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THE EFFECTS OF RACIAL AND CLASS NEIGHBORHOOD COMPOSITION ON
COMMUNITY GARDEN OUTCOMES

A Thesis submitted in partial satisfaction of the requirements for the degree of Master of
Arts

in

Sociology

by

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2016

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Dedicated to Wesley and Mack Butterfield

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ABSTRACT

Low-income communities and communities of color often lack access to fresh food from large food retailers within the traditional food system. Growing public concern for these and other food inequalities across the U.S. has generated interest in alternate food outlets such as community gardens as solutions. However, recent scholarly work suggests that community gardens may be more prevalent in predominately white or higher-income communities. This research further suggests that the primary goals and ideology that drive the development of community gardens may resonate more with white higher-income participants than lower-income or racial minorities. As a result, the participants in these programs are often primarily white, high-income individuals. By using negative binomial and spatial regression techniques to examine data from New York City and Minnesota, the current research project aims to clarify to what degree communities of color and low-income communities face a lack of access to community gardens. Further, this research investigates variation in the ideology or framing associated with community gardens with different demographic profiles. Findings suggest low-income communities and communities of color do not lack access to community gardens at a higher rate than white and high-income communities. However, findings show that the goals and ideology of community gardens vary across communities with different demographics. This research develops a more nuanced understanding of the race and class-based barriers to participating in community gardens. It adds to the literature on food access by revealing the degree to which community gardens as alternative, local food programs are accessible and welcoming to low-income, black, and Latino individuals, who have historically experienced barriers to accessing healthy food. Findings suggest that more work could be done to ensure accessibility to community gardens in less educated communities, and that gardens in more diverse communities could focus more on the benefits valued by black Americans and Latinos to ensure these groups feel welcome in the gardens.

INTRODUCTION

Disadvantaged groups, specifically low-income, Latinos and black Americans, have been systematically excluded from access to healthy food within the American agrifood system, the system of American food consumption and agriculture production established and maintained by institutionalized enterprises (Allen and Sachs 2007; Powell et al. 2007; Larson, Story, and Nelson 2009; Miller, Middendorf, and Wood 2015). With limited access to traditional food outlets, such as grocery stores, low income and minority individuals have experienced increased rates of food insecurity, obesity, and diet-related health issues in recent years (Adams et al. 2003; Allen et al. 2003; Morton and Blanchard 2007; Alkon and Norgaard 2009; Hinrichs 2010). Rates of food insecure households have grown to 14% nation-wide in 2014 (Coleman-Jensen et al. 2015). Obesity rates have also climbed dramatically, but have leveled off since 2003 (Ogden et al. 2014); in 2014 28.9% of U.S. adults were obese (Centers for Disease Control and Prevention 2015). Diet-related diseases have also been on the rise, with 12.3% of U.S. adults suffering from diabetes, 11.4% suffering from heart disease, and 32.2% having high blood pressure in 2012 (Centers for Disease Control and Prevention 2014).

Although disadvantaged groups face multiple barriers to accessing a diversity of affordable, fresh food (Hallett and McDermott 2011; Sullivan 2014), research has focused on physical access to fresh food at supermarkets as a significant barrier (Thomas 2010; Hilmers, Hilmers, and Dave 2012; Widener et al. 2013). In 2010, 29.7 million Americans (9.7%) lived in low-income areas more than 1 mile from a supermarket (Ver Ploeg et al. 2012). Low-income, black, and Latino individuals are overrepresented among residents of geographic areas with minimal access to healthy food (Morton and Blanchard 2007).

Growing public concern about health disparities associated with a lack of access to fresh and nutritious fruits and vegetables has increased interest in alternative food programs as potential solutions (Allen, Fitz, Simmons, Goodman, and Warner 2003; Guthman 2008). Alternative food programs are institutions like farmers' markets, community supported agriculture programs, and community gardens that provide access to healthy food that may augment or compensate for a lack of traditional food outlets. These alternate food systems may also seek to educate people about food and encourage community members to develop local food systems of their own (Guthman 2008). Some studies have suggested that alternative food programs, particularly farmers' markets and community gardens, may be alleviating physical access barriers to healthy food, most notably in urban areas (Sage, McCracken, and Sage 2013; Wang, Qiu, and Swallow 2014). There are also specific examples of community gardens serving low-income and racial minority communities, which traditionally lack access to healthy food (Peña 2013; Hondagneu-Sotelo 2014).

There are racial and class differences in perceived benefits of alternative food programs (Guthman, Morris, and Allen 2006; McEntee 2011; Guthman 2011; Peña 2013; Hondagneu-Sotelo 2014). For example, Peña (2013) and Hondagneu-Sotelo (2014) provide evidence that Latino immigrants value building and maintaining their culture and community through their social interactions in community gardens and through growing food from their homeland. Guthman (2011) shows that whites often tout the benefit of

local, organic, and sustainable food that alternative food programs can provide more so than blacks. McEntee (2011) found that higher-income individuals focused on the importance of alternative food programs providing environmental or social benefits, while lower-income individuals articulated the importance of alternative food programs providing access to affordable, fresh food.

I focus on one type of alternate, local food program, community gardens, to examine the relationship between the racial and class composition of communities and their access to healthy food through alternative food programs. Community gardens may have significant potential health and social benefits among participants and their communities, as they can provide inexpensive access to local, fresh, healthy, culturally appropriate food (Macias 2008). The most commonly identified and important benefits associated with community gardens in a 2011-2012 survey of community gardening organizations were "food production and access," "social engagement, community building, or neighborhood revitalization," "education," and "improved nutrition" (Lawson and Drake 2013). The number of community gardens has also been increasing in recent years (Drake and Lawson 2015). Drake and Lawson (2013:7) identified 8,550 community gardens across the U.S. and parts of Canada, and estimate that the actual number of gardens serving these same areas may be as high as 19,483. Community gardens also typically cost little to participate in -some recommend a yearly fee of only \$32 (Surls et al. 2015).

Research Question

This study seeks to clarify the relationship between the racial and class composition of communities and access to fresh fruits and vegetables from community gardens. Because much of the previous research is qualitative and focused on case studies, it is difficult to discern whether a pattern exists between the racial or class composition of a community and their access to a community garden. Moreover, it is important to assess whether the ideology or "framing" of community gardens varies across neighborhood composition; that is, do the goals or mission of community gardens differ by race or class composition? I use data collected by two non-profit organizations and data from the U.S. Census (2010) to identify the relationships between the racial and class-based composition of communities and the number of community gardens located in them, as well as the types of framing used by the gardens. More specifically, my research questions are: (1) what is the relationship between the racial and class composition of a community and number of community gardens located in it, and (2) what is the relationship between the racial and class composition of a community and the type of framing used in the community garden; that is, the ideology, goals, or mission of the community garden?

I further the sociological understanding of food access by connecting the alternative food program literature and literature on the traditional food system in a new way. Scholars have recently emphasized the importance of conducting research in the area of food (Macias 2008; Hinrichs 2010; Alkon and Agyeman 2011). Hinrichs (2010) calls for researchers to consider ways the food system can be a setting for sociological inquiry. Alkon and Agyeman (2011) call for rigorous comparative research focusing on the intersection of geographies of food inequalities with racial and economic inequalities.

Macias (2008) calls for more systematic, quantitative research on the relationship between alternative food programs and food equality. My focus on the above questions and my hypotheses addresses each of these valuable calls for additional sociological research on food and alternative food programs. My use of quantitative methods also allows me to examine broader patterns of race and class-based barriers to food access within alternative food programs at the local level that have been suggested by previous research.

