a New Narrative

Cohen’s cultural ecology of local food is a crucial aspect in crafting a vision of a redefined food movement narrative. Today, the isolated nature of organizations with similar missions demonstrates the need for more intentional collaboration and cross-platform partnerships. Moreover, a movement which truly and effectively diminishes the power of the agribusiness model at its roots must actively incorporate both food justice and food sovereignty.

Food justice is a concept which underpins many food movements. Food justice advocates seek to address injustices that disproportionately impact people based on race, class, or gender.<sup>36</sup> Food justice argues broadly for more equitable access to resources and participation in decision-making. In addition, food justice emphasizes the history of oppression within the U.S. food system; the system was built over centuries of violent,

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<sup>34</sup> B. R. Cohen, “Don’t Mono-crop the Movement,” 6.

<sup>35</sup> *Ibid*, 7.

<sup>36</sup> Jessica Clendenning, Wolfram Dressler, and Carol Richards, “Food justice or food sovereignty? Understanding the rise of urban food movements in the USA,” *Agriculture and Human Values*, Vol. 3, No. 1 (2016): 170.

global-scale dispossession and continues to rely on the appropriation and exploitation of land, labor, and capital, both in the United States and abroad.<sup>37</sup> Throughout the twentieth century, black farmers lost their land at a rate 3-4 times higher than white farmers.<sup>38</sup> In the 1960s, federal highway projects demolished black neighborhoods; urban supermarkets moved to suburbs in a process dubbed “supermarket redlining.”<sup>39</sup> Black Americans have systematically been denied the right to produce food. After recognizing the history of oppression, it is essential to celebrate the cultural importance of food, pushing community actors to think about the social relationships, cultural meanings, and exercise of rights produced through practices across food systems. Here, we begin to see the importance of food sovereignty.

Food sovereignty is a concept which revolves around peoples’ rights. Food sovereignty is understood as the rights of people to define their own food and agriculture; to protect and regulate domestic agricultural production and trade; to determine the extent to which they want to be self-reliant; and to restrict the dumping of products in their markets.<sup>40</sup> Due to its emphasis on ownership, rights, and participation, a vital piece of the framework of food sovereignty is a process of localization. Crafting food systems that are more local and regional, as opposed to national or global, is understood as an alternative to neoliberal and colonialist food economies that have created costly externalities for both

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<sup>37</sup> Eric Holt-Giménez and Yi Wang, “Reform or Transformation?” 92.

<sup>38</sup> Alison Alkon, “Growing Resistance: Food, Culture, and the Mo’ Better Foods Farmers’ Market.” *Gastronomica*, Vol. 7, No. 3 (Summer 2007): 94.

<sup>39</sup> Alison Alkon, “Growing Resistance,” 94.

<sup>40</sup> Pimbert, Michel. “Food Sovereignty and Autonomous Local Systems.” *RCC Perspectives*, No. 1, Think Global, Eat Local: Exploring Foodways (2015): 38.

people and the environment.<sup>41</sup> Investing in these alternative models eliminates reinvestment into the agribusiness model which continues to reproduce racial and economic inequalities and disparities. The food sovereignty framework advocates a redefinition of food and agriculture in a rights-based approach to social relations that is tethered to people, communities, and places.<sup>42</sup>

A movement which combines food justice and food sovereignty into its mission and approach examines political-economic dimensions of control over food resources. One way this is done is through scrutinizing the ways that food production, distribution, and consumption reproduce racial and economic inequalities and by exploring the possibilities for productive autonomy by local communities independent of large-scale capitalist food economies.<sup>43</sup> Essential to introducing these concepts into local and regional food systems is relationship-building. A strong regional food economy understands that rural farmers depend upon the urban centers to sell their products. Positive, equitable relationships between actors in the supply chain is a key aspect of regional food economies. Here, neoliberalism can act as a barrier to change—even when elements of food justice and food sovereignty are incorporated into a local system, they tend to be heavily influenced and weakened by the wider neoliberal setting in which they exist.<sup>44</sup> To transverse this barrier, it is crucial that proponents of this movement learn how to both “negotiate and undermine the neoliberal settings that favor the corporate food regime at both local and global scales.”

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<sup>41</sup> Melissa Poe, Rebecca McLain, Marla Emery, and Patrick Hurley. “Urban Forest Justice and the Rights to Wild Foods, Medicines, and Materials in the City.” *Human Ecology*, Vol. 41, No. 3 (June 2013): 411.

<sup>42</sup> Carolyn Sachs and Anouk Patel-Campillo, “Feminist Food Justice,” 403.

<sup>43</sup> Melissa Poe et al. “Urban Forest Justice,” 411.

<sup>44</sup> Jessica Clendenning, Wolfram Dressler, and Carol Richards, “Food justice or food sovereignty? Understanding the rise of urban food movements in the USA,” *Agriculture and Human Values*, Vol. 3, No. 1 (2016): 175.

<sup>45</sup> Another strategy to combat the far-reaching effects of neoliberalism lies in worker-ownership. Under the principles of worker-ownership, there is no distinction between the owners of the means of production and those who labor within them. For example, Mandela Food Co-op in West Oakland, California sells a variety of fresh produce for significantly cheaper than health food stores. Mandela Food Co-op is also worker-owned. This can be empowering for fellow community members, as they see their friends and neighbors own and operate businesses. Ownership is a central tenet of both food justice and food sovereignty.

#### 2.4. Measures of the Food Environment

Many studies have attempted to elucidate the relationship between the food environment (a term that includes spatial access, food store type, and other demographic factors) and specific health outcomes. Between 2007 and 2015, the most common methodology among these studies was a geographic analysis approach, used in 65% of studies.<sup>46</sup> Of 432 studies reviewed by Lytle and Sokol (2017), 57.6% reported neither reliability nor validity.<sup>47</sup> The most common type of study was a cross-sectional study of a food store environment using geographic analysis. While able to provide compelling and significant information, cross-sectional studies taken alone are insufficient grounds for making suggestions for policy.

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<sup>45</sup> Jessica Clendenning, Wolfram Dressler, and Carol Richards, "Food justice or food sovereignty?" 175.

<sup>46</sup> Leslie Lytle and Rebeccah Sokol, "Measures of the Food Environment: A Systematic Review of the Field, 2007-2015." *Health & Place*, Vol. 44 (March 2017): 20.

<sup>47</sup> Lytle and Sokol, "Measures of the Food Environment," 21.

One of the most important takeaways from a review of the field is that the relationship between the food environment and health outcomes is not direct—it is mediated through a complex web of interrelated factors surrounding dietary choices, individual/family taste preference, food preparation skills, perception of food environment, social and cultural norms, and economic resources. Due to these difficulties in making significant claims pertaining to the relationship between the food environment and health outcomes, suggestions for improving health outcomes will have to be tailored to specific populations (such as women, children, etc.), and specific health outcome measures (such as child mortality, obesity, chronic disease rates, etc.). Only after a comprehensive analysis of the unique characteristics of Worcester’s food environment will researchers be able to understand the characteristics of the food landscape in Worcester. This analysis focuses on the geographic prevalence of two diet-related chronic illnesses in relation to two socio-economic factors. The illness analyzed are diabetes and coronary heart disease; the socio-economic factors analyzed are race/ethnicity and income. One suggestion I expect to make is that there is a need for more longitudinal, interdisciplinary research studies on the related topics in order to better understand the issues and how they are connected to one another.



### **3. Methodology**

#### **3.1. Methodological Approach and Rationale**

The process of maintaining a food secure status has elements that are geographic; indeed, one must go somewhere in order to acquire food. In this light, food security is inherently place-based. A brief review of some of the characteristics of the neighborhoods of Worcester is thus necessary to examine food security in Worcester. There are six regions of Worcester which can be further subdivided into neighborhoods. The six regions are North Worcester, West Side, East Side, Central, Downtown, and South Worcester (Figure 1). Each region has numerous neighborhoods; only a few from each region will be listed. North Worcester contains Burncoat, North Lincoln Street, Great Brook Valley and Indian Hill. West Side contains Tatnuck square, the Worcester Regional Airport, and Beaver Brook. East Side contains Green Hill Park, Grafton Hill, and Shrewsbury Street. Central Worcester contains Piedmont, Beacon Brightly, Main Middle, northern parts of Main South, and Cedar Street. South Worcester contains southern parts of Main South, Cambridge Street, College Hill, and Quinsigamond Village. See figure 1 for a map of the regions of Worcester.

