Title
Modeling Community Garden Participation: How Locations and Frames Shape Participant Demographics

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Abstract

Ample research documents the health benefits of community gardens, but our understanding of the factors shaping gardener participation is limited. Neighborhood demographics and garden frames have each been theorized to play a role in shaping who participates in community gardens. Yet, our understanding of the interplay between these factors is underdeveloped and this body of work lacks consideration of the racial and class makeup of gardeners on a large scale. With a nation-wide survey that includes measures of gardener demographics (N=162), the present study considers the extent to which community garden frames and locations simultaneously shape participant demographics. I combine these factors into a conceptual model explaining community garden participation as an iterative process of framing, accessibility, and representation, all situated within a garden's surrounding community. Results show some base correlations between gardens focusing on healthy food access or symbolic food labels and gardener demographics, but ordered logistic and negative binomial regressions show stronger evidence of community demographics shaping gardener demographics. At the same time, t-tests comparing mean neighborhood and gardener demographics shows a consistent under-representation of Latinx community members among gardeners. As theorized in the model presented, community garden locations are important for shaping what demographics are represented among gardeners, but how community garden benefits are framed can limit garden accessibility, and subsequently neighborhood representation, especially for Latinx residents. This model helps illustrate the mechanisms through which garden organizers and advocates can develop more inclusive community gardens through fostering representation from people of color and the working-class.

Keywords

Community Gardens; Race and Class; Inequality; Health; Food Access

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Author biography

Katie Butterfield is a quantitative sociologist with research focused on health disparities/social determinants of health; quantitative methods and analysis; food inequality; race, class, and gender; and rural health. Currently, she studies the accessibility of community gardens across the United States and their potential to alleviate food insecurity and food desert conditions among different demographics while improving overall health and well-being. She holds an M.A. and Ph.D. in Sociology from the University of California, Merced.

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Introduction

Scholars have documented a wide range of dietary and health benefits of community gardens (Ferris et al. 2001; Twiss et al. 2003; Draper and Freedman 2010; McCormack et al. 2010; Corrigan 2011), cooperative endeavors that provide resources for people to collectively cultivate food (Lawson 2005, p. 3). Community gardens have been consistently shown to improve the physical health of their participants through improved diet, mental health, physical activity, and social interaction (Ferris et al. 2001; Twiss et al. 2003; Draper and Freedman 2010; McCormack et al. 2010; Corrigan 2011). For participants and communities they bring improved walkability and open space for physical activity, fresh garden produce, opportunities for educational and job-skill improvement, and even improved security and safety (Ferris et al. 2001; Draper and Freedman 2010). Community garden participants also benefit from a steady supply of fresh fruits and vegetables, often sharing excess with friends, family, and community (Draper and Freedman 2010; McCormack et al. 2010; Corrigan 2011). At the same time community gardens provide participants and their communities opportunities for physical activity and improved mental health (Ferris et al. 2001; Twiss et al. 2003; Draper and Freedman 2010).

Within a broader social context where racism and class inequalities lead to poorer health among people of color and the working-class (Link and Phelan 1995; Lutfey and Freese 2005; Phelan and Link 2005; Kwate 2008; Chang and Lauderdale 2009; Caspi et al. 2012), it is important to consider who participates in community gardens and what factors shape this participation. Qualitative examples of community gardens throughout existing literature paint a conflicting story about who community gardens reach (Glover et al. 2005; Lawson 2007; Hale et al. 2011; Cohen et al. 2012; Kato et al. 2014; Aptekar 2015; White 2017; Braswell 2018; Butterfield 2020). And some scholars argue that community gardens should be thought of as simultaneously perpetuating and resisting systems of inequality (McClintock 2014; Alkon et al. 2020). In some instances, working-class gardeners and gardeners of color are systematically excluded from community gardens through the use of framing - language used to describe the main goals, benefits, and/or mission of the community garden - that focused on environmental

preservation and symbolic food labels, like "local" and "sustainable"[1] (McEntee 2011; Aptekar 2015; Becker and McClintock 2020). Yet community gardens have been used as cites of resistance to structural inequality by the working-class and people of color for many years (Saldivar-tanaka and Krasny 2004; White 2018; Myers et al. 2020).