COMMUNITY GARDENS AND THE FOOD ENVIRONMENT

Through the persistence of structural inequalities in the American agrifood system, disadvantaged low-income, black, and Latino communities lack access to healthy food, like fruits and vegetables, at higher rates than high-income and predominately white communities (Allen and Sachs 2007; Powell et al. 2007; Larson et al. 2009; Alkon and Agyeman 2011). Disadvantaged groups face economic challenges to purchasing healthy food due to a lack of resources (Ford and Dzewaltowski 2008), and physical barriers due to the lack of large food retailers (Allen et al. 2003; Miller et al. 2015). Living with limited access to healthy food results in less healthy diets and substantial negative health effects, including obesity, diabetes, heart disease, and other diet-related diseases (Adams et al. 2003; Morton and Blanchard 2007; Hinrichs 2010; USDA 2015). Obesity rates are higher than the national average among black adults (62.6%) and among Latino adults (44.1%) (National Institute of Diabetes and Digestive and Kidney Diseases 2012). Diabetes rates are also higher than average among black adults (19.6%), those of Mexican origin (17.9%), and those living in poverty (14.5%) (Centers for Disease Control and Prevention 2014). Our food environment creates a system where low-income, black, and Latino communities face limited access to healthy food, which puts them at higher risk of having poor nutrition and other diet-related issues like obesity and diabetes (Slocum 2006; Ford and Dzewaltowski 2008; Diamant et al. 2010).

Researchers and activists have suggested that community gardens may provide a solution to limited food access and diet-related diseases (Allen et al. 2003; Larson, Story, and Nelson 2009; Diamant et al. 2010). Because community gardens provide spaces where community members are able to grow or affordably access healthy food (Lawson 2005), they have the potential to allow low-income black and Latino individuals to overcome their lack of access to healthy food within the traditional food system (Armstrong 2000; Fang et al. 2013; Hondagneu-Sotelo 2014; Peña 2013). Community gardens in particular are often structured to reach disadvantaged groups and communities where they live, more than other types of alternative food programs. Community gardens, therefore, may provide physical access to healthy food among low-income, Latino, and black Americans who have been historically excluded from such access within the American agrifood system.

The benefits of community gardens are perceived differently across race and class (Guthman et al. 2006; McEntee 2011; Guthman 2011; Hondagneu-Sotelo 2014). This suggests that the goals of community gardens may vary based on the racial and class composition of the communities in which they are located. The literature also indicates that community garden programs may often use framing that focuses on the benefits valued more highly by white people and high-income people, like local, organic,

sustainable food and environmental or social benefits. The focus on these benefits while overlooking benefits valued by disadvantaged groups (like cultural preservation, empowerment, and affordable access to fresh food) may create additional barriers to accessing healthy food via community gardens among low-income, Latino, and black Americans by making them feel unwelcome in these spaces or feel that the gardens don't address their needs (Slocum 2006; Guthman et al. 2006; Guthman 2008; Guthman 2011; McEntee 2011).

Food Access

In 2014, 14 percent of all U.S. households were identified as food insecure, defined as households that did not have enough food at one or more times throughout the year; the rates of food insecurity are higher among black households (26.1%), Latino households (22.4%), and those at or below the poverty line (39.5%), than higher income and white households (Coleman-Jensen et al. 2015). Low income, Latino, and black Americans are less likely than whites or those with higher incomes to live in communities with traditional food outlets, such as grocery stores, more likely to be food insecure, and to suffer health consequences as a result (Drewnowski and Specter 2004; Alkon and Agyeman 2011; Johnston, Rodney, and Szabo 2012). Race has played a role not only in determining where groups of people live, but also what kinds of services different groups have access to (Alkon and Norgaard 2009). For example, historically, the food system discriminated against black farmers, which reduced their numbers across the U.S. (Alkon and Norgaard 2009). In this way, access to healthy food is conditioned not only by economic purchasing power, but also by systematic racial discrimination that limited food access in minority communities.

Although disadvantaged groups face a variety of systematic barriers to accessing healthy food (Whelan et al. 2002; Ford and Dziewaltowski 2008; Acheampong and Haldeman 2013), recent studies have focused on a particularly significant cause of unequal access to healthy food: spatial barriers to physical access. Spaces with limited access to healthy food are often marked by poverty, preventable disease, and other social inequalities (Hinrichs 2010; McEntee and Agyeman 2010). As a result, disadvantaged low-income individuals not only face economic barriers to purchasing healthy food, but also spatial barriers to accessing healthy food. Areas with limited access to healthy food tend to have low education and income rates, high resident age, and larger numbers of small grocery and convenience stores (Morton and Blanchard 2007). Miller and colleagues (2015) also find communities with lower household income are less likely to have access to healthy food, but the racial composition of neighborhoods was more influential.

A lack of large grocery stores is not the only barrier to accessing healthy food within the American agrifood system that disadvantaged groups face (Whelan et al. 2002; Ford and Dziewaltowski 2008; Acheampong and Haldeman 2013). In particular, as Ford and Dziewaltowski (2008) suggest, healthy food is often unaffordable due to budgetary constraints among low-income individuals. Along with economic resources, attitudes about healthy food have a significant impact on healthy food choices within black and, to a greater extent, Latino populations (Acheampong and Haldeman 2013). Personal mobility, cultural and social beliefs, and the presence of children in the home have also

been identified as significant factors affecting a family's ability to maintain their food security within the American agrifood system (Whelan et al. 2002).

Community Gardens

In this study, I focus on community gardens, cooperative endeavors providing resources for people within a community to come together to cultivate food (Lawson 2005:3). Particularly because of their low cost of participation and long history of aiming to alleviate hunger in the U.S., community gardens may provide more accessibility among disadvantaged individuals than other types of alternative food programs. Interested individuals and families often participate in the garden for a minimal yearly fee; the Common Ground program of University of California Cooperative Extension in Los Angeles suggests \$32/year in their community garden start-up guide (Surls et al. 2015). The U.S. has a long history of community gardening and urban farming, with records of such endeavors being used to relieve hunger during economic downturns in cities like Detroit as early as 1894 (Lawson 2005).

Drake and Lawson (2015) gathered data on over 400 community garden organizations of various sizes, which together serve and support over 8,500 individual community gardens, providing a comprehensive overview of community garden organizations in the United States. Along with identifying the growth of community garden organizations in recent years, Drake and Lawson (2015) found 99.7% of the community garden organizations interviewed indicated the benefits of food production and increased food access were consistent with their organization's goals. Ninety-nine point five percent also indicated the benefit of improved diet was consistent with their organization's goals (Drake and Lawson 2015). These findings suggest community garden organizations seek to improve food access and nutrition.

The challenges and expectations facing the development and success of community gardens over the long term vary in urban and rural locations (Armstrong 2000; Morton and Blanchard 2007; Guthman 2008; Alkon and Norgaard 2009; Hinrichs 2010; Drake and Lawson 2015). Location can affect food costs (Morton and Blanchard 2007), public and government support for community gardens, and access to water (Drake and Lawson 2015), and can even shape the farming practices used in a garden (Guthman 2008). These variations may have an impact on the locations of community gardens.

Community Garden Benefits

Although community gardens as alternate food programs have been found to alleviate physical barriers to accessing healthy food (Sage et al. 2013; Wang et al. 2014), examples of alternative food programs from the literature also suggest that community gardens may primarily serve white and high-income individuals (Guthman et al. 2006; Slocum 2007; Alkon and Agyeman 2011; Guthman 2011; McEntee 2011), even when they are located in disadvantaged communities (Kato 2013). This phenomenon indicates that, in order to fully understand the effects of class and racial neighborhood demographics on access to healthy food through community gardens, we must consider what groups are most likely to utilize gardens along with examining their locations. Specifically, examples from the literature suggest that disadvantaged groups may find different benefits from community gardens than white and high-income individuals

(Alkon and Norgaard 2009; Guthman 2011; McEntee 2011; Peña 2013; Hondagneu-Sotelo 2014).