Various data analysis techniques were utilized in both the analysis of the existing literature and the analysis of spatial patterns in the city of Worcester. A comparative analysis approach was employed to examine both diabetes prevalence and coronary heart disease (CHD) prevalence with racial/ethnic minority population and median household income. Diabetes and CHD were chosen because they represent two chronic food-related ailments. Concentration of racial/ethnic minority populations are measured by percent Black population and percent Hispanic/Latino population per census tract. The unit of

analysis was U.S. census tracts. Geographic Information Systems (GIS) software was ideally suited for this analysis. Data used was all secondary; it had all previously been collected and is currently publicly available. The 500 Cities Project is an initiative of the Centers for Disease Control and Prevention (CDC), with extensive data on unhealthy behaviors, health outcomes, and prevention measures. Data was collected through the Behavioral Risk Factor Surveillance System (BRFSS). The 500 Cities Project is a special resource for all health-related endeavors.

### 3.2. Analysis of Literature

The following search terms were used (oftentimes in tandem with another search term) in an elaborate search of Jstor, Google Scholar, Academic OneFile, WorldCat, and LexisNexis: food security; food insecurity; food access; geographic access; health outcomes; food availability; food justice; food sovereignty; food banks; food pantries; and neoliberalism. Abstracts of articles, studies, and reviews were scanned in order to judge relevance. Relevant literature was then read and notes were taken about each study or article. Coding techniques were then used to divide notes on existing literature into the following topical categories: general food security, food justice, food sovereignty, and food movements.

### 3.3. Maps and Spatial Patterns

To create maps of Worcester to analyze, I needed to obtain four primary data layers: U.S. census tracts, health data (containing prevalence rates of diabetes and prevalence rates

of CHD), income data, and demographic data (containing percent Black and Hispanic/Latino populations). To obtain a shapefile with U.S. census tracts, I downloaded a shapefile of U.S. census tracts from the MassGIS website. I then used a select-by-attribute query to select all census tracts within the city of Worcester—44 in all. I then exported the selected features to a new feature class in order to obtain a file of census tracts within the city of Worcester. To obtain health data, I downloaded an excel sheet from the CDC's 500 Cities Project containing data at the census tract level. I then cleaned this excel sheet to contain only Worcester census tracts. In ArcMap, I joined this excel sheet to the shapefile of census tracts. Subsequently, I exported this layer as a feature class in order to obtain a file of health data for Worcester connected to census tracts. At this stage, I could visualize diabetes prevalence as well as CHD prevalence. To obtain income data, I downloaded an excel sheet showing median household income by census tract from the U.S. Census Factfinder website. Median household income data came from the 2016 American Community Survey (ACS), using 5-year estimates. I then cleaned this spreadsheet to contain only data for the city of Worcester, and formatted the sheet for a join in ArcMap. In ArcMap, I joined the excel sheet to the census tract shapefile. Then I exported this layer as a feature class in order to obtain the file. At this stage, I could visualize median household income by census tract. Finally, to obtain demographic data, I downloaded an excel sheet from the U.S. Census website via their TIGER (Topologically Integrated Geographic Encoding and Referencing) database. This data came from the 2010 U.S. Census. I then joined this excel sheet to the shapefile of census tracts and exported this layer as a feature

class in order to obtain the file. At this point, I was able to visualize demographic information, such as percent Black population and percent Hispanic/Latino population.

After obtaining all data layers, I then chose to compare each chronic food-related ailment (diabetes and CHD) to both demographic data and income data for analysis. Spatial patterns were identified after defining my classification scheme. I chose to classify the data based on Jenks Natural Breaks classification scheme because this scheme automatically places breaks in classes at intervals based on frequency of occurrence and is optimal, in most cases, for visualizing data. I defined classes on a simple graduating scale of five measures: very high, high, medium, low, and very low, each corresponding to the natural breaks in classes. These definitions apply to prevalence rates of diabetes and CHD, concentration of Black and Hispanic/Latino populations, and median household income.

#### **4. Food in Worcester**

The 2015 Worcester Community Health Assessment (CHA) identified access to healthy food as one of the top seven indicators of a healthy community,<sup>48</sup> and was listed as one of the Central Massachusetts Regional Public Health Alliance's (CMRPHA) nine priority areas. According to the CMRPHA's regional Youth Health Survey, less than 40% of respondents reported daily fruit and vegetable consumption, compared to over 60% nationally. In Worcester, food access contributes to health disparities among populations.<sup>49</sup> Food deserts, defined by the Centers for Disease Control and Prevention (CDC) as "areas

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<sup>48</sup> Worcester Division of Public Health, *Greater Worcester Community Health Assessment*, Central Massachusetts Regional Public Health Alliance, (October 2015): ix.

<sup>49</sup> Worcester Division of Public Health, *Greater Worcester Community Health Assessment*, 38.

that lack access to affordable fruits, vegetables, whole grains, lowfat milk, and other foods that make up the full range of a healthy diet,”<sup>50</sup> exist in a couple of census tracts in Worcester, but there are other difficulties that act as barriers to food security. For example, food “swamps” are understood as areas with inadequate food markets that sell a high density of unhealthy foods.<sup>51</sup> With respect to the issue of access to healthy food, the Worcester Community Health Improvement Plan (CHIP) of 2016 aims to “ensure all people have equal access to healthful foods by building sustaining communities that support health through investment in the growth, sale, and preparation of healthy foods.”<sup>52</sup> The Worcester CHIP outlines three objectives with strategies and outcome measures to accomplish its aim, including partner organizations working toward each objective.<sup>53</sup>

The Worcester CHIP’s objectives are: increase the number of eligible people participating in federal food programs (SNAP, WIC, National School Lunch Program) by 5% by 2020 and increase utilization of those programs for healthy food; increase the average daily number of fruits and vegetables eaten by youth and adults by 1 serving by reducing systematic barriers to healthy eating; and increase the number of individuals participating in school and community garden and nutrition programs by 50%.<sup>54</sup> Strategies for achieving these objectives include increasing enrollment of eligible individuals in federal food programs; increasing utilization of the Regional Environmental Council’s (REC) Mobile Farmers Market; increasing the number of farmers markets accepting SNAP and WIC;

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<sup>50</sup> Ibid, 38.

<sup>51</sup> Yue Zhang, “Understanding Food Access in Main South Community, Worcester, Massachusetts, USA,” Clark University (May 2011): 2.

<sup>52</sup> Worcester Division of Public Health, *Worcester Community Health Improvement Plan*, Central Massachusetts Regional Public Health Alliance, (June 2016): 56.

<sup>53</sup> Worcester Division of Public Health, Worcester Community Health Improvement Plan, 57-63.

<sup>54</sup> Ibid, 57-63.

establishing sustainable funding for farmers market SNAP match programs; developing a mechanism for school-aged children to provide input on breakfasts, lunches, and snacks provided through federal school meals programs; increasing buying power of low income household by increasing the statewide minimum wage; and increasing the means of culturally-diverse community gardens and gardeners to grow fruits and vegetables.<sup>55</sup> Many of these strategies actively incorporate the concept of food justice into their approach, as one entire objective is dedicated to reducing systematic barriers to healthy eating. The concept of food sovereignty is also present; the Worcester CHIP advocates for an increase of the state minimum wage, utilizing the government to seek change. In addition, one strategy seeks to increase the means of culturally-diverse community gardens and gardeners to grow fruits and vegetables; this strategy actively attempts to increase the ownership and control of residents over their food by helping them gain the opportunity to garden.

In the Worcester CHA, overweight/obesity was indicated as the third most urgent condition that should receive more attention within the community; nutrition ranked fourth.<sup>56</sup> In 2013, 63% of non-Hispanic white Worcester residents were overweight or obese, compared with 59% state average; 70% of non-Hispanic black Worcester residents were overweight or obese, compared with 69% state average; and 73% of Hispanic Worcester residents were overweight or obese, compared with 67% state average.<sup>57</sup> While the difference between Worcester and the state average is almost negligible for non-Hispanic black residents, the disparity between Hispanic Worcester residents and the

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<sup>55</sup> Ibid, 57-59.

<sup>56</sup> Worcester Division of Public Health, *Greater Worcester Community Health Assessment*, 39.