At the same time, a focus on representation is key for building inclusive community gardens with long tenure, meaning that they sustain for many years (Armstrong 2000a; Mundel and Chapman 2010). By representation, I mean the extent to which different demographic groups are present in community gardens at similar rates to the overall population. Some scholars assume community gardens are representative of their surrounding communities when they use neighborhood demographics as a proxy for participant demographics (Braswell 2018; Butterfield 2020). Community garden locations may very well set the context for participation through limiting who is in close physical proximity to the garden. However, limits on garden accessibility (gardens being welcoming and usable spaces for all) can prevent representation of some groups among gardeners (Armstrong 2000a; Mundel and Chapman 2010; Aptekar 2015). Intentional inclusion of low-resourced groups within the garden organizational makeup can foster representation of these groups within the garden, in part through the development of garden framing that supports accessibility (Armstrong 2000a; Mundel and Chapman 2010).

Locations and frames have both been theorized to play a role in shaping what demographics are represented in community gardens. Yet, our understanding of the interplay between neighborhood demographics, representation, framing, and accessibility is underdeveloped and this body of work lacks consideration of the racial and class makeup of gardeners on a large scale. The present study therefore combines these factors into a single conceptual model explaining community garden participation and assesses the impacts of (1) the benefits garden managers focus on and (2) neighborhood racial and class demographics on the race and class makeup of community gardens participants. With survey data from community garden managers across the United States, coupled with U.S. Census data, I investigate the extent to which the (1) benefits community gardens focus on and (2) neighborhood demographics of garden locations are associated with the presence of different demographic groups among garden

1 Symbolic food labels are labels like "local," "organic," or "sustainable" that may signal to White alternative food program participants in particular that a food should be considered healthy (Butterfield and Ramírez 2020; Guthman 2011).

participants. I explore these relationships using a correlation matrix, t-tests, and regression models. I find that neighborhood demographics seem to play a more central role in shaping what racial and class groups participate in community gardens than the benefits the gardens focused on. However, I also find evidence that the benefits gardens focus on are correlated with participant demographics and may function to exclude Latinx residents from participating in community gardens.

Background

Community garden participation

The affordability of community gardens suggest that they may be accessible among the working-class. Among alternative food programs, community gardens have comparatively low participation and development costs. Though community supported agriculture programs often require an up-front cost of about $200-$700 each year (Hinrichs and Kremer 2002; NCAT 2019; Roos 2020), one representative community garden starting guide recommends charging $32 per year to cover their costs (Surls et al. 2001). A more recent community garden handbook from North Carolina notes that charging "between $5 and $50 per plot annually is common practice for community food gardens" (Boekelheide and Bradley 2017, p.56)[2]. The startup cost of building a community garden is also relatively small. Some community gardens can be built for as little as $2,500-$5,000, or even less with support and supplies from local businesses (Surls et al. 2001; Boekelheide and Bradley 2017).

Qualitative examples of gardens serving predominately Black, Latinx, and low-income communities also point toward their accessibility among these populations. For example, White (2017) highlights the founder of a community garden in Detroit, who empowers her Black community through starting and maintaining the garden with her family and neighbors. In another example, South Central Farm in Los Angeles was started in the early 1990s and maintained by over three-hundred families, most of whom were Mexican and Central American immigrants living in the surrounding community (Lawson 2007). Low-income ethnic minorities are also consistently present among NYC community gardeners, despite their systematic

2 The cost of community garden participation was similar within the data presented in this paper, which was collected between 2015 and 2017 and is described further in the Methods section below. In this sample, 40% of respondents reported an annual garden fee of $30 or less, and 85% reported an annual garden fee of $60 or less.

exclusion from accessing important city and non-profit resources (Cohen et al. 2012; Reynolds 2015; Reynolds and Cohen 2016).

However, other work suggests community gardens lack accessibility among Black, Latinx, and low-income populations, instead predominately serving well-educated White communities. In a study on the importance of aesthetics for community garden health outcomes, more than 70 percent of interview respondents from 28 different gardens across Denver, Colorado identified as non-Hispanic White (Hale et al. 2011). For comparison, only about 52% of the overall population of this city identified as Non-Hispanic White on the 2010 U.S. Census (U.S. Census Bureau 2022a). College-educated Americans have also expressed interest in community gardens, likely playing a substantial role in shaping garden goals, outcomes, participant demographics, and even locations (Kato et al. 2014; Aptekar 2015). In post-hurricane New Orleans, for example, the development of community gardens for food was largely organized and carried out by college-educated individuals coming into the city specifically to work on community gardening projects (Kato et al. 2014). Further, most community garden survey respondents in St. Louis, Missouri had completed a college or graduate level degree (Glover et al. 2005), while less than 30% of the city had a bachelor's degree or more in St. Louis as late as 2010 (U.S. Census Bureau 2022b).