Among the examples in the literature of community gardens serving Latino, black, and low-income individuals, Hondagneu-Sotelo (2014) describes a community garden, founded by community members and eventually coordinated by a non-profit organization, located in a low-income, Latino immigrant community in Los Angeles. Participants, primarily Latino immigrant women, reported that the garden provided a space to build and maintain their culture and community through social interaction and food choice, and to access healthy food (Hondagneu-Sotelo 2014). A similar community garden, South Central Farm, started in the early 1990s and was maintained by over three-hundred Mexican and Central American immigrant families in an impoverished neighborhood of Los Angeles (Peña 2013). This community garden was also valued by its participants as a means to access healthy, affordable, culturally appropriate food among individuals who had limited access to healthy food due to their economic conditions and the food availability in their neighborhood, and as a means of cultural preservation and community building (Peña 2013).¹

Alkon and Norgaard (2009) also document a farmers' market valued by black participants as a means of empowerment through challenging racism within the American agrifood system and a means of maintaining their culture through social interaction, music, and the presence of specific types of food. McEntee (2011) finds that, among alternative, local food program participants who found purchasing local food too expensive, producing it themselves became an important option. These individuals with limited resources tended to participate in alternative food options that were focused on their involvement in production or procurement like gardening, raising animals, and hunting (McEntee 2011). When explaining their reasons for participating, these individuals primarily articulated what McEntee (2011) calls "traditional localism," the importance of having access to affordable, fresh food (either local or conventionally grown), as well as their ability to maintain tradition and exchange resources.

However, the benefits of community gardens are likely not limited to disadvantaged groups. Previous work provides examples of the local and alternative food program benefits articulated by high-income and white participants. The high-income individuals in McEntee's (2011) study of local and alternative food participation in Grafton County, New Hampshire, focus on the importance of what he calls "contemporary localism." The benefits articulated through "contemporary localism" encompass environmental and social goals, including sustaining local farmers and vendors, supporting and bettering the local economy and environment, as well as helping those in need through traditional means like donations of lower-quality produce to food pantries (McEntee 2011). Guthman (2011) also gives examples of white individuals focusing on the importance of alternative food programs providing healthy food; however these individuals define "health food" as local, organic, or sustainable food specifically.

¹ South Central Farm was bulldozed by the city of Los Angeles in 2006 for future development; however, these benefits were articulated by the low-income, Latino participants between 2001 and 2005, while the garden was still thriving (Peña 2013).

Overall, research suggests that the primary benefits of community gardens as alternative food programs valued by disadvantaged groups may vary from those valued by white and high-income individuals, as outlined below in Table 1. Alkon and Norgaard (2009), Peña (2013), and Hondagneu-Sotelo (2014) provide evidence suggesting that black Americans and Latinos may participate in community gardens as a means of cultural preservation and empowerment. McEntee's (2011) work indicates that low-income individuals may participate in community gardens in order to access affordable, fresh food, while high-income participants may have environmental or social goals for participating. Lastly, the work of Guthman (2011) indicates that white individuals may participate in community gardens to access specific types of healthy food: local, organic, and/or sustainable food.

Table 1: The Primary Benefits of Community Gardens by Participant Demographics

Participant Demographics:	Primary Benefits:
Low-income Participants	Affordable, Fresh Food
High-income Participants	Environmental or Social Goals
Black and Latino Participants	Cultural Preservation and Empowerment
White Participants	Local, Organic, and Sustainable Food

Sources: Alkon and Norgaard 2009; Guthman 2011; McEntee 2011; Hondagneu-Sotelo 2014

Several qualitative studies have suggest that community gardens are spaces where disadvantaged groups are underrepresented. Many alternative food programs focused on the benefits sought by white participants while overlooking the values, needs, and histories of black and Latino populations. Scholars argue that this use of problematic framing results in alternative food programs being unwelcoming to black Americans and Latinos and therefore primarily being white spaces (Guthman et al. 2006; Slocum 2007; Alkon and Agyeman 2011; Guthman 2011; McEntee 2011). Additionally, McEntee (2011) argues that because these types of programs often underscore "contemporary localism" by focusing on environmental and social goals, rather than "traditional localism," primarily focused on affordable access to fresh food, they lack resonance with low-income individuals.

The use of "traditional localism" or "contemporary localism" within community garden programs does not necessarily follow directly from the desires of the program leadership; that is, even well-intentioned gardens may end up using framing that excludes disadvantaged groups. Although managers of community gardens may be interested in addressing the issue of limited food access among low-income individuals (Fang et al. 2013), managers in Guthman et al.'s (2006) study did not use what McEntee (2011) describes as "traditional localism" in framing their programs. These managers were constrained by practical issues of providing food at a lower cost for low-income individuals, but also by perspectives about assistance for low-income individuals, including skepticism of economic redistribution (Guthman et al. 2006). The programs

instead focused on supporting the local economy and local farmers, rather than providing access to affordable fresh food. This framing resonated more with high-income than low-income individuals, and therefore contributed to these spaces primarily serving high-income customers (Guthman et al. 2006; McEntee 2011). In this way, previous research suggests that community gardens using "contemporary localism" and not "traditional localism" are likely to have an overrepresentation of high-income participants.

Similarly, the use of whitened framing within alternative food programs, often through narratives reflecting "whitened cultural histories" that overlook both the historical role of racism in the food system and also the desires of black Americans and Latinos, result in these programs being accessed primarily by white people (Guthman 2008). Guthman (2011) argues that through two "manifestations of whiteness," colorblindness and universalism, alternative food programs, by assuming the blanket goodness of the benefits they value from alternative food programs, mainly local, organic, and sustainable food, create a dichotomous relationship between themselves and racial minorities who lack access to healthy food or value different benefits from alternative food programs. This dichotomous relationship classifies people who do not purchase these types of food, as subject to either conversion or marginalization (Guthman 2011). In an environment where black Americans and Latinos are disproportionately located in spaces where access to healthy food is limited (Alkon and Norgaard 2009), this conversion to purchasing local, organic, or sustainable food is often not an option for these groups. Without the ability to simply change their food purchasing patterns, or the desire to do so for the same reasons as whites, black Americans and Latinos are marginalized by those fortunate enough to have easy access to healthy food (Guthman 2011). Guthman (2011) argues that this type of framing distances minority groups and helps maintain the over-representation of white people within alternative food programs.

While community gardens may aim to address issues of food insecurity and food inequality in the American agrifood system (Guthman 2011), they may not address underlying problems created by spatial inequalities in the food system that are disproportionately faced by disadvantaged groups (Slocum 2006). Additionally, as has been documented in a variety of alternative food programs, community gardens may focus on the benefits valued by white and high-income individuals while overlooking or marginalizing those valued by black, Latino, or low-income individuals (Guthman et al. 2006; Slocum 2007; Alkon and Agyeman 2011; Guthman 2011; McEntee 2011). This focus may result in an overrepresentation of white and high-income individuals in community gardens due to a lack of resonance with the values of disadvantaged populations (Slocum 2006; Guthman 2008). Previous literature also indicates that this may happen even among gardens located within black, Latino, or low-income communities (Kato 2013).

Theoretical Framework

Overall, previous research suggests divergent explanations for the emergence of community gardens based on racial and class composition. This research shows race and class inequalities in food access, whereby Latinos, blacks, and low-income individuals lack access to healthy food at higher rates than white and high-income people (Drewnowski and Specter 2004; Johnston et al. 2012; Miller et al. 2015). We therefore

might expect that communities of color and low-income communities have fewer community gardens, as they do supermarkets. However, community gardens are often suggested as solutions to limited physical access to healthy food and the corresponding diet-related diseases (Allen et al. 2003; Larson et al. 2009; Diamant et al. 2010), and have a large potential to increase food access among disadvantaged groups due to their structure and low cost of participation (Surls et al. 2015). As a result, it may be more likely that disadvantaged communities have more, rather than fewer, community gardens, as compared to white and high-income communities.

Examining the goals of community gardens as well as the locations provides a better understanding of the actual effect that community gardens may have on access to healthy food. The literature on framing and benefits of alternative food programs again suggests a contradiction in the variation we might expect to see in the goals of gardens based on the demographics of the communities in which they are located. Based on the literature identifying particular benefits of alternative food programs valued differently among different demographics, we might expect to see the benefits emphasized in the gardens' goals to match up with the benefits valued more highly by those in the surrounding community. However, literature on alternative food programs suggests that the framing used in these programs often focused on the benefits valued more by white and higher-income individuals, creating unwelcoming spaces for low-income individuals and people of color and preventing them from accessing healthy food through participating in these programs (Slocum 2007; Guthman et al. 2006; Guthman 2008; Mcintee 2011). Given these qualitative studies on the framing used in alternative food programs, it may be more likely that the goals used by community gardens focus more on the benefits valued by white and high-income individuals, even within communities of color and low-income communities.