<sup>57</sup> Ibid, 42.

state average for Hispanic Massachusetts residents is relatively large. Two primary approaches to combat food insecurity in Worcester are farmers markets and food pantries. Farmers markets provide a means for people to access fresh, local, organic produce who might not otherwise be able to access these foods. The Regional Environmental Council runs a mobile farmers market which makes stops around Worcester, reducing the need for transportation for many individuals facing issues of food insecurity. One major caveat with farmers markets is that almost all of the Worcester farmers markets are closed during the winter months; only the Canal District market and three mobile market stops are open during winter months. Food pantries play an important role in reducing barriers to a food secure status for many individuals in Worcester. The Worcester County Food Bank (WCFB) served 68,606 unique individuals in the city of Worcester between July 2014 and June 2015.<sup>58</sup>

In a study on the Main South community in Worcester, Zhang (2011) found that food access can be influenced by a community's socio-economic characteristics.<sup>59</sup> Main South is not a food desert by the CDC definition; however, many residents face issues maintaining a food secure status, due to socioeconomic factors such as race and class. As can be seen in the maps below, Main South is characterized by low income residents and a high concentration of Hispanic/Latino people. According to Meng (2012), "race, ethnicity, median household income, and education attainment are associated with fresh produce accessibility."<sup>60</sup> In this study, reliable access to transportation significantly improved access

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<sup>58</sup> Worcester Division of Public Health, *Greater Worcester Community Health Assessment*, 41.

<sup>59</sup> Yue Zhang, "Understanding Food Access in Main South," 31.

<sup>60</sup> Fei Meng, "Spatial Disparities in Fresh Produce Accessibility in Massachusetts, USA," Clark University, (2012): 22.

to fresh produce for all populations.<sup>61</sup> Every Saturday from spring to mid-autumn, the REC mobile market stops in University Park, located in the Main South community. Locating a mobile market stop here helps to reduce the reliance of Main South residents on transportation to access healthy foods. Moreover, the REC runs numerous community gardens in the Main South community, as well as two youth gardens, which employ youth during the summer months.<sup>62</sup> There are several food pantries in the Main South neighborhood. St. Peter's Food Pantry serves as a locations where clients can obtain food free of cost. If in need for supplemental assistance, clients can obtain two bags of groceries weekly for low costs.<sup>63</sup> The WCFB provides most of the food, and clients must prove that they reside in the Main South neighborhood and have some form of personal identification.<sup>64</sup> Jeremiah's Inn is an emergency food pantry that provides groceries once per month to residents of Main South (as defined by zip-code). Clients must reside in one of the three following zip-codes: 01610, 01602, 01603 and provide proof of identification.<sup>65</sup> As with St. Peter's, a majority of the food comes from the WCFB. Over the course of a given month in 2010, Jeremiah's Inn served approximately 600 households.<sup>66</sup> Walter Spencer, executive director of Jeremiah's Inn, indicated in an interview that a large issue facing the pantry was supply—there was often not enough supply at the pantry to meet the demands of the community.<sup>67</sup>

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<sup>61</sup> Fei Meng, "Spatial Disparities in Fresh Produce Accessibility," 26.

<sup>62</sup> Yue Zhang, "Understanding Food Access in Main South," 19.

<sup>63</sup> Ibid, 20.

<sup>64</sup> Yue Zhang, "Understanding Food Access in Main South," 20.

<sup>65</sup> Ibid, 20.

<sup>66</sup> Ibid, 34.

<sup>67</sup> Ibid, 34.



In the Zhang (2011) study, it was found that many of the Main South residents accessing pantries were also receiving other forms of food assistance, and seek out pantries as supplemental support.<sup>68</sup> It was ultimately recommended that pantries incorporate an educational aspect where clients can learn to make healthier food decisions, and potentially learn preparation methods.<sup>69</sup>

In all, Worcester's Division of Public Health is taking the issue of access to healthy food seriously; the specific objectives, strategies, and measures outlined in the CHIP illustrate the city's commitment to improving the health of their citizens, and are informed largely by local residents through the CHA survey. The Main South neighborhood offers an example of some of the characteristics of the issues of food insecurity that Worcester residents are facing, and shows how institutions are approaching the issues.

## **5. Findings**

A brief examination of Worcester's regions and their neighborhoods will be rooted in median household income and concentration of racial/ethnic minorities (as measured by percent Black population and percent Hispanic or Latino population). Generally, the Central Worcester and Downtown regions observe the highest concentration of racial/ethnic minorities and the lowest incomes (Figures 2 and 3). West Side observes the lowest concentration of racial/ethnic minorities and the highest incomes (Figures 2 and 3). Two western census tracts of the East Side region observe very high concentrations of

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<sup>68</sup> Ibid, 34.

<sup>69</sup> Ibid, 37.

racial/ethnic minorities, and these census tracts have low incomes (Figures 2 and 3). Eleven out of fifteen census tracts with a very high concentration of racial/ethnic minorities observe low or very low incomes; seven out of eight census tracts with very low income contain very high concentrations of racial/ethnic minorities (Figures 2 and 3). Four out of six census tracts with very high incomes have very low concentrations of both Black populations and Hispanic/Latino populations (Figures 2 and 3). A brief examination of median household income and racial/ethnic minority populations begins to elucidate the narrative that the spatial patterns tell. Here, the takeaway is that there is significant overlap between census tracts with high concentrations of racial/ethnic minority populations and census tracts with low median household incomes (Figures 2 and 3).

While the nature of this analysis does not demonstrate causality, spatial patterns can reveal a narrative. The question becomes: what story is told by the spatial patterns about chronic food-related ailments (diabetes and coronary heart disease)? Here, it is worth noting that analysis of maps showing food stores, walking distance, and other food variables would augment this research in important ways; however, it is beyond the scope of this paper to include such analysis. That being said, analysis will begin by examining diabetes and coronary heart disease prevalence in Worcester alone, then the lenses of racial/ethnic minorities and median household income will be applied to the chronic ailments, respectively.

In 2015, the national rate of diabetes prevalence in the United States was 9.4%.<sup>70</sup> This estimate includes undiagnosed occurrences. Accounting only for diagnosed

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<sup>70</sup> American Diabetes Association. Statistics About Diabetes.  
<http://www.diabetes.org/diabetes-basics/statistics/>

occurrences, the national rate of diabetes prevalence is about 7%.<sup>71</sup> According to Blue Cross Blue Shield of Massachusetts, the New England rate of diabetes prevalence is noticeably lower, at approximately 6%.<sup>72</sup> As the definition of the measure used in this paper does not account for undiagnosed occurrences, comparisons ought to be made to the diagnosed rate of 7% nationally and 6% for the Commonwealth. Thus, the highest three classes (very high, high, and medium) of diabetes prevalence in Worcester are above both the state and national averages. It can be observed that the census tracts with very high rates of diabetes prevalence are found primarily in Central Worcester, with a couple of tracts in North Worcester near the North Lincoln Street and Great Brook Valley neighborhoods (Figure 2). The census tract containing Shrewsbury Street (the northwesternmost tract in the East Side) also observes a very high rate of diabetes prevalence (Figure 2). A cluster of census tracts just east of Central Worcester observe high rates of diabetes, as well as two tracts just west of Central Worcester (Figure 2). Fifteen out of seventeen census tracts with high or very high rates of diabetes prevalence are bordering each other, clustering in and around the Central Worcester region (Figure 2). It ought to be noted that the census tracts with very low rates of diabetes prevalence are primarily located in the West Side region and the westernmost tract of North Worcester (Figure 2).

When comparing diabetes prevalence with racial/ethnic minority population concentrations, the spatial patterns begin to add to the outline of our story. Seven out of

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<sup>71</sup> American Diabetes Association. Statistics About Diabetes.

<http://www.diabetes.org/diabetes-basics/statistics/>

<sup>72</sup> Blue Cross Blue Shield of Massachusetts. Health Impact of Diabetes in New England is 20% Lower than National Average.

<http://newsroom.bluecrossma.com/2017-08-01-Health-Impact-Of-Diabetes-In-New-England-Is-20-Lower-Than-National-Average>

eight census tracts with very high rates of diabetes prevalence also have very high concentrations of Hispanic/Latino people (Figure 2). All eleven census tracts with very high concentrations of Hispanic/Latino people observe rates of diabetes prevalence above both the state and national averages (Figure 2). All eight census tracts with very high concentrations of Black people observe rates of diabetes prevalence above both the state and national averages (Figure 2). All seventeen census tracts with either high or very high rates of diabetes prevalence have either high or very high concentrations of racial/ethnic minority populations (Figure 2). Fifteen of these seventeen census tracts with very high rates of diabetes prevalence observe a very high concentration of a racial/ethnic minority population (Figure 2). These spatial patterns indicate that racial/ethnic minority populations disproportionately carry the burden of diabetes. This finding is supported by the scatterplots showing the relationship between diabetes prevalence and racial/ethnic minority populations (Figures 6 and 7).