Community garden goals, frames, and accessibility

The meaning and purpose of community gardens also remains contested (McClintock 2014; Alkon et al. 2020), as evidenced by a wide range of goals and frames leveraged within different gardens (Butterfield and Ramírez 2020). These goals and frames are often present in the mission statements and other publicly available community garden content, but several scholars have described them shaping how gardeners participate in the gardens, as well as how they interact with one another and the surrounding community (Saldivar-tanaka and Krasny 2004; McEntee 2011; Aptekar 2015; White 2018; Becker and McClintock 2020; Myers et al. 2020). Butterfield and Ramírez (2020) provide an outline of the common frames of community gardens across Minnesota, finding that garden managers often used frames in their garden missions and goals that reflected values of greater good and community orientation. To a lesser extent, the frames encompassing healthy food access, food donation, and self-empowerment; symbolic food

labels like “local”, “organic”, and “sustainable” were also used (Butterfield and Ramírez 2020). Other work has identified the unique resonance of the frames of healthy food access and self-empowerment among working-class, Black, and Latinx participants of alternative food programs like community gardens and farmers markets (Lawson 2007; Alkon and Norgaard 2009; McEntee 2011; White 2018; Myers et al. 2020). For example, McEntee (2011) describes working-class alternative food program participants seeking access to healthy or fresh food as a broadly defined concept that included hunted meat and lacked emphasis on symbolic food labels. At the same time, White, middle-class alternative food program participants often use frames focusing on greater good goals or symbolic food labels that signaled specific definitions of healthy food (Guthman 2011; McEntee 2011; Aptekar 2015; Becker and McClintock 2020). However, without broad scale measures of participant demographics, this work has yet to fully consider the impact of these frames on the accessibility of community gardens among Black, Latinx, and working-class participants.

Important examples in existing research show that when community gardens focus on goals and frames consistent with symbolic food labels or supporting a greater good, White, well-educated, and middle-class gardeners become over-represented, and the gardens can be less accessible to working-class people of color (Aptekar 2015; Becker and McClintock 2020). For example, one New York City community garden gradually took up a green space vision that primarily resonated with White, well-educated, middle-class gardeners and focused on maintaining a lush, green, and orderly space that upheld White, middle-class understandings of acceptable gardening methods and building materials (Aptekar 2015). While this vision of the garden was in conflict, sometimes quite directly, with other visions for the garden supported by non-White and working-class gardeners, it prevailed with strategic connections to institutional support from the city and non-profits (Aptekar 2015). Ultimately, this limited the ability of non-White and working-class gardeners to fully participate in the garden and rules prevented gardening techniques and physical structures that were commonly used among this group (Aptekar 2015). Another example comes from Portland, Oregon, where the gardener demographics of a local orchard shifted from residents of the neighboring public housing complex to mostly White, middle-class residents of communities further away (Becker and McClintock 2020). This change happened slowly as non-profit support for the orchard pushed

the goals of the garden away from neighborhood residents growing food for themselves, to more holistic goals of distributing food to a broader range of low-income people and educating people about food and fruit trees (Becker and McClintock 2020). Along with these changes in goals, came more sustainable gardening practices that the public housing residents found unappealing, and more strict rules about participation that these same residents found challenging to comply with; both of these factors limited their participation (Becker and McClintock 2020).

At the same time, community gardens have been harnessed as aspects of broader social movements to resist racism and class inequalities (White 2018; Myers et al. 2020), utilizing goals and frames focused on healthy food access and empowerment and maintaining accessibility among people of color and the working-class. For example, Booker T. Washington, George Washington Carver, and W.E.B. Du Bois all envisioned agriculture as supporting wellness and as an integrated aspect of resistance and independence strategies for Black Americans (White 2018). From Fannie Lou Hamer's Freedom Farm Cooperative, founded in 1967, to the present-day Detroit Black Community Food Security Network, Black Americans have used community gardens to access their own fresh food, and as strategies to build economic autonomy (White 2018). East New York Farms! is yet another organization that supported working-class communities of color, dis-invested in by the local government, by supporting residents growing their own food as a resistance strategy to lacking fresh food access in their communities (Myers et al. 2020).

Representation and community garden tenure

Limited work on community gardens directly considers their distribution across demographically different locations. These studies rely on the largely untested assumption that community gardeners are a representative sample of neighborhood residents. For example, in her analysis of the locations of community gardens across New York City, Butterfield (2020) finds an increased presence of community gardens in low-income, Black, and Latinx communities and suggests their accessibility among these groups follows from this prevalence. This argument is supported by various researchers and activists who have consistently fought to build recognition of the community gardening work of oppressed populations within the city (Cohen et al. 2012; Kato et al. 2014; Aptekar 2015; Reynolds 2015; Reynolds and Cohen 2016; Campbell 2017;

Myers et al. 2020). Other work considering the locations of community gardens draws different conclusions about their accessibility. Connecting community gardens to the gentrification process within St. Louis, Missouri, Braswell (2018) finds an association between the presence of community gardens and an increase in higher-socioeconomic residents in the area, indicating their limited accessibility among oppressed populations.