I use quantitative methods to examine the relationship between the class and racial composition of communities and the presence of community gardens, as well as the relationship between the class and racial composition of community garden locations and the framing gardens use. Although previous research has provided specific examples of alternative food programs located in disadvantaged communities (Alkon and Norgaard 2009; Peña 2013; Hondagneu-Sotelo 2014), and specific examples of these types of programs excluding disadvantaged individuals through the use of framing (Guthman et al. 2006; Alkon and Agyeman 2011; Mcintee 2011), my quantitative analyses contribute to previous research by revealing how neighborhood racial and class composition affect access to healthy food through community gardens on a wider scale. This study brings a systematic dimension to literature that provides a depth of understanding on race and class within alternative food programs.

Hypotheses

Previous research indicating that disadvantaged communities lack access to healthy food suggests that we may see a similar pattern for community gardens as means of accessing healthy food (Drewnowski and Specter 2004; Johnston et al. 2012; Miller et al. 2015). This leads me to two hypotheses relating to my first research question: (1a) zip codes with higher median household incomes are likely to have more community gardens; and (1b) zip codes with higher rates of black and Latino residents are likely to

have fewer community gardens. However, examining the framing used by community gardens give us some key additional insights into who community gardens are actually welcoming and therefore accessible to. Previous research revealing the variation in benefits of alternative food programs valued by different demographics (Alkon and Norgaard 2009; Guthman 2011; McEntee 2011; Peña 2013; Hondagneu-Sotelo 2014) suggests two hypotheses relating to my second research question: (2a) community gardens located in zip codes with higher median household incomes are more likely to focus on environmental or social goals and less likely to focus on access to affordable fresh food; and (2b) community gardens located in zip codes with higher rates of black and Latino residents are more likely to focus on cultural preservation and empowerment and less likely to focus on local, organic, or sustainable food.

RESEARCH DESIGN

I conduct two related analyses. The first examines the relationship between the racial and class composition of a neighborhood and the number of community gardens in that location. The second analysis investigates the relationship between the racial and class composition of community garden locations and the stated goals of the gardens.

In my analyses I used data on community gardens from two different locations, New York City and the state of Minnesota. The examination of both New York City and Minnesota allowed this study to compare across cities and states. The inclusion of one large urban area and one entire state let me examine the effects of race and class on community garden locations at two different scales. New York City presented an urban location with a greater population density and a small spatial area, while Minnesota presented a larger rural and urban location with a much lower population density.

Minnesota and New York City were ideal locations to examine the broader effects of race and class on community garden locations because each provided a very different type of area in terms of population density, urbanization, and demographics. This not only added to the generalizability of this study, but also allowed for potential variations across different types of locations within the U.S. to emerge. Finding consistent patterns across New York City and Minnesota between the racial and class composition of neighborhoods and the prevalence of community gardens would provide strong evidence for an overall trend among community garden locations; however, inconsistencies in this relationship across the two locations may reveal a more complex relationship.

Table 2 shows, although a smaller physical area, New York City has a larger population than Minnesota. New York City is also more racially diverse than both Minnesota and the U.S. overall, while Minnesota is less diverse than the U.S. overall. Additionally, a zip code is much more likely to have at least one community garden in New York City than in Minnesota. Home-ownership rates are lower in New York City than the national average, and higher in Minnesota than the national average. Both areas have overall educational rates higher than the national average, though New York City's are higher than Minnesota's. New York City has a lower median household income and higher poverty rate than the national average, while the poverty rate in Minnesota is lower than the national average and the median household income is higher. There is consistency, however, when comparing the zip codes within New York City and Minnesota with at least one community garden. As Table 2 also indicates, zip codes with at

least one community garden in both New York City and Minnesota have higher rates of racial minorities than those zip codes with no community gardens. Zip codes with at least one community garden also have lower rates of homeownership and education while having higher median household incomes and higher poverty rates.

Table 2: Summary Racial, Ethnic, and Class Demographics

	U.S.	New York City	Minnesota	Zip Codes in NYC with a Community Garden	Zip Codes in MN with a Community Garden
Total Population	308,745,538	8,175,133	5,303,925	5,476,313	3,041,710
Percent White	78%	44%	85%	29%	80%
Percent Black	13%	26%	5%	28%	7%
Percent Hispanic	17%	29%	5%	31%	5%
Percent of zip codes with at least one community garden		56%	17%		
Owner-occupied Housing Rate	67%	33%	74%	7%	20%
Percent with Bachelors Degree or More	28%	33%	31%	25%	23%
Median Household Income	\$51,914	\$50,285	\$57,243	\$53,113	\$60,235
Poverty Rate	14%	19%	11%	22%	13%

Source: 2010 US Census; 2010 American Community Survey Estimates

Data

I used two datasets, one collected by Gardening Matters, a Minnesota-based non-profit organization focused on promoting and preserving community gardens across the state (Gardening Matters 2015). The other dataset was collected by GrowNYC, a New York City-based non-profit organization focused on improving quality of life throughout the city (GrowNYC 2015). These datasets provide a comprehensive look at the locations of community gardens throughout Minnesota and New York City. They also include information about the gardens themselves and their participants, which allowed me to examine spatial access to community gardens, as well as the goals of each garden in Minnesota, articulated either directly or through its mission statement.

Gardening Matters has collected data as part of their goal to maintain the most comprehensive database of community gardens in Minnesota (Gardening Matters 2015). The data include responses from garden organizers on various survey questions, including information on the locations, characteristics, participants, and goals of the gardens (Gardening Matters 2015). GrowNYC and Greenthumb, organizations in New York City, maintain an online database of the city's community gardens, and implemented a survey to update this information. The survey began in 2009, but is on-

going (GrowNYC 2015). The data I used in the present study were last updated in 2014. The survey focuses on the physical features and organizational structure of the gardens; however, I focused on the garden locations in this dataset because information about the goals and mission statements of the gardens were not included. I also utilized 2010 U.S. Census data on my predictor and control variables to construct my final datasets.

For my first analysis of community garden locations, I combined the data from these three sources to create one dataset aggregated up to the zip code level. This dataset includes zip code level data for both New York City and the state of Minnesota. In my further analyses of community garden locations, I used these same three data sources to create two separate datasets, one using the New York City data and the other using the Minnesota data. With these data and U.S. Census measures of zip code locations and areas, I used R and QGIS to create the two aggregated spatial datasets, both including zip code level data along with information on the physical location, size, and shape of each zip code.

In constructing datasets for my examination of community garden locations, I excluded community gardens that did not provide the zip code they were located in on the survey (5 out of 580 gardens in New York City, and 6 out of 644 gardens in Minnesota). This is likely due to the respondent of the survey not knowing their zip code or address, overlooking the question, or choosing to not respond, perhaps in the interest of maintaining confidentiality of the garden or gardeners. I also excluded zip codes for which the U.S. Census did not have 2010 census data available (2 out of 177 zip codes in New York City, and 8 out of 872 zip codes in Minnesota). This is likely due to variations of zip code structures between 2010 and the time data collection was completed, 2014-2015. I also excluded any zip codes referenced by the 2010 U.S. Census as being in Minnesota or New York City, but which reported having no neighboring zip codes (0 in New York City, 1 in Minnesota), as they weren't analyzable in the second model I use to examine this phenomenon. As only 1-2% of my data was missing overall (11 out of 1,224 community gardens and 11 out of 1,049 zip codes) I used list-wise deletion to handle missing data. My final subsets of data included 863 observations (zip codes) in the state of Minnesota, and 175 observations (zip codes) in New York City.