Several spatial patterns jump out when comparing diabetes prevalence to median household income. First, seven out of eight census tracts with very low median household incomes observe very high rates of diabetes (Figure 3). Fourteen out of seventeen census tracts with high or very high rates of diabetes prevalence have low or very low median household incomes (Figure 3). These two patterns suggest that lower income families disproportionately carry the burden of diabetes (Figure 8). Further, five out of six census tracts with very high median household incomes have rates of diabetes prevalence above the national and state averages, suggesting a potential “leveling-off” of the correlation (Figure 3). In other words, the potential negative correlation between diabetes prevalence

and income may level off past a certain income threshold (Figure 8). However, spatial patterns are not robust enough to conclude that a “leveling-off” phenomenon is definitely present.

Coronary heart disease (CHD) is the most common form of cardiovascular disease. Generally, there are two clusters of census tracts with very high rates of CHD prevalence in the city of Worcester—one cluster around Central Worcester and one cluster in the southeastern tracts of North Worcester, near the North Lincoln Street and Booth Apartments neighborhoods (Figure 4). High rates of CHD prevalence is the most frequently occurring class and these census tracts are scattered around the city. When analyzing CHD alone, there are few spatial patterns that can be elucidated.

A couple of spatial patterns are observable when comparing CHD to racial/ethnic minority populations. First and foremost, five out of seven census tracts with very high rates of CHD prevalence have very high concentrations of at least one of the two racial/ethnic minority populations (Figure 4). Further, ten out of fifteen census tracts with very high concentrations of at least one racial/ethnic minority have high or very high rates of CHD prevalence (Figure 4). While the correlations suggested by these spatial patterns are not as strongly indicated as the potential correlation between diabetes prevalence and racial/ethnic minority populations, these patterns do add to the narrative. The biggest takeaway here is that the tracts with the highest rates of CHD prevalence are likely to contain very high rates of racial/ethnic minority populations (Figures 4, 9, and 10).

When examining CHD through the lens of median household income, one can derive several spatial patterns. Four out of seven census tracts with very high rates of CHD

prevalence contain families with very low incomes (Figure 5). Six out of these seven census tracts contain families with low or very low incomes (Figure 5). Here, the tracts with the highest rates of CHD prevalence are likely to contain lower income populations (Figure 11). Further, as with diabetes, a “leveling-off” phenomenon may be present. Four out of six census tracts with very high incomes observe either medium or high rates of CHD prevalence (Figure 5). Moreover, ten out of twelve census tracts with high incomes observe either medium or high rates of CHD prevalence (Figure 5). Both of these patterns suggest a potential “leveling-off” of the potential negative correlation between CHD prevalence and income (Figure 11).

## **6. Interpreting Findings**

The above findings illustrate a narrative about chronic food-related ailments. The central pillar of this narrative is that both racial/ethnic minority populations and low-income populations disproportionately carry the burden of chronic food-related ailments. This narrative understands discrimination based on race/ethnicity and/or on income as structural aspects of our society, and more specifically, of the agribusiness model of food. If food security truly is a human right, all people ought to proportionately carry the burden of food-related ailments. This narrative also understands the relationship between food security and food-related health outcomes as a complex, nonlinear, interweaving relationship. Due to the complex nature of this food security-health outcome nexus, it is a colossal task to map causal pathways within the nexus. Analysis would have to be

expanded to include many other variables, including but not limited to proximity to supermarkets, transportation variables, and proximity to convenience stores. Rather, it is valuable—and practical considering the scope of this paper—to examine chronic food-related illnesses and socioeconomic factors in the context of a specific place.

How do the spatial patterns observed connect to the existing literature? Put simply, the patterns and the accompanying narrative demonstrate why food justice and food sovereignty are necessary, central tenets of the new food movement narrative.

Conceptually, food justice framed our narrative to include an emphasis on racial/ethnic disparities. In the spatial patterns elucidated from analyzing census tracts in Worcester, it is observed that racial/ethnic disparities are rife. Thus, food justice must be incorporated as a vital piece of Worcester's food movement going forward. The omnipresent and utterly persistent forces of neoliberalism, taken in tandem with the spatial patterns elucidated regarding income, show the pressing need to incorporate food sovereignty into Worcester's food movement narrative.

There are several important limitations pertaining to the above analysis. In addition to outlining potential confounding factors, it is essential to consider the potential limitations of indicators as well as data resources. With respect to confounding factors, there are many, as chronic ailments occur, grow, and evolve over the course of a person's lifetime. Almost every action is either positively or negatively contributing to a person's health. If this research were to be extended, there are a couple of confounding factors that would deserve attention. For example, analysis of proximity to food stores ought to be exhaustive, as food stores are the primary way people procure food. Additionally,

proximity to green space or amount of green space per census tract ought to be considered. Spending time being active can reduce a person's chance of contracting chronic ailments; green space provides a location where a person can be active. With respect to potential limitations of the indicators used, it ought to be noted that both diabetes prevalence and CHD prevalence are based on reported diagnoses among adults aged 18 or older. Erroneous respondent recall of diagnoses could potentially skew data pertaining to diabetes prevalence and/or CHD prevalence. Additionally, undiagnosed cases of diabetes and/or CHD could potentially affect the prevalence rates. It ought to be noted that there is a limitation of the resource used to collect data. As with all self-reported surveys, the data from the 500 Cities Project may be subject to systematic error resulting from noncoverage, nonresponse, or measurement bias.

## **7. Conclusions**

Multiple conclusions can be deduced when consolidating learnings from the field with the present study of Worcester. The first set of conclusions is conceptual and can be applied beyond Worcester. The second set of conclusions are substantive and are unique to Worcester. The third and final set of conclusions are wider implications for community development as a field.

Perhaps the most significant conceptual conclusion is the complex, multifaceted nature of the food security-health outcome relationship. Closely related is the conclusion that approaches to strengthening food security ought to be place-based. While this study only examines one city, the analysis is inherently place-based due to the nature of



comparisons that were made between census tracts and the understanding of Worcester's regions and neighborhoods. Food security is inherently geographic. Moreover, Cohen (2014) demonstrates the importance of a cultural ecology of local food. Efforts aimed at improving food security ought to be in constant communication with other local efforts. In this light, partnership and collaboration is urgent.

In terms of substantive conclusions unique to Worcester, it is concluded that organizations and efforts aimed at improving food security must place specialized emphasis on both food justice and food sovereignty. A holistic approach to strategic planning and collective action is advocated for here. The partnership between the Regional Environmental Council (REC), the Worcester Regional Food Hub (WRFH), and the Worcester Chamber of Commerce demonstrates a commitment to solving issues of food insecurity while strengthening our regional farm economy. The REC incorporates programs that actively teach youth about the impacts of racial/ethnic discrimination. Working with the city government shows a willingness to attempt to make change at the state level. Such a partnership endeavors to resist the forces of neoliberalism. The fact that the WRFH provides consistent support to regional farmers idealistically opposes the agribusiness model of food production and distribution. In Worcester, more partnerships and collaborative efforts are needed.