Other work more directly considers the impact and importance of fostering representation for shaping the goals, frames, and ultimately accessibility of community gardens. For example, Armstrong (2000a) argues that engaging disadvantaged communities rests, in part, on incorporating active community members as leaders and decision-makers in the community garden. Armstrong (2000b) points out that even the physical structure of a garden can be important, citing the lack of fencing around a garden influencing the local Native American community to feel more welcome to participate and support it. The garden in Mundel and Chapman's (2010) study actively promotes decolonization through participatory teaching styles, incorporation of participants' cultural histories and related foods, acknowledgment of participants' colonized experiences, and a focus on holistic health of individual participants along with that of society and the world more broadly. All of this was possible because Mundel and Chapman (2010) took care to incorporate study participants and community leaders in the development and decision-making process of the garden.

Representation is also important to consider because of its connection to garden tenure. Aptekar (2015), as well as Becker and McClintock (2020), describe participation challenges stemming from community gardens focusing on greater good and symbolic food labels in working-class communities of color. While the tenure of these gardens is unspecified within this research, lack of interest is a consistent reason that community gardens close as reported by community gardening organizations of all sizes (Drake and Lawson 2015). Three out of the top five most frequently addressed challenges community garden organizations faced were related to gardener involvement; over half of organizations regularly addressed "Getting new people involved" (62%), "Keeping people involved long term" (61%), and "Recruiting volunteers" (56%) (Drake and Lawson 2015). Other work on retail inequality and food desert outcomes points more directly to the relationship between framing miss-match and program failure (Kolb 2022). Kolb (2022) argues for seeing the food desert debate as more than about food and health,

but about structural inequality and a dis-investment in poor communities of color. Food deserts are communities with few grocery stores located in them, often while facing other forms of dis-investment (Kolb 2022). Food desert interventions were largely unsuccessful because they focused on health and nutritional goals rather than recognizing and centering the goals and needs of the communities they targeted, mainly empowering these communities in ways that resisted decades of racism and government disinvestment (Kolb 2022). Similarly, community gardens that frame their benefits and goals in ways that do not resonate with community residents are likely to struggle with participation and may close.

In sum, existing research presents a complicated picture of community garden participation, but lacks systematic consideration of the demographics of actual gardeners. This paper presents a participation framework that simultaneously considers neighborhood demographics, representation, framing, and accessibility. I test this framework with an analysis of the impact of community garden locations and frames on gardener demographics among a national sample of community gardens. I ask: (1) to what extent are the benefits community gardens focus on associated with the presence of different demographic groups among garden participants?, and (2) to what extent are the demographics of garden locations associated with the presence of different demographic groups among garden participants?

Hypotheses

I first hypothesize that the benefits garden managers focus on will be associated with the benefits valued among the demographics within that garden. I expect several of the frames used in community gardens – greater good, healthy food access, empowerment, and symbolic food labels (Butterfield and Ramírez 2020)[3] – to be associated with the presence of different demographic groups within the gardens in the present study. Scholars have highlighted the exclusionary impact of gardens focused on sustainability and aesthetics (Aptekar 2015; Becker and McClintock 2020), and the focus on basic needs and resisting structural oppression in more inclusive gardens (White 2018; Myers et al. 2020). Based on this work, I expect:

3 While existing work identifies greater good and empowerment as important benefits as described in the present paper, I was unable to fully consider these measures in the analyses presented here (due to a lack of variation within my data that I discuss later in the paper) and have therefore excluded them in these hypotheses.

Hypothesis 1a: gardens where the manager focused on healthy food access[4] will be associated with more Black, Latinx, and working-class participants than gardens without this focus.

Hypothesis 1b: gardens where the manager focused on symbolic food labels will be associated with more White and middle-class participants than gardens without this focus.

Secondly, I hypothesize that the demographics of the neighborhoods in which gardens are located will correlate with the demographics of garden participants. Here I test the assumption of existing scholarship that the demographics of community garden locations implicate participation among different demographic groups (Braswell 2018; Butterfield 2020).

Hypothesis 2a: gardener class will have a positive relationship with neighborhood median household income and/or education rates.

Hypothesis 2b: rates of Black and/or Latinx gardeners will have a negative relationship with rates of White neighborhood residents.[5]

Hypothesis 2c: on average, the rates of different racial and class demographics among garden participants will match the rates of these same groups among neighborhood residents.