Finally, when examining the racial and class makeup of community garden locations and the stated goals of the gardens, I created a third dataset using U.S. Census data and community garden level data from Minnesota. These data were not aggregated up to the zip code level, as in the datasets described above; instead, the units of analyses are community gardens. As many Minnesota garden respondents did not provide information about their goals or mission statements on the survey, substantial amounts of data were missing in this dataset. However, the means and standard deviations of racial and class indicators for the sub-sample used, shown below in Table 3, exhibit little variation from the overall sample.

Table 3: Means and Standard Deviations for Variables Of Interest By Full and Sub-Sample Used for Analyses of Garden Goals in Minnesota

	Full Sample	Goals Sub-Sample
Percent White	62.821 (23.423)	63.033 (22.646)
Percent Hispanic	9.050 (7.374)	9.251 (7.666)
Percent Black	15.952 (15.081)	15.869 (14.718)
Median Household Income	507.971 (189.780)	497.060 (178.249)
Percent Bachelor's Degree or Higher	23.458 (10.838)	23.236 (10.290)
Sample Size	639	363

Standard deviations in parentheses

Median household income measured in hundreds of dollars

Source: US Census 2010; Gardening Matters 2015

Community Garden Locations

My outcome variable for this first set of analyses was the number of community gardens located within each zip code in New York City and Minnesota. My predictor variables included measures of race, ethnicity, and class. The primary racial and ethnic categories I examined are non-Hispanic black and Hispanic, with non-Hispanic whites serving as the reference group, as these categories are often discussed in the literature on the food system, alternative food programs, and community gardens (Slocum 2006; Slocum 2007; Guthman 2008; Alkon and Norgaard 2009). I used the 2010 U.S. Census to create variables measuring the percent of residents who identified as non-Hispanic black and the percent of residents who identified as Hispanic in each zip code within Minnesota and New York City. I used a broad definition of social class consistent with previous research (Allen et al 2003; Hendrickson, Smith, and Eikenberry 2006; Guthman 2008; Macias 2008; Morton et al. 2008; Alkon and Norgaard 2009; Schafft, Jensen, and Hinrichs 2009), including two contextual variables measuring aggregate median household income and the percent of people who have at least a bachelor's degree in each zip code. I also used 2010 U.S. Census data to construct these variables.

Finally, for all analyses of the Minnesota data, I again used the 2010 U.S. Census to construct a control variable indicating if the zip code was primarily urban, in keeping with previous research identifying the variations among urban and rural community gardens (Morton and Blanchard 2007; Guthman 2008; Alkon and Norgaard 2009; Hinrichs 2010; Drake and Lawson 2014). I only included this control variable with the data from the state of Minnesota, as all of the zip codes in New York City were primarily urban according to this measure. I also used U.S. Census data to control for the total population of the zip codes and the physical area of the zip codes, as these factors may also affect the number of gardens located in a zip code. It follows logically that there may be more gardens in zip codes with more people to organize and participate in them and/or more physical space for gardens to be located in.

I conducted two sets of analyses in order to best identify the relationship between racial and class composition of neighborhoods and community garden locations. First, I conducted a negative binomial logistic regression analysis to predict the number of community gardens in a neighborhood². Using this technique allowed me to accurately control for the non-normal distribution of my outcome variable: the number of community gardens located in each zip code. My predictor variables for this analysis were Hispanic, non-Hispanic black, income, and education. I controlled for total population, the physical size or area of each zip code, urban/rural setting, and whether the garden was located in New York City or Minnesota, since the dataset includes data from both locations.

Secondly, I used a spatial error model. Although this model does not allow me to accurately control for the non-normal distribution of my outcome variable as does the negative binomial regression model, it does allow me, unlike the previous model, to control for the spatial autocorrelation of community garden. The spatial autocorrelation of gardens refers to the likelihood of gardens being clustered across space, and can be controlled for with the use of a spatial regression model. Community gardens may be clustered due to reasons outside the scope of the present study, including land quality, zoning, or land-use regulations. But gardens could also be clustered simply due to exposure. Not only can ideas spread spatially (Goodchild et al. 2000), but simply knowing a neighborhood nearby has a community garden may inspire someone to start one in their own neighborhood. This type of exposure is likely to cause spatial autocorrelation in my data as well. A spatial error model, which uses a matrix information from neighboring zip codes to control for physical clustering, accounts for potential biases due to these factors, as well as from variables not directly examined here (Ward and Gleditsch, 2008). To control for the non-normal distribution of my outcome variable here, I ran fully-standardized models in these analyses.

² I also ran an ordinal logistic regression analysis and several binary logistic regression analyses to examine the relationship between the racial and class composition of zip codes and whether there were different numbers of community gardens located in a zip code (ie. 1 or more garden verses none, 2 or more gardens verses fewer, etc.). Although these techniques yielded similar results, they required me to collapse my outcome variable into categories. I therefore chose to present the negative binomial analysis, as it includes the full range of data on my outcome variable.

I began my analyses by running fully standardized ordinary least squares regressions in order to correct for the non-normal distribution of the number of community gardens in a zip code. I then ran Moran's tests on the residuals from these models. The Moran's test provides a measure of spatial autocorrelation (Ward and Gleditsch, 2008). The Moran's I for the residuals from the New York City analysis was .22 and highly significant, indicating that there was spatial autocorrelation in the data not explained by the fully-standardized ordinary least squares model. The Moran's I for the residuals from the Minnesota data was .17 and also highly significant. I then used spatial error models to control for the remaining spatial autocorrelation in order to examine the relationships between my outcome and predictor variables more accurately. In both New York City and Minnesota, Moran's tests on the residuals from the spatial error models yielded Moran's Is that were close to zero and no longer significant, indicating that the spatial error model had controlled for the remaining spatial autocorrelation. Both the AIC and BIC were also smaller for the spatial error models than for the ordinary least squares models, indicating that the spatial error model was a better overall fit for both sets of data.

Community Garden Goals

I next examined the stated goals of community gardens in Minnesota only. Unlike the data from New York City, the Minnesota data included mission statements and goals from community gardens in the survey, which I then coded using the categories of benefits found in the literature on alternative food programs and community gardens: 1) access to affordable fresh food; 2) environmental or social benefits; 3) cultural preservation or empowerment; and 4) local, organic, and sustainable food (see Table 1). The first variable I coded identifies whether the garden had goals associated with providing access to healthy affordable fresh food, often articulated as low cost food access or providing food access to low-income communities. The second identifies whether the garden had goals oriented towards environmental or social benefits. This category included goals like educating the community, beautifying the neighborhood, improving the health of participants, growing food for donation, improving the environment, building entrepreneurship skills, improving neighborhood safety, and providing food for local restaurants. The third variable identifies whether the garden had goals oriented towards cultural preservation or empowerment, often articulated by the gardens as building community, growing culturally appropriate or indigenous foods, or encouraging self-empowerment of participants. Finally, the fourth variable identifies whether the garden had goals associated with providing local, organic, and/or sustainable food, measured as the use of the words "local", "organic", or "sustainable" within the gardens goals or mission statement.

I created my four binary outcome variables indicating whether a garden articulated goals consistent with each of these categories of benefits. These variables were each coded as "1" if the goal measured by that variable was stated in the garden's goals or mission statement, and as "0" if it was not stated in the garden's goals or mission statement. I did not treat the four benefit categories as mutually exclusive; the gardens that articulated more than one of these four categories in their goals or mission statement were coded accordingly.

The predictor variables included in this set of analyses, similar to the analyses of garden locations, were the racial and class composition of communities. The racial composition of communities was assessed using the percent of residents in the community garden zip code who identify as Hispanic and the percent who identify as non-Hispanic black; the class composition of communities was defined using household income and education. Specifically, the median household income of residents located in a given community garden zip code and the percent of residents in the community garden zip code with a bachelor's degree or more. I used four separate binary logistic regression models to examine the relationship between each of my four outcome variables and these predictor variables.