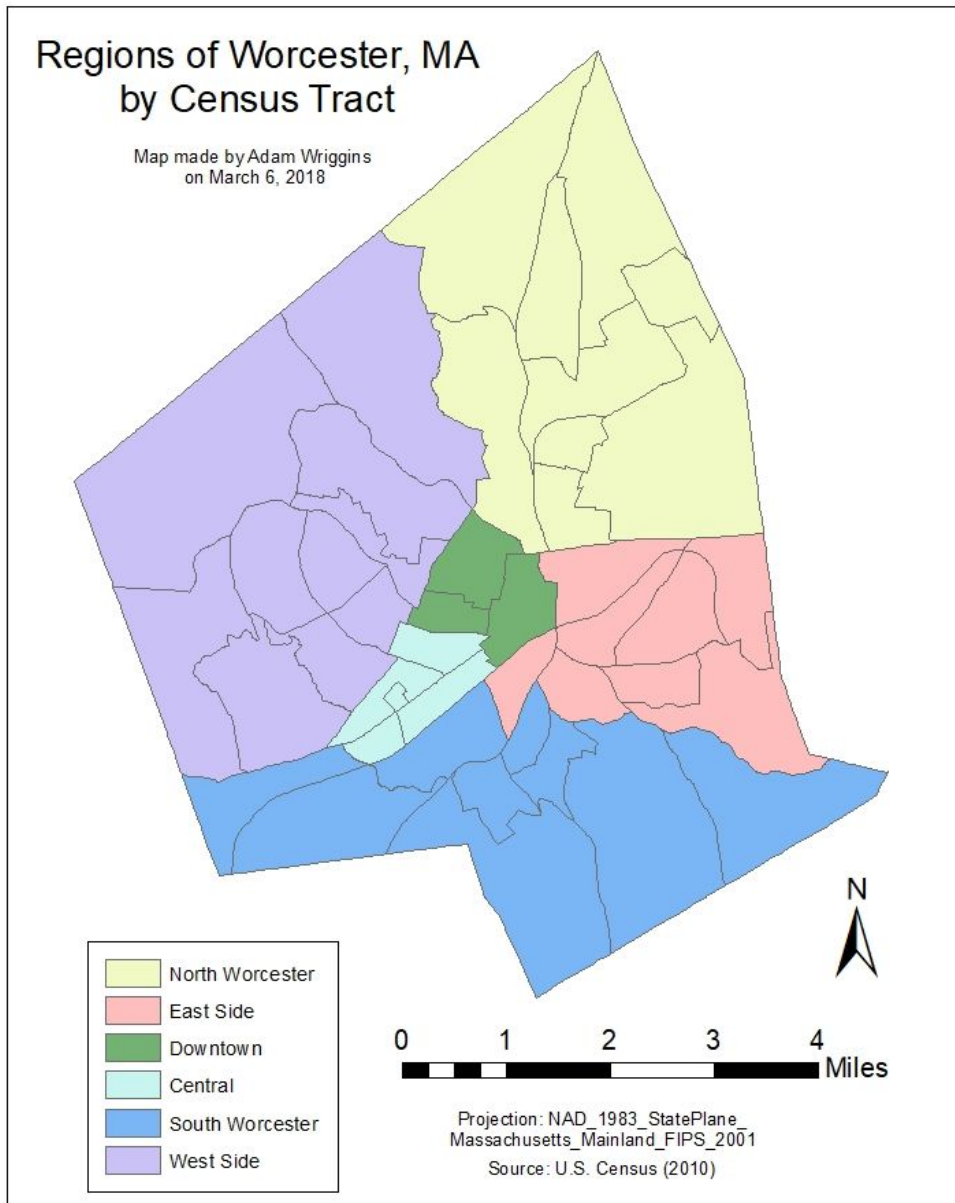
There are several conclusions to be made pertaining to the field of community development. Broadly speaking, the field should be investing in change at a policy level away from the agribusiness model. Specifically, communities should seek out collaboration and partnerships that can realistically approach the multidimensional issue of food

insecurity. Further interdisciplinary, longitudinal research is needed to ensure that efforts and resources are being directed to the optimal places.

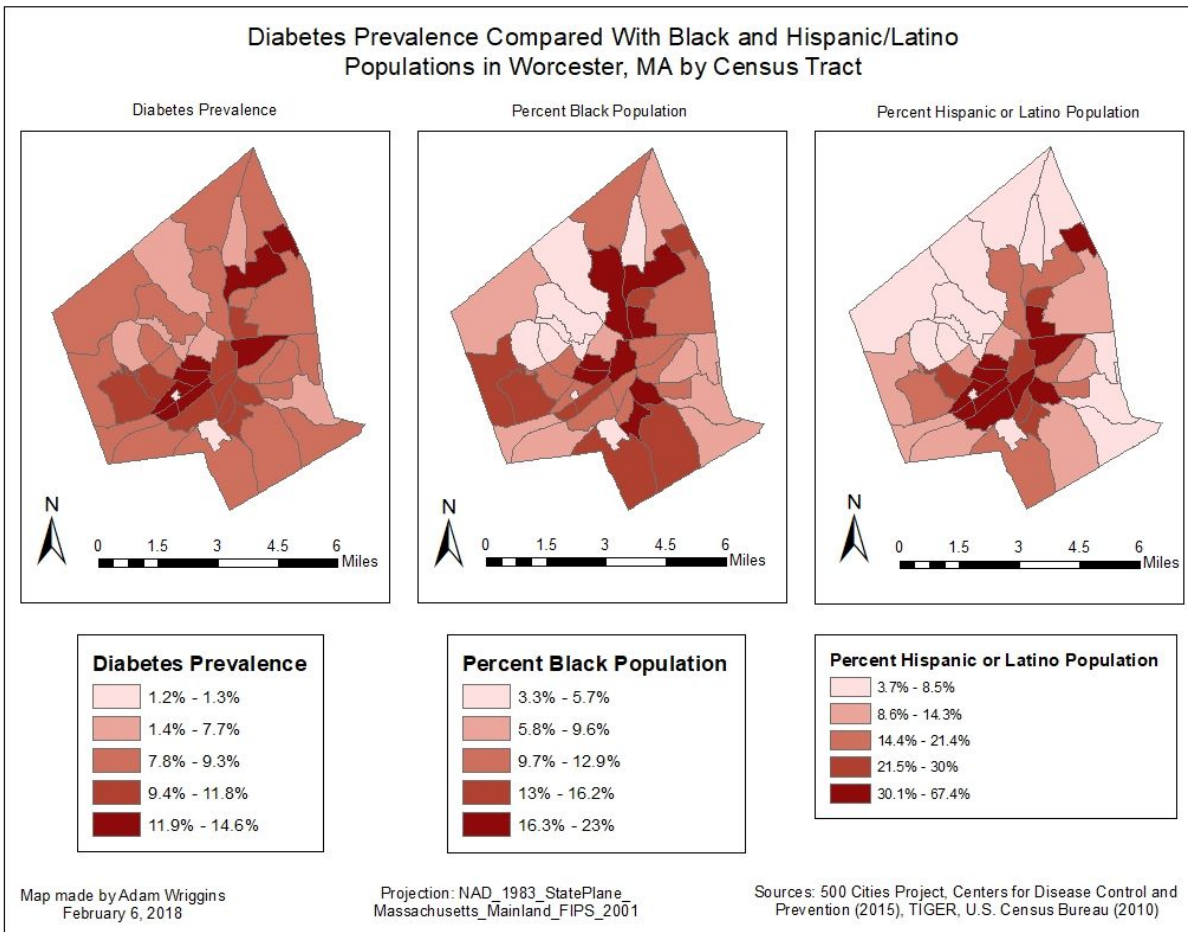
## 8. Appendix

### 8.1 Figures

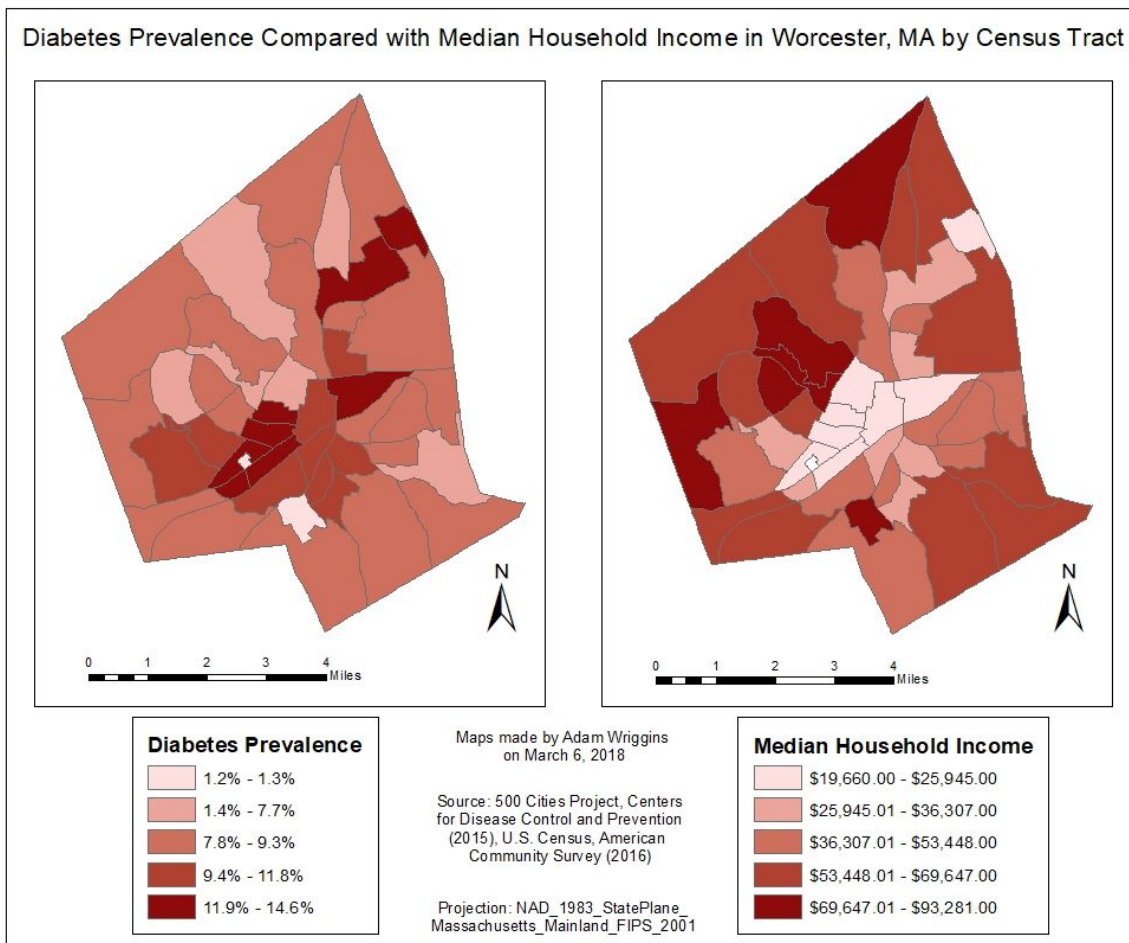
**Figure 1: Regions of Worcester, MA by Census Tract.**