Methods

Data

4 Here healthy food access represents a focus on basic needs, in contrast to the more restrictive identification of what people should be eating that comes with a focus on symbolic food labels.

5 The rate of White neighborhood residents was used to holistically consider community racial makeup without over-complicating the regression models and introducing issues of multi-coliniarity that would have been present with the individual consideration of White, Black, and Latinx residents within the same models. The comparison of rates of Black gardeners and residents, as well as rates of Latinx gardeners and residents, are more directly considered in Hypothesis 2c.

This quantitative study includes analyses of data collected by myself and a Co-PI from community garden leaders across the United States via an original online survey that took place between 2015 and 2017. The survey was designed using Qualtrics and included separate but overlapping sets of questions for gardeners and managers. Along with survey participant and garden demographic information, we asked about production, benefits, organizational makeup, physical structures, and policies of their community gardens; we also asked about health and wellness of the gardeners, and food sales and related policies within the garden. The gardeners and managers were invited to participate in the survey through the American Community Garden Association newsletter, and through fliers handed out at the American Community Garden Association 2015 and 2016 Conferences. We also invited an additional ten community gardens from each state in the United States to participate in the survey. We used the first ten Google entries with identifiable gardens and contact information available; we searched for "community gardens in [each state]" to identify these gardens. The survey had a total of 342 completed responses, 162 from garden managers and 180 from gardeners. Data from the managers are the focus of this paper as we asked them to provide summary demographic information for their garden participants, which is our outcome of interest here.

Garden names, and limited location information provided by survey respondents were then used to collect publicly available garden addresses from online sources using Google. ArcGIS Pro 2.4.0 was then used to geocode the gardens using the addresses we collected. We then spatially joined census tract level measures of income, education, and race using 5-year American Community Survey estimates for 2014-2018 (U.S. Census Bureau 2019), prepared and formatted for ArcGIS by ESRI through the Living Atlas project (ESRI 2019).

[TABLE 1 ABOUT HERE]

[TABLE 2 ABOUT HERE]

My outcome variables are the class of garden participants, and the number of garden participants who were either Black or Latinx (Tables 1 & 2). To measure the class of garden participants, we asked garden managers "How would you describe the typical class of the garden

participants?" We provided the response options "Upper-class," "Middle-class," "Working-class," and "Poor." The overall survey was rather long, so in an effort to avoid participant drop-off or fatigue, we did not provide definitions of these categories or any other instruction on how this question should be answered. To measure the racial makeup of garden participants, we asked garden managers "How many gardeners represent the racial/ethnic groups listed below?" with open response space for each of the following categories: "White," "Black or African American," "American Indian or Alaskan Native," "Asian," "Native Hawaiian and Other Pacific Islander," "Latino/a or Hispanic," and "Some Other Racial or Ethnic Identification." We also noted "If no participants identify with one of these racial/ethnic groups, please indicate this with a 0."; however, upon inspection of the data, it became evident that several managers left categories blank in these instances. To avoid these data points being missing, we re-coded entries to 0s when the sum of the number of participants in other racial/ethnic groups matched the total number of gardeners. In this study, I focus on the numbers of either Black or Latinx gardeners[6], the number of Black gardeners, and the number of Latinx gardeners as outcome variables measuring the race of garden participants[7]. I also utilized gardener demographics as control variables in each model. When predicting the race of gardeners as described above, class was controlled for; when predicting class, race was controlled for.

For testing my first hypothesis, the main predictor variables measuring garden benefits come from a survey question asking garden managers "Of the following, what would you consider the most significant benefit resulting from your garden?" Response options included "Food affordability and access," "Environmental benefits," "Social benefits/Increased social networks," "Cultural preservation," "Participation in local, organic, fresh food," "Self-empowerment/Self-reliance," "Community organizing/building," and "None of the above".

6 The number of either Black or Latinx participants is a combined measure representing the sum of the number of Black and the number of Latinx gardeners in each garden.

7 I also considered the number of White gardeners and the number of non-White gardeners (calculated as the total number of gardeners minus the number of White gardeners), but the garden benefits had no significant relationships with these outcome variables. I therefore excluded them from this paper. Impacts of control variables and neighborhood demographics (class of the garden participants, neighborhood racial makeup, neighborhood income, and neighborhood education) were substantively similar to the models presented in the results section of this paper.

While we asked about a wide range of community garden benefits in other areas of our survey (including food donation and sale, skills building, community development, food purchasing habits, and general health), this was a forced choice question intended to clarify one main goal/benefit of the garden framing. However, garden managers may have considered these other benefits when answering this question. For example, some may have considered food donation to be part of our "Food affordability and access" category.