RESULTS

Community Garden Locations

Negative Binomial Model

Table 4 shows the odds ratios from the negative binomial regression model predicting the number of community gardens in each zip code in both New York City and the state of Minnesota. Overall these results show that communities with more racial diversity and higher educational attainment have more gardens, whereas higher-income zip codes have fewer gardens. Higher rates of black residents in a zip code increases the number of community gardens by a factor of 1.05, as compared to lower rates of black residents in a given zip code, holding other factors constant (percent Hispanic residents, income, education, total population, zip code area, urban setting, and whether the zip code is located in New York City or Minnesota). Similarly, higher rates of Hispanic residents increases the number of community gardens by a factor of 1.04, as compared to lower rates of Hispanic residents, holding all else constant. Net of other factors, zip codes having a higher median household income decreases the number of community gardens by a factor of .997, as compared to those with lower median household income. Finally, higher rates of educational attainment increase the number of community gardens by a factor of 1.09, controlling for other factors.

Table 4: Odds Ratios from Negative Binomial Logistic Regression of Key Covariates on the Number of Community Gardens

	Base Model	Control Model
Percent Black	1.0647*** (.00774)	1.0455*** (.00442)
Percent Hispanic	1.0313*** (.00615)	1.0430*** (.00592)
Median Household Income	.997*** (.000563)	.997*** (.000450)
Percent Bachelor's Degree or Higher	1.111*** (.0106)	1.0915*** (.00817)
Total Population		1.000037*** (.000)
Zip Code Area		1.00153* (.000636)
Urban		9.598*** (2.640)
Location (NYC vs. MN)		19.0102*** (4.703)
Constant	.2406*** (.0672)	.00235*** (.00106)
AIC	1934.308	1607.397
BIC	1963.978	1656.847

Two-tailed test, Standard errors in parentheses

Median household income measured in hundreds of dollars

Source: US Census 2010; GrowNYC 2014; Gardening Matters 2015

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Spatial Error Model

Although I use negative binomial and spatial regression techniques to analyze the same relationship (the effect of racial and class composition on the number of community gardens in a given zip code), each provides different details about this relationship. The negative binomial model allows me to examine the aggregate relationship across New York City and the state of Minnesota while properly controlling for the non-normal distribution of the number of community gardens. The spatial error models, however, allow me to examine any variation in this relationship between New York City and the state of Minnesota while properly controlling for spatial autocorrelation in the data.

The results from the spatial error model for New York City are presented in Table 5. The spatial error model shows a positive relationship between a community's racial diversity and the number of community gardens. In New York City, a one standard deviation increase in the percentage of black residents in a zip code (an increase of 25 percentage points) is associated with a .31 standard deviation increase in the number of community gardens in a zip code (an increase of about 2.179 gardens), and a one standard deviation increase in the percentage of Hispanic residents in a zip code (an increase of 20 percentage points) is associated with a .26 standard deviation increase in the number of community gardens in a zip code (an increase of about 1.828 gardens).

In New York City, there is a negative relationship between household income and number of community gardens; however, this relationship is only marginally significant (with a p-value of .0524). There is also a positive relationship between education and community gardens. Though marginally significant, one standard deviation increase in the median household income in a zip code (an increase of \$27,211) is associated with a .22 standard deviation decrease in the number of community gardens in a zip code (a decrease of 1.547 gardens). A one standard deviation increase in the percentage of residents with a bachelor's degree or more in a zip code (an increase of 17 percentage points) is associated with a .33 standard deviation increase in the number of community gardens in a zip code (an increase of 2.320 gardens).

The results from the spatial error model for Minnesota are presented in Table 6. The coefficients from the spatial error model of the Minnesota data, similar to the model using New York City data, show a positive relationship between the diversity of a zip code and the number of community gardens. Here a one standard deviation increase in the percentage of non-Hispanic black residents in a zip code (an increase of 5 percentage points) is associated with a .54 standard deviation increase in the number of community gardens in a zip code (an increase of 1.866 gardens), and a one standard deviation increase in the percentage of Hispanic residents in a zip code (an increase of 4 percentage points) is associated with a .084 standard deviation increase in the number of community gardens (an increase of .290 gardens).

The coefficients in this model for my class variables are less consistent with the New York City analysis. Median household income has no significant effect on the number of community gardens in a zip code. In Minnesota there is a negative relationship between education and the number of community gardens; in New York City this relationship was positive and significant. In Minnesota, a one standard deviation increase in the percentage of the population with a bachelor's degree or more in a zip code (an

increase of 9 percentage points) is associated with a .098 standard deviation decrease in the number of community gardens (a decrease of .339 gardens).

**Table 5: Coefficients from Regression of Key Covariates on
Number of Community Gardens in New York City Zip Codes**

	Base Model	Control Model	Spatial Error Model
Percent Black	.347*** (.0795)	.360*** (.0770)	.305** (.0968)
Percent Hispanic	.257** (.0906)	.264** (.0878)	.256* (.105)
Median Household Income	-.395*** (.117)	-.273* (.118)	-.223 ⁺ (.120)
Percent Bachelor's Degree or Higher	.414*** (.117)	.418*** (.114)	.326* (.139)
Total Population		.257*** (.0733)	.254*** (.0724)
Constant	.000 (.0671)	.000 (.0650)	.00587 (.101)
AIC	461.838	451.532	436.698
BIC	480.827	473.686	462.016
Moran's I	.217***	.219***	.000573

Two-tailed test, Standard errors in parentheses

Reported coefficients are fully standardized

Source: US Census 2010; GrowNYC 2014

⁺ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

**Table 6: Coefficients from Regression of Key Covariates on
Number of Community Gardens in Minnesota Zip Codes**

	Base Model	Control Model	Spatial Error Model
Percent Black	.598*** (.0292)	.553*** (.0303)	.542*** (.0340)
Percent Hispanic	.132*** (.0271)	.108*** (.0269)	.0841** (.0276)
Median Household Income	-.0472 (.0318)	-.0690* (.0310)	.00822 (.0334)
Percent Bachelor's Degree or Higher	.0403 (.0333)	-.0126 (.0350)	-.0984* (.0386)
Total Population		.285*** (.0361)	.311*** (.0351)
Urban		-.155*** (.0372)	-.133*** (.0353)
Constant	.000 (.0253)	.000 (.0244)	.00270 (.0392)
AIC	1940.929	1884.363	1821.358
BIC	1969.492	1922.446	1864.202
Moran's I	.154***	.170***	.00777

Two-tailed test, Standard errors in parentheses

Reported coefficients are fully standardized

Source: US Census 2010; Gardening Matters 2015

+ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$

Community Garden Goals

Table 7 shows the odds ratios from the regression of different goals on neighborhood composition. This analysis reveals that gardens located in zip codes with higher rates of Hispanic and black residents are less likely to use goals associated with local, organic, or sustainable food, as compared those located in zip codes with lower rates of Hispanic and black residents (Figure 1). However, there is no statistically significant relationship between the rates of Hispanic residents in a garden's zip code and the use of goals associated with cultural preservation and empowerment. Although this relationship is only marginally significant ($P=.074$), gardens located in zip codes with higher rates of black residents are less likely to use goals associated with cultural preservation and empowerment compared to those located in zip codes with lower rates of black residents. Gardens located in zip codes with higher median household incomes are less likely to use goals associated with increasing access to affordable fresh food, but more likely to have environmental or social goals as compared to gardens located in zip

codes with lower median household incomes (Figure 2). There is no statistically significant relationship between educational rates within garden zip codes and the use of goals associated with any of the four types of benefits tested in these models.