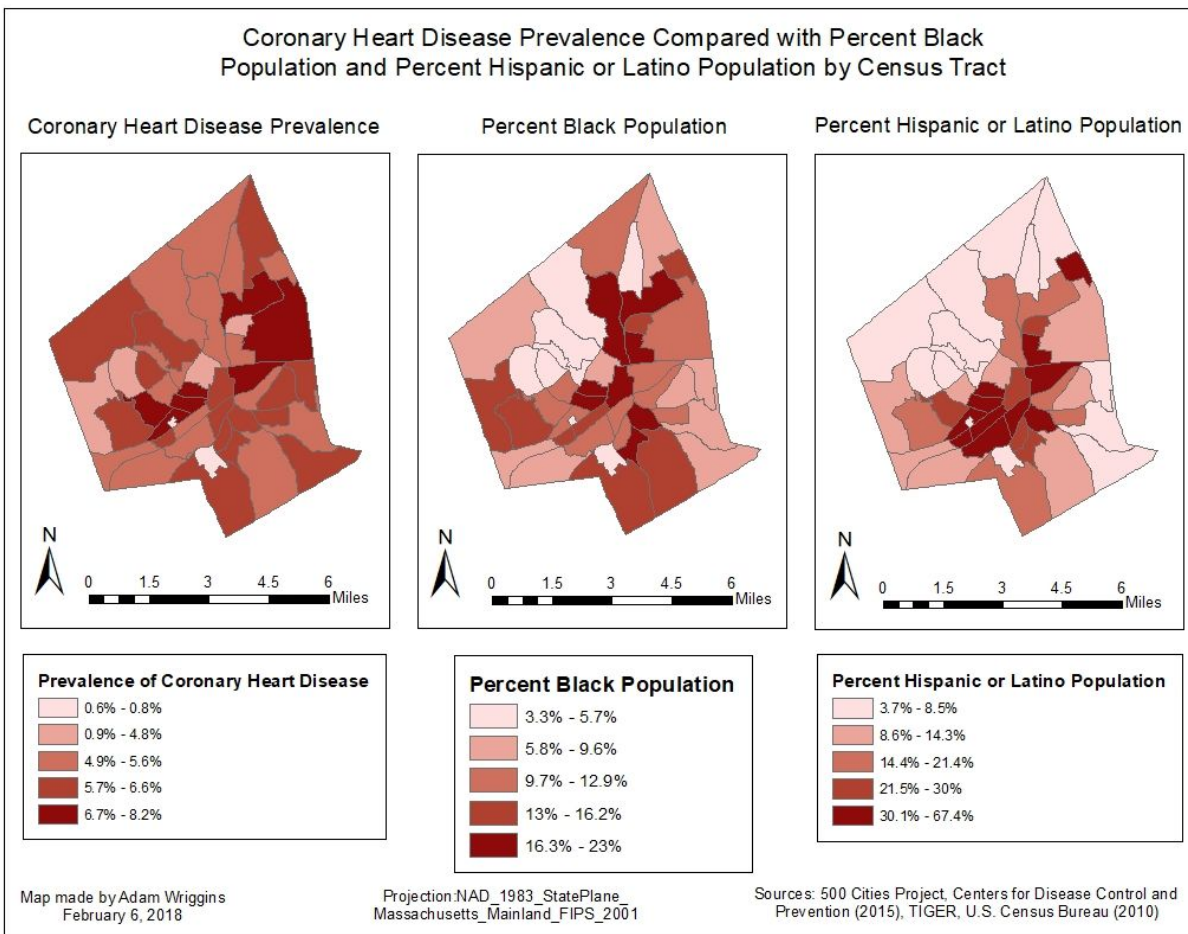
**Figure 2: Diabetes Prevalence Compared with Black and Hispanic/Latino Populations in Worcester, MA by Census Tract.**



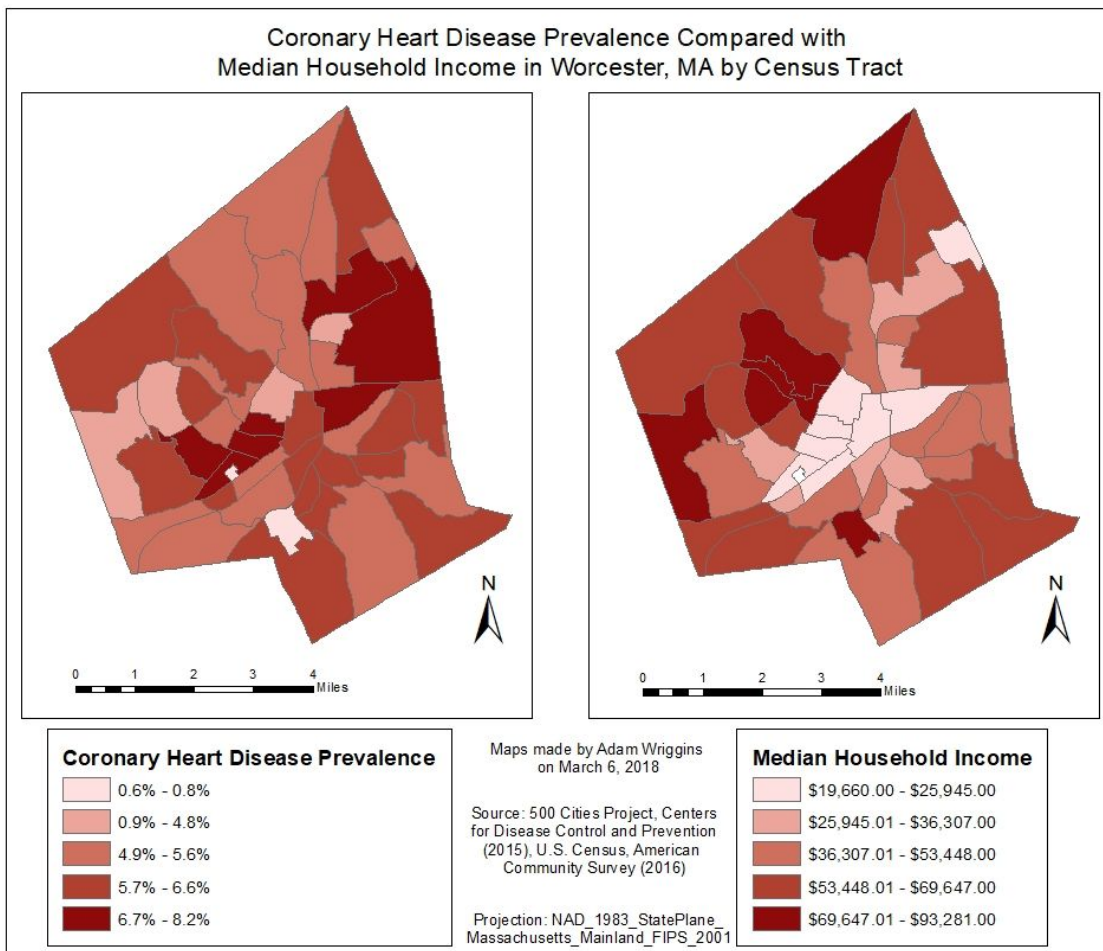
**Figure 3: Diabetes Prevalence Compared with Median Household Income in Worcester, MA by Census Tract.**