In their content analysis of community garden mission statements and goals, Butterfield and Ramírez (2020) identified 6 benefits consistently highlighted: greater good, community orientation, healthy food access, food donation, self-empowerment, and symbolic food labels. In keeping with this research, I created binary variables (Table 2) measuring whether or not the garden manager identified each of five benefits[8]: greater good included the response "Environmental benefits," community orientation included both "Social benefits/Increased social networks" and "Community organizing/building," healthy food access included "Food affordability and access," self-empowerment included "Self-empowerment/Self-reliance," and symbolic food labels included "Participation in local, organic, fresh food."

For testing my second hypothesis, main predictors include the demographics of the neighborhoods in which the gardens are located, as measured by census-tract level 5-year (2014-2018) estimates from the American Community Survey (U.S. Census Bureau 2019)[9]. As measures of neighborhood class, I included neighborhood income, measured as the median household income in $1,000 increments of a census tract, and neighborhood education, measured as the percent of residents 25 years old or older who had a bachelors degree or more education. I measured neighborhood race through the percent of census tract residents who identified as non-Hispanic White.

Analyses

8 While Butterfield and Ramírez (2020) identified an additional category – food donation – in their work, we had not included a response option that corresponded to this category in our survey. I was therefore unable to consider this category in the present study.

9 I also included gardener demographics as controls where relevant: I controlled for gardener class, as described above, when predicting gardener race; I controlled for the percent of gardeners identified as White (calculated from the number of White gardeners and the total number of gardeners) when predicting gardener class.

I first examine existing published research on community gardens to build a conceptual model that considers the cyclical connections between neighborhood demographics, representation, framing, and accessibility in shaping who participates in community gardens. I then consider my first set of hypotheses (1a and 1b) that benefits will be associated with gardener participant demographics with a correlation matrix and regression models. I consider my second set of hypotheses (2a, 2b, and 2c) that neighborhood demographics will be associated with garden participant demographics using regression models and a set of t-tests. To more thoroughly test my conceptual model I also consider the interplay between benefits and neighborhood demographics in shaping participant demographics with regression models that include both benefits and neighborhood demographics.

I used ordered logistic regression to examine the class of garden participants because the outcome categories for this variable are ordered categories. Because each measure of race was a numeric count of gardeners of that race (creating a non-normal distribution), I used negative binomial regression to examine race outcome variables[10]. To avoid variations in numbers of Black and/or Latinx participants due to the size of the garden itself, I include the total number of gardeners (measured as "For your garden, please indicate the number of: Total gardeners:" on the survey) as an exposure variable in all negative binomial models. In each regression model predicting gardener class, I controlled for the racial makeup of garden participants by including the percent of garden participants identified as White. Similarly, in each regression model predicting gardener race, I controlled for gardener class.

To examine Hypothesis 1a and 1b, I first used a correlation matrix to examine the base correlations between each of my measures of garden benefits (greater good, community, healthy food access, self-empowerment, and symbolic food labels) and each of my measures of garden participant race and class (estimated gardener class, percent of gardeners White, percent of gardeners Black, and percent of gardeners Latinx). This will indicate the presence of these correlations as well as their direction. Then, for each outcome measure (class, Black & Latinx

10 I used negative binomial regression instead of Poisson regression because the means ($Mean_{B\&L}$ = 30.13; $Mean_{Latinx}$ = 8.13; $Mean_{Black}$ = 22.31) were much lower than the variances ($Variance_{B\&L}$ = 41,172.37; $Variance_{Latinx}$ = 1,122.07; $Variance_{Black}$ = 29,806.54). In the base models, likelihood ratio tests for the alphas measuring overdispersion are also statistically significant at the .001 level, indicating that the alphas ($Alpha_{B\&L}$ = 1.27; $Alpha_{Latinx}$ = 3.00; $Alpha_{Black}$ = 2.25) are not equal to 0 and that there is overdispersion in the outcome variables. This suggests that the negative binomial regression model is a better fit than the Poisson regression model.

gardeners, Latinx gardeners, and Black gardeners), I tested the relationship between each of 2 of the 5 benefit categories (healthy food access and symbolic food labels[11]) and the outcome variable independently while controlling for the other gardener demographic using the appropriate regression model as described above. These models test the relationship between the most important benefit of a garden as reported by the garden manager and the demographics of the garden participants. To test my second set of hypotheses, I tested neighborhood income, neighborhood education, and rates of White residents in the neighborhood as predictors for each garden participant demographic category (class, Black & Latinx, Latinx, and Black), while controlling for the other gardener demographic. Lastly, to increase clarity on the interplay between these two sets of predictors (benefits and neighborhood demographics), I included all predictors in full models of each outcome.