Table 7: Odds Ratios from Logistic Regression of Key Covariates on Measures of Garden Goals (Minnesota)

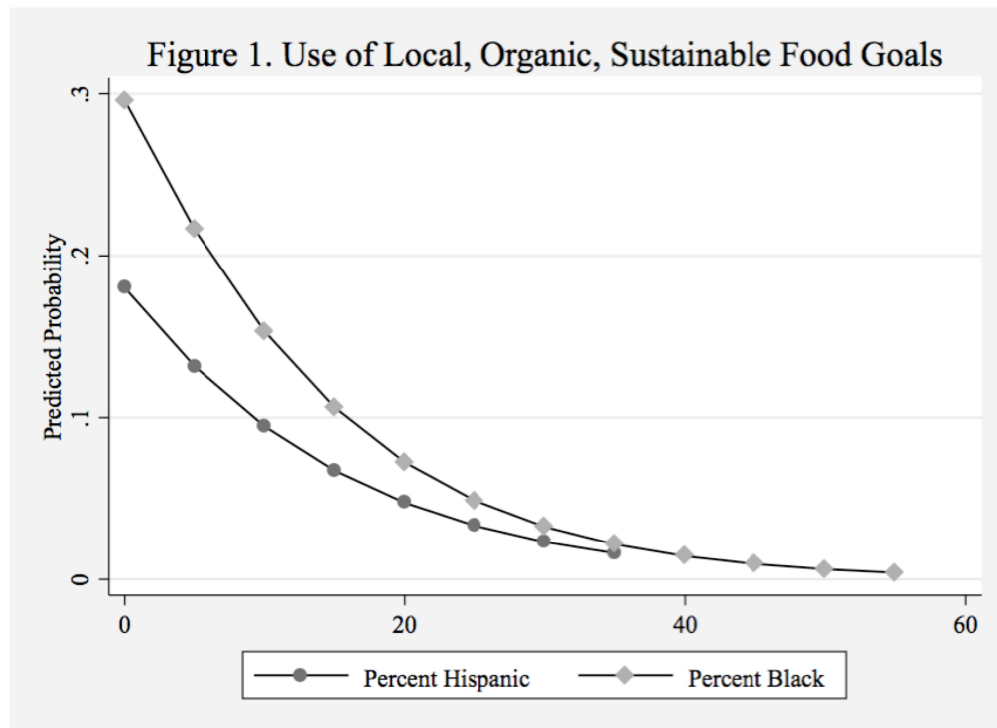
	Access to Affordable Fresh Food	Environmental or Social Goals	Cultural Preservation and Empowerment	Local, Organic, Sustainable Food
Percent Hispanic	.933* (.0276)	1.0383 ⁺ (.0202)	.992 (.0144)	.929* (.0309)
Percent Black	.969* (.0134)	1.0270* (.0115)	.984 ⁺ (.00907)	.919*** (.0203)
Median Household Income	.996** (.00123)	1.00350** (.00103)	.997** (.000866)	.996** (.00119)
Percent Bachelor's Degree or Higher	.997 (.0184)	.994 (.0150)	1.000 (.0129)	.981 (.0184)
Constant	3.199 ⁺ (2.116)	.339 ⁺ (.199)	4.464** (2.420)	8.226** (5.332)
Pseudo R2	.0877	.0489	.0227	.184

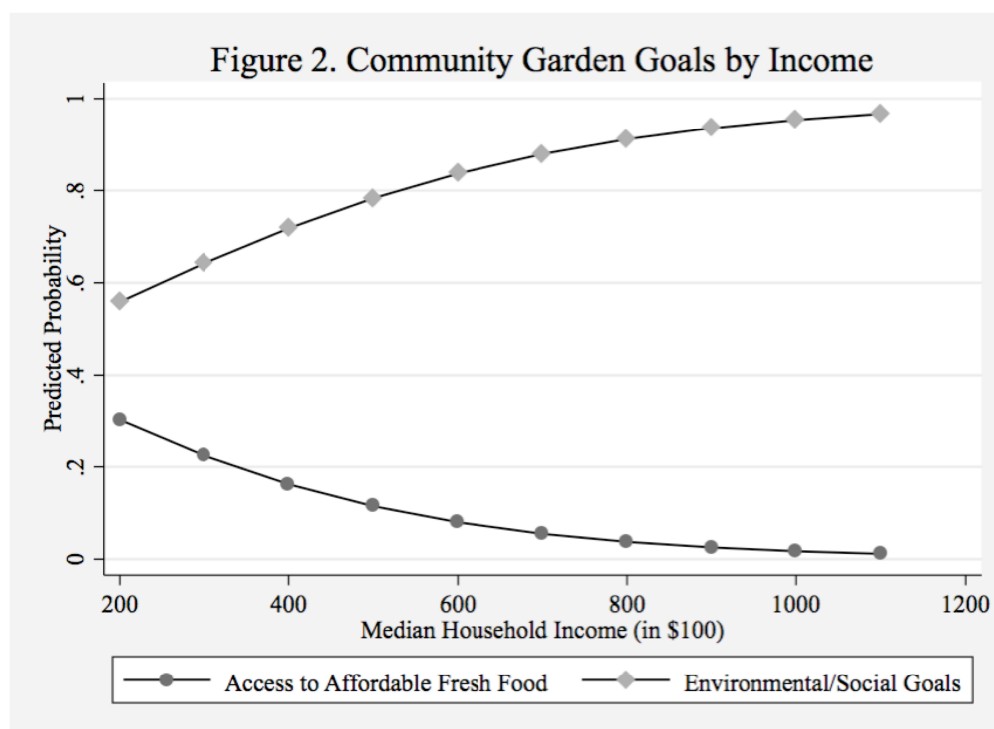
Two-tailed test, Standard errors in parentheses

Median household income measured in hundreds of dollars

Source: US Census 2010; Gardening Matters 2015

⁺ $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$





DISCUSSION AND CONCLUSIONS

Results from my examination of the effects of racial and class composition on community garden locations provide evidence contradicting my first two hypotheses. Unlike our expectation stated in Hypothesis 1a, higher-income areas appear to have fewer community gardens. Additionally, unlike our expectation in hypothesis 1b, more racially diverse areas appear to have more community gardens. Results from my analyses of the effects of racial and class composition of community garden locations on the stated goals of community gardens provides mixed evidence for my second two hypotheses. As we expected (hypothesis 2a), gardens located in higher-income areas were more likely to state environmental or social goals and less likely to state access to affordable fresh food as a goal. Consistent with hypothesis 2b, community gardens located in more racially diverse communities were less likely to focus on local, organic, or sustainable food. However, these results also provide limited evidence inconsistent with this same hypotheses (2b): community gardens located in more racially diverse communities are not more likely, and may even be less likely, to focus on cultural preservation and empowerment.

This study adds to the literature by utilizing quantitative methods to develop a more nuanced understanding of healthy food access among low-income, black, and Latino communities. By focusing on the accessibility of community gardens, this study examines the effects of race and class on access to healthy food through community gardens, and reveals the extent of the trends documented in previous literature. Given that spatial availability is often a significant barrier to accessing food within the American agrifood system, I have examined the spatial availability of community gardens by the

racial and class composition of communities. This examination helps to clarify the race and class-based barriers to participating in community gardens as alternative food programs on a broader scale, as well as the extent to which gardens are located in a similar unequal manner as supermarkets in the American agrifood system. By further examining the goals of community gardens by the racial and class composition of those communities, I clarify whether the stated goals of gardens serve the interests of the communities in which they are located, and specifically, whether community gardens are welcoming to low-income, black, or Latino communities, where they may provide real solutions to food insecurity in the U.S.

The traditional food system systematically leaves disadvantaged communities with limited access to healthy food (Allen et al 2003; Miller et al 2015). My study adds to existing literature by clarifying whether disadvantaged communities face a lack of physical access to community gardens, as is the case with access to supermarkets in the American agrifood system, or whether these communities have higher rates of community gardens, since gardens often strive to address issues disproportionately faced by disadvantaged communities. Using both a negative binomial logistic regression model and spatial error regression models, as well as data from two different types of locations, my analyses reveal that disadvantaged communities do not lack physical access to community gardens. There is, however, some indication that higher-class communities, as measured by educational attainment, have increased access to community gardens.

The negative binomial model indicated that higher rates of diversity, measured as the percentage of the population identifying as non-Hispanic black or Hispanic, and higher rates of education, measured as percent of the population with a bachelor's degree or more, were associated with increased numbers of community gardens. This model also indicated that higher median household incomes were associated with lower numbers of community gardens. This seeming contradiction between the effect of education and the effect of income may be indicating that these specific class-related phenomena operate differently with respect to community gardens. It may be the case that those with more income are more likely to seek out less time-consuming but more expensive means for getting healthy food, like shopping at supermarkets or participating in other forms of alternative food programs like community supported agriculture programs. At the same time, higher rates of education may be driving interest in community gardens among community members, as those with more education may see a broader variety of benefits associated with participating in a community garden, regardless of their race, ethnicity, or income level.