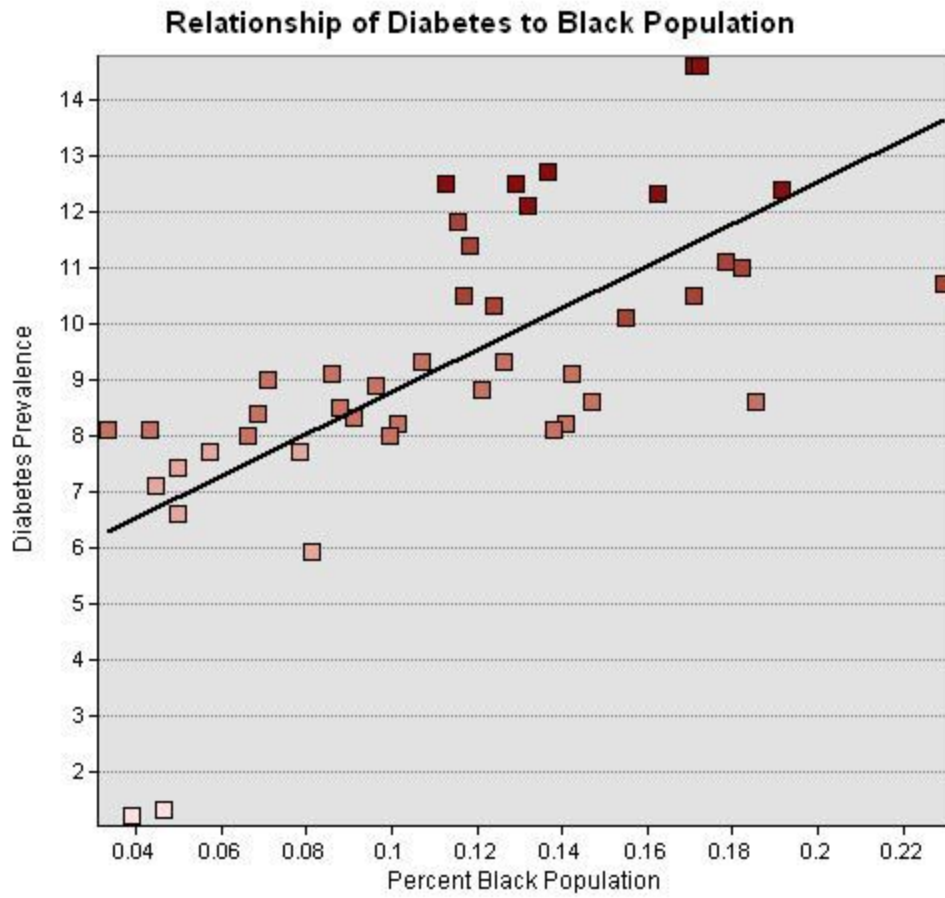


**Figure 4: Coronary Heart Disease Prevalence Compared with Percent Black and Hispanic/Latino Populations in Worcester, MA by Census Tract.**



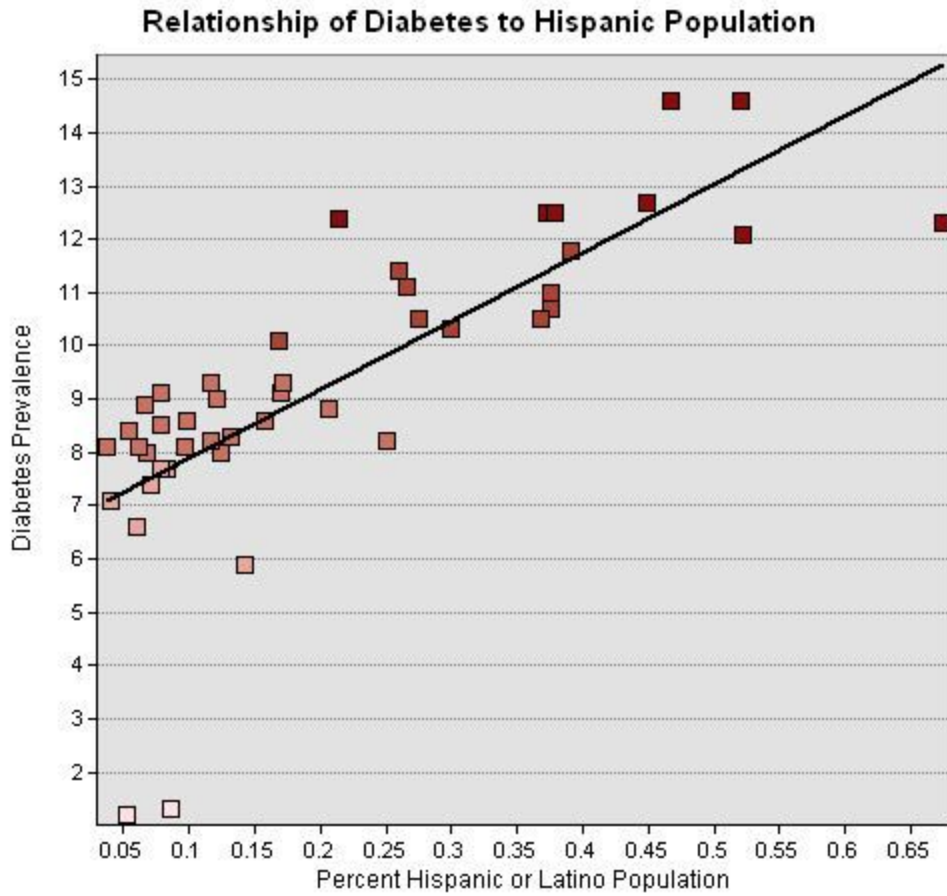
**Figure 5: Coronary Heart Disease Prevalence Compared with Median Household Income in Worcester, MA by Census Tract.**