While the regression models used to test my second set of hypotheses will show overall correlative trends between neighborhood demographics and gardener demographics, they will not as easily demonstrate how closely aligned gardener demographics are with the demographics of their surrounding neighborhoods. To further demonstrate the relationship between neighborhood and participant demographics, I compared the mean values of each demographic measure within the gardens and census tracts. Paired t-tests were used to assess differences between mean rates of participant race/ethnicity and mean rates of neighborhood race/ethnicity. The data lacked sufficient detail to make similar statistical comparisons with respect to class, as participant class was assessed with a single measure, estimated by garden managers, rather than detailed estimates of actual income and education rates of garden participants.

Results

Conceptual model

Here, I develop a complex conceptual model explaining gardener participation that combines aspects of existing work on accessibility, goals/frames, and representation within community gardens (Figure 1). This model theorizes garden participation, and ultimately tenure,

11 Greater good and self-empowerment were excluded in these analyses due to the lack of variation in responses to these options (see Table 2 for details). Community orientation was also excluded from regression models because it was not a main area of interest in this study and showed no statistically significant relationships with gardener class or race measures.

as an iterative process situated within community garden locations. The locations of community gardens shape who is available to participate. Neighborhood demographics of these locations are likely the pool from which gardeners are drawn (Braswell 2018; Butterfield 2020). Without external forces limiting garden accessibility, gardeners should be representative of the communities in which their gardens are located. At the same time, gardeners can and often do shape the goals and/or frames the garden uses (Armstrong 2000a; Mundel and Chapman 2010). These frames and goals impact who feels comfortable participating as well as other aspects a garden's accessibility (Aptekar 2015; White 2018; Becker and McClintock 2020; Myers et al. 2020). Gardens lacking accessibility among certain demographics may fail to fully represent their local neighborhoods, if certain groups within that neighborhood feel excluded or face other barriers to easily joining the garden. This lack of representation, demonstrated through a lack of community interest or volunteer commitments, can ultimately lead to garden closure (Drake and Lawson 2015). If and when community gardens remain, garden participants continue to shape the goals and frames of the garden, which continue to impact garden accessibility and further community representation, and so on.

[FIGURE 1 ABOUT HERE]

This model helps explain how and when different groups of people participate in community gardens. Gardens with many non-White and working-class participants are likely located in non-White and working-class communities, but also focus on representation of community leaders within these groups, who help ensure that the goals and frames of the garden meet the needs of community members (Armstrong 2000a; Mundel and Chapman 2010). Without ensuring that the garden frames and goals align with local residents, gardens started in dis-invested communities may lack participation from the local community (Armstrong 2000a), placing them at risk of closing (Drake and Lawson 2015). Kolb (2022) describes a similar pattern in food desert interventions: these were largely unsuccessful because they focused on health and nutrition, which were goals of those implementing the intervention, rather than the more community-investment and racial-justice oriented goals of food desert residents.

This model also helps explain the effects of rapid changes in neighborhood demographics on community gardens. Even community gardens established with goals of food access and empowerment in communities with many long-time non-White, working-class residents have been marketed as green spaces to draw new, middle-class and White residents to historically marginalized neighborhoods (Alkon and Cadji 2020). As these newer, White and middle-class resident gain representation in a community garden, however, they may leverage their institutional connections and social capital to change the goals of the garden to more closely align with White, middle-class desires for the space that subsequently make the space unwelcoming to non-White and/or working-class residents, regardless of how long they have lived in the area or participated in the garden (Aptekar 2015; Becker and McClintock 2020). These changes likely affect representation of neighborhood residents within the garden, even as communities continue to see demographic change.

Primary benefit of the community garden

Table 3 shows the correlations between the demographic makeup of community garden participants and each of the frames used in the gardens. This analysis shows three notable correlations that support my first set of hypotheses. First, there is a statistically significant negative correlation between gardener class and the use of healthy food access frames, meaning that gardens where participants are lower-class were more likely to use healthy food access framing. Second, the use of symbolic food labels was positively associated with gardener class, indicating that this frame was more likely to be used in gardens with middle- and upper- class participants. Third, the rate of Latinx gardeners was negatively associated with the use of symbolic food labels. In other words, gardens using symbolic food labels had lower rates of Latinx gardeners. What's unclear from these correlation coefficients is the roles of conflating factors in shaping these relationships.