The results from the spatial regression models again indicated that zip codes with increased rates of non-Hispanic black and Hispanic residents were associated with higher numbers of community gardens. These models provided further evidence that higher-income zip codes were associated with fewer gardens; however, this finding lacks significance in these models; it is only marginally significant in the New York City data, and is not significant in the Minnesota data. The spatial regression results for the effect of education yield a more nuanced picture, where zip codes with higher rates of educational attainment in New York City are associated with an increased number of community gardens, but zip codes with higher rates of educational attainment in

Minnesota are associated with a decreased number of community gardens. This could be an indication that the initiators and maintainers of community gardens are different in New York City than in Minnesota. It's possible that gardens in New York City are more often started and maintained by local residents and that gardens in Minnesota are more likely to be started and maintained by organizations outside of the community. As education likely helps garden organizers be successful, whether it be through social capital, organizational skills, or critical thinking skills, we would expect education to have a positive effect on the number of community gardens where local residents are starting and managing gardens in their own neighborhoods. In Minnesota, however, those same potential benefits of education on garden success may be coming from outside the communities where the gardens are located through the involvement of non-profit or other organizations seeking to serve disadvantaged communities, including communities where educational attainment is lower.

The consistency of results across the negative binomial and spatial error models indicates both the robustness of my findings and the similar effects that race and class, though particularly race, have on the number of community gardens in an area. This consistency indicates a broader trend of the effects of race and class on the *physical* accessibility of fresh food from community gardens based on their locations. Overall, these findings suggests that community gardens are in good physical locations to address real issues of food insecurity and therefore diet-related health issues.

Although this study shows that community gardens are more likely to be located in more disadvantaged zip codes, this does not necessarily indicate that the disadvantaged individuals residing in these zip codes are using the gardens. As Sullivan (2014) shows is the case with an organic grocery store located in a historically disadvantaged community in Portland, Oregon, the garden participants may be newer, white and higher-income residents of the area, rather than the low-income, black, and Latino residents who may have lived in the area for a longer period of time. It's possible that the results I find are an indication of gentrification rather than an increase in food access among disadvantaged groups. As the data used in this study does not include a measure of gentrification, such as an indicator of shifts in the demographics of zip codes over time, more research is needed to investigate this more clearly.

Additionally, as Kato (2013) shows is the case with a local food market located on the edge of a predominately black community, the actual participants in community gardens may be traveling from nearby zip codes with less diversity and more affluence. Recent scholarly work utilizing qualitative methods also shows that different benefits from alternative food programs, including community gardens, tend to be valued more highly by different demographics (Guthman et al 2006; Guthman 2011; McEntee 2011; Peña 2013; Hondagneu-Sotelo 2014). It has also been shown that the framing used by alternative food programs often focuses on the benefits valued by white and high-income people, and therefore resonates more with these groups (Guthman et al 2006; McEntee 2011). It has been argued that this results in alternative food programs having an overrepresentation of white, high-income individuals among their participants (Slocum 2007; Guthman 2008).

While, unfortunately, I cannot examine the racial and class composition of actual garden participants due to data limitations³, by investigating neighborhood composition and the goals of the community gardens in diverse communities, I begin to address the question of who may feel welcomed to participate in a community garden, and whether the garden may actually serve disadvantaged residents. The relationship between the racial and class composition of garden locations and the goals of the gardens tells us something about how welcoming gardens may be to their surrounding communities. Here I found that the racial and class composition of garden locations are associated with variations in the benefits focused on by the gardens such that the garden goals may be associated with: a less welcoming environment to black Americans and Latinos, through a focus on local, organic, or sustainable food, in less diverse communities (as compared to more diverse communities); a more welcoming environment to low-income people, through a focus on access to affordable fresh food, in low-income communities (as compared to higher-income communities); and a more welcoming environment to high-income people, through a focus on environmental or social goals, in high-income communities (as compared to lower-income communities). Based on these uses of framing, community gardens located in disadvantaged communities may be successfully serving the low-income, black, and Latino residents of these communities.

However, these analyses also provide some evidence to the contrary. In particular, they provide no evidence that gardens located in more diverse communities focus on cultural preservation or empowerment, which black and Latino participants have articulated as valuable benefits of alternative food programs (Alkon and Norgaard 2009; Peña 2013; Hondagneu-Sotelo 2014). In fact, this analysis shows that gardens in zip codes with higher rates of black residents may be *less* likely to use this benefit in their goals. This indicates that the goals of gardens in Latino and, to a greater extent, black communities are not using framing that these demographics may find more welcoming. While gardens are more likely to be *located* in more diverse communities, they may still not be serving black and Latino residents of these communities.

Limitations

The present study was limited by the availability of data on the locations of community gardens across the U.S. While I was able to use data from different types of U.S. locations, New York City and the state of Minnesota, each of these locations vary demographically from the U.S. overall. These areas allowed me to examine community garden locations at both the city and state levels, as well as in two demographically different spaces. However, this study did not provide a nationally representative sample, as New York City and Minnesota only represent the North-East and the Mid-West. A nationally representative sample of community gardens would allow for more generalizable results, as each region of the country would be represented, including the West and the South. Future research should strive to collect and utilize such a dataset.

³ A brief examination of the participant demographics of the gardens in Minnesota indicate that gardens in more diverse communities are likely to have more diversity among their participants; however these results are unreliable, given the high rate of missing data on these outcome measures (90-95%).

Although the present study provided no evidence that disadvantaged communities face physical limitations to accessing fresh food through community gardens when measuring these indicators at the zip code level, future research should continue to examine this relationship with more detailed spatial data. Literature on identifying food deserts and their effects on access to healthy food has revealed variation in results based on how locations and neighborhoods are measured (McIntee and Agyeman 2010; Thomas 2010; Widener et al 2013). The use of zip codes in this study may be masking a more nuanced relationship between race, class, and community garden locations. As several neighboring communities with different demographics can be located within a single zip code, increased numbers of community gardens located in zip codes with higher rates of diversity and lower median household incomes is not necessarily an indication that there are more gardens located in the specific spaces within these zip codes where disadvantaged individuals reside. Future analysis should explore the relationships examined here using different spatial measurements that are also used in the literature on food access in the American agrifood system, including driving or walking distance to a garden for the residents of an area and the use of census tracts instead of zip codes as the level of measurement.

Future research should also strive to examine the demographics of community garden participants and continue to investigate the framing of community gardens on a systematic scale. As this study was limited by the availability of data, I was unable to examine the effects of garden locations or framing on the demographics of garden participants. However, this analysis would provide a clearer understanding of how gardens can best serve disadvantaged individuals. Similarly, more precise measures of the framing used by community gardens would also benefit the examination of this relationship.

The present study also has limited generalizability to the alternative food program literature more broadly as it focuses on one specific type of alternative food program. A comparison between community gardens and other types of local and alternative food programs would provide a broader understanding of the effect of race and class on the locations of these types of programs overall. Future research should examine the relationship between race and class and the location of other types of alternative food programs, like farmers' markets or community supported agriculture programs to help clarify this overall relationship.

Implications

These findings indicate that community gardens have real potential to provide access to healthy food among groups that have historically been excluded from such access in the American agrifood system. Activists interested in using local and alternative food programs to address food insecurity should take note of these results and focus on community gardens in particular as a means of combatting food insecurity. Specifically, organizations could do more to ensure equal access to gardens by supporting or starting community gardens in communities with lower educational rates. Activists should also ensure that community gardens are welcoming to black and Latino participants by incorporating the goals and values of these individuals into their framing. While more work still needs to be done to provide better access to healthy food through community

gardens among those who have been systematically excluded from accessing healthy food, community gardens do present a promising picture for their ability to serve disadvantaged individuals and combat food inequality.

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