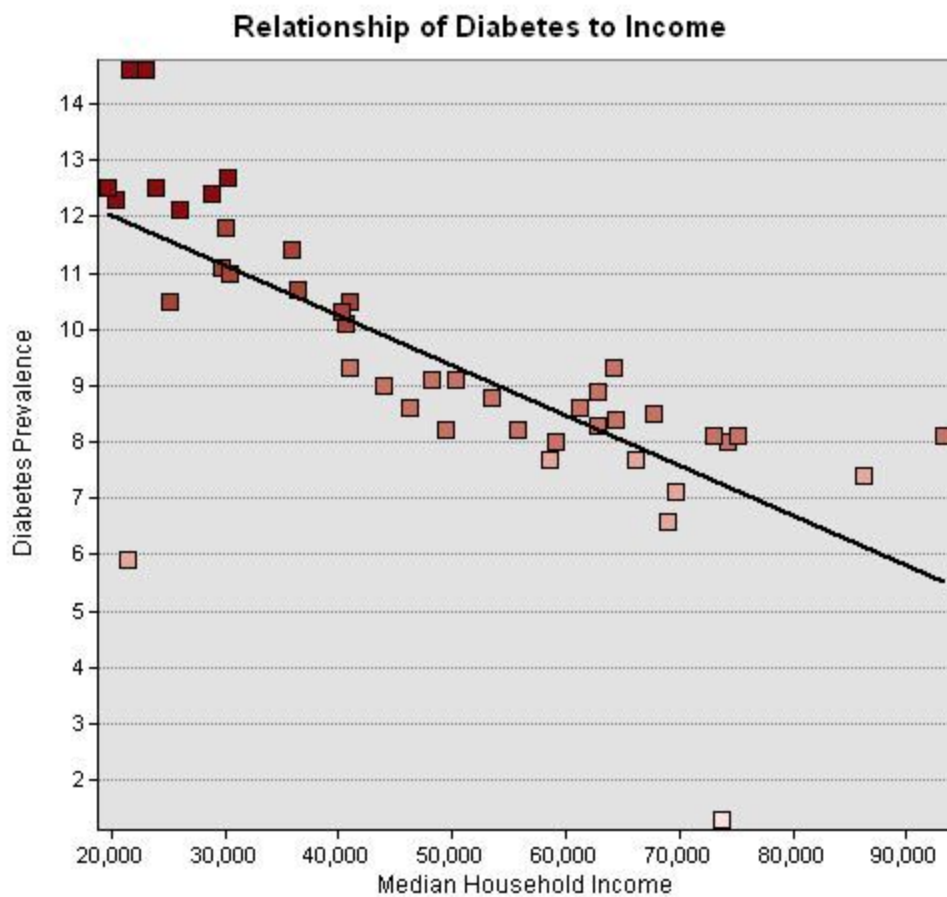


**Figure 6: Scatterplot Showing Relationship of Diabetes to Black Population**

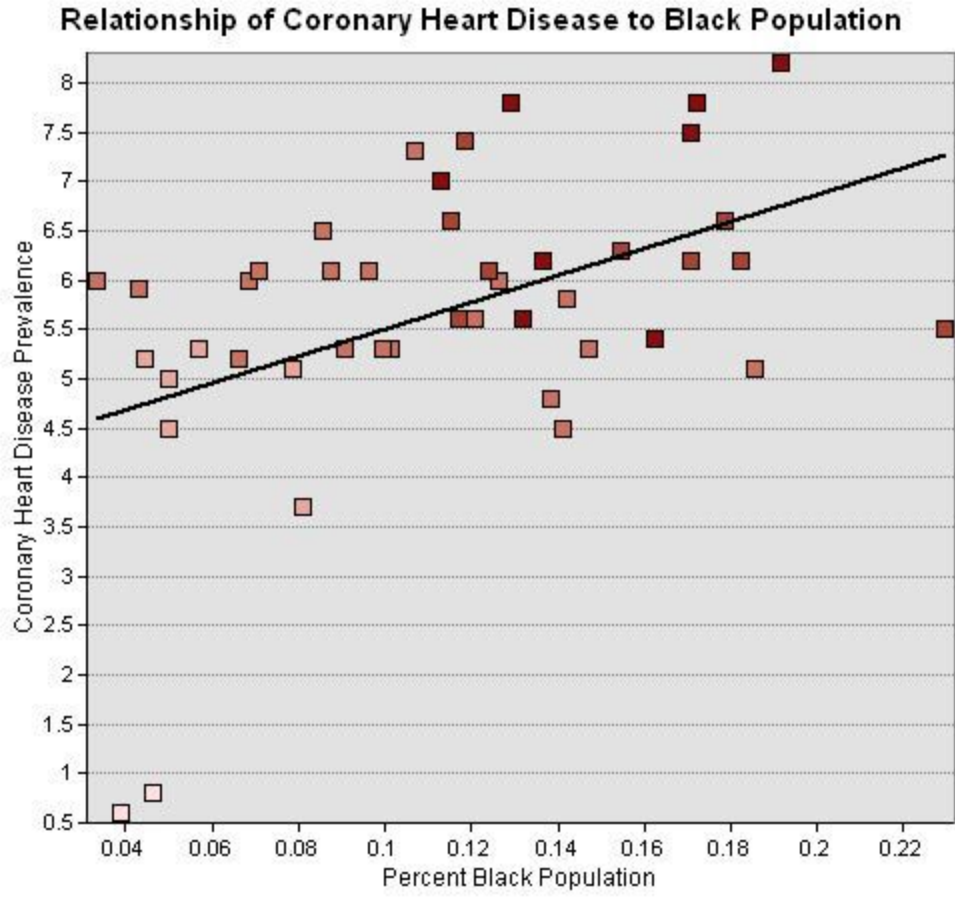


**Figure 7: Scatterplot Showing Relationship of Diabetes to Hispanic or Latino Populations**

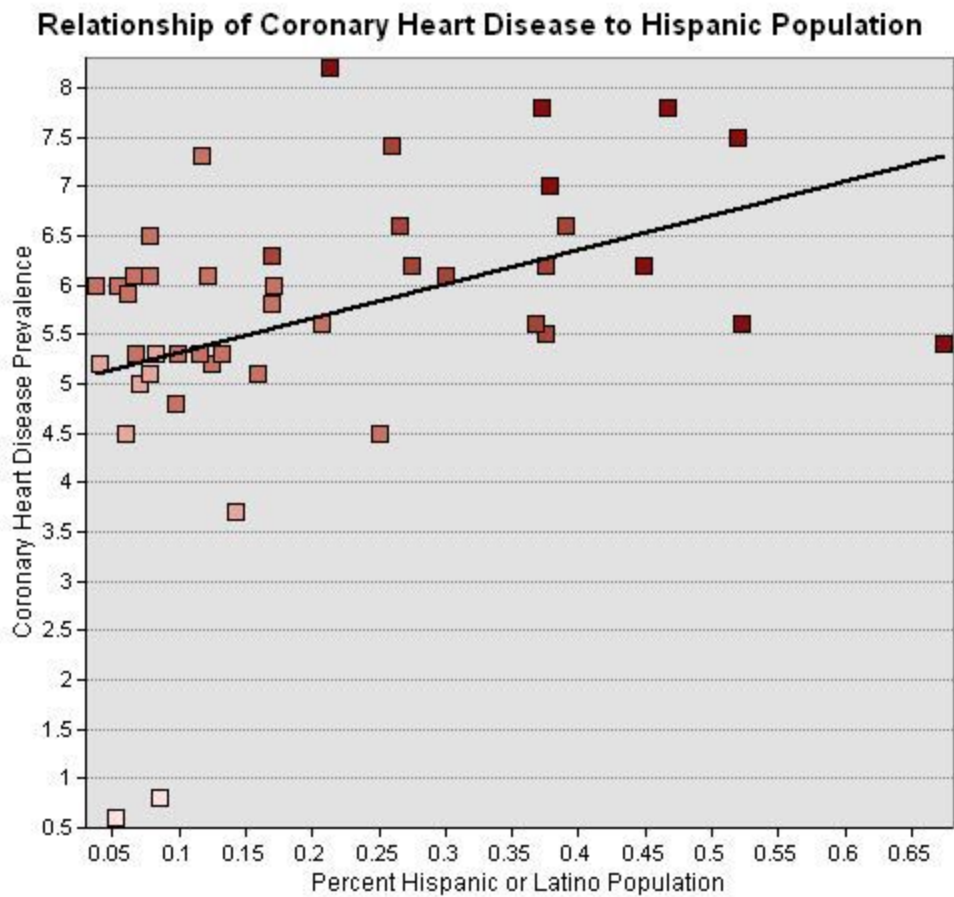


**Figure 8: Scatterplot Showing Relationship of Diabetes to Median Household Income**

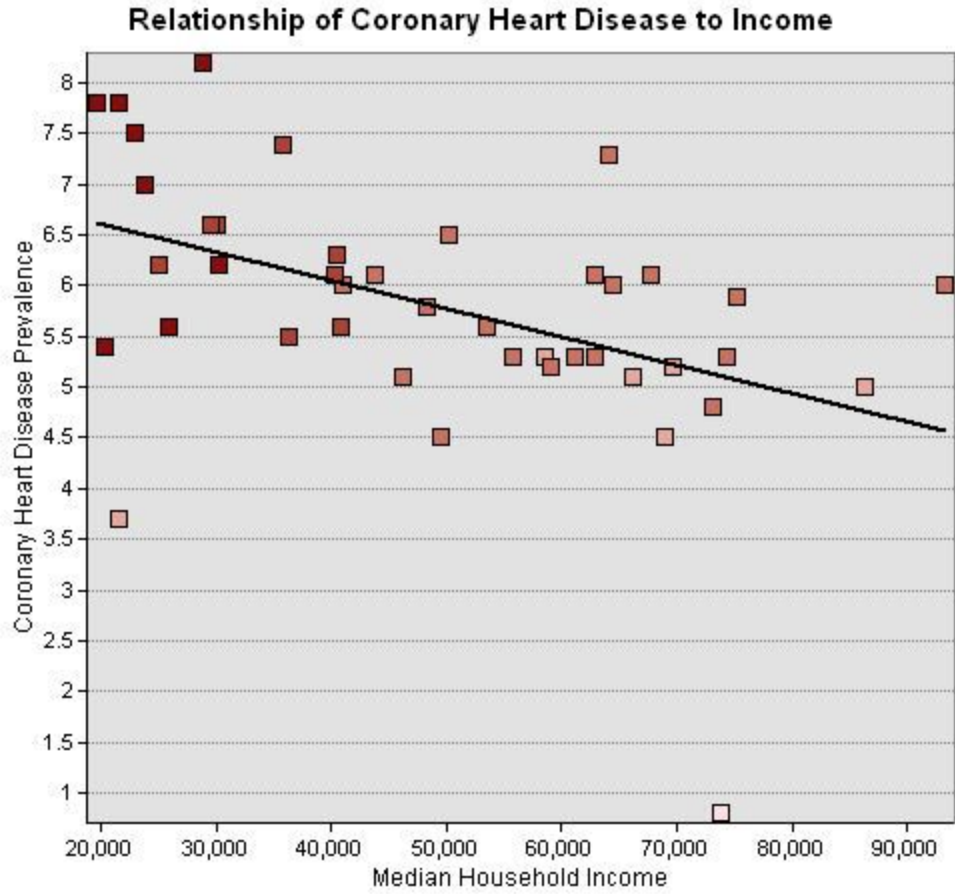
**Figure 9: Scatterplot Showing Relationship of Coronary Heart Disease to Black Population**



**Figure 10: Scatterplot Showing Relationship of Coronary Heart Disease to Hispanic or Latino Population**



**Figure 11: Scatterplot Showing Relationship of Coronary Heart Disease to Median Household Income**



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