[TABLE 3 ABOUT HERE]

Table 4 shows odds ratios from ordinal logistic regression of garden participant class on measures of the primary benefit of a community garden. These models clarify the relationships

identified in Table 3 by controlling for gardener race. Benefit Model 1 shows that, after controlling for the race of garden participants, focusing on healthy food access is associated with a decrease in the odds of the garden participants being higher class by a factor of .27 or 73% (OR=.27; 95%CI=[.10, .74]). However, once the neighborhood demographics are included in the model, the impact of a healthy food access focus falls and is no longer statistically significant (Full Model 1). We see a similar pattern in statistical significance when considering the impact of managers focusing on symbolic food labels as the primary benefit from their garden (Table 4). Benefit Model 2 shows that focusing on symbolic food labels is associated with an increase in the odds of the garden participants being higher class by a factor of 2.74 or 174% (OR=2.74; 95%CI=[1.09, 6.87]), holding gardener race constant. And once again, with the inclusion of neighborhood demographics in the model (Full Model 2), symbolic food labels is no longer a significant predictor of the class of garden participants. These full models suggest that the garden benefits are less prominent drivers of gardener class than neighborhood demographics.

[TABLES 5a through 5c ABOUT HERE]

Tables 5a through 5c show incident rate ratios from negative binomial regression of number of gardeners who the garden manager identified as Black and Latinx (Table 5a), Latinx (Table 5b), and Black (Table 5c) on measures of the primary benefit of a community garden. While the correlations outlined above (in Table 3) suggest a relationship between the use of symbolic food labels and rates of Latinx participants, these regression models (Benefit Models 3 and 4 in Table 5a, Benefit Models 5 and 6 in Table 5b, and Benefit Models 7 and 8 in Table 5c) show that, once the class of gardeners was controlled for, symbolic food labels had no statistically significant impact on gardener race. Further, when neighborhood demographics are included in the models (Full Models 3 and 4 from Table 5a, Full Models 5 and 6 from Table 5b, and Full Models 7 and 8 from Table 5c), the roles of garden benefits were also not statistically significant, and neighborhood race seems to be a more prominent predictor of Latinx participation (Full Models 5 and 6 from Table 5b).

Location of the community garden

Table 4 shows statistically significant and similar relationships between neighborhood income and neighborhood education on the class of garden participants when controlling for race at the garden and neighborhood levels, and when two different benefits were considered: healthy food access and symbolic food labels. Neighborhood Model 1 indicates that a $1,000 increase in median household income of the garden's census tract was associated with an increased likelihood of the gardeners being higher-class by a factor of 1.036 or 3.6% (OR=1.036; 95%CI=[1.014, 1.059]). At the same time, a one percentage point increase in the rates of garden census tract residents 25 years old or older having at least a bachelor's degree was associated with an increase in the likelihood of gardeners being higher-class by a factor of 1.043 or 4.3% (OR=1.043; 95%CI=[1.011, 1.076]). These relationships remain statistically significant and substantively similar once including benefits in these models (see Full Model 1 and Full Model 2 from Table 4).

Tables 5a through 5c also show that neighborhood racial demographics predict garden racial demographics, especially for Latinx participants. In Neighborhood Model 2 (Table 5a), a one percent increase in the rates of garden census tract residents who identified as non-Hispanic White was associated with a decrease in the number of Black and Latinx participants in the garden by a factor of .981 or 1.9% (IRR=.981; 95%CI=[.971, .9915]), controlling for the class of garden participants, neighborhood income, and neighborhood education rates. Similarly, in Neighborhood Model 3 (Table 5b), a one point increase in the rates of White neighborhood residents was associated with a decrease in the number of Latinx garden participants by a factor of .965 or 4.5% (IRR=.965; 95%CI=[.949, .982]). These relationships remain similar in significance and substance once benefits are included in the models (see Full Models 3 and 4 in Table 5a and Full Models 5 and 6 in Table 5b). Rates of White neighborhood residents was not a significant predictor of the number of Black garden participants in Neighborhood Model 4 or Full Models 7 and 8 (Table 5c).

Lastly, Table 6 shows the mean values of each demographic measure within the gardens and census tracts broken out by different sub-categories for income, education, and racial make-up of the census tracts. This table demonstrates the consistency between neighborhood demographics and community garden participant demographics over several sub-categories. For example, among low-income census tracts (those with a median household income less than the

sample mean of $64,007), garden participants within 51% of the gardens were characterizes as working-class, consistent with the average neighborhood income of $39,907 (Table 6). Among census tracts with an average or above-average median household income, garden participants within 74% of the gardens were characterized as middle-class, consistent with the average neighborhood income of $95,177 among this sub-category (Table 6). Similarly, the class of garden participants tracked with the education rates of neighborhoods. Census tracts with below-average (<40%) rates of residents with bachelor's degrees (on average, 20% had at least a bachelor's degree) had gardens with working-class participants. In contrast, well-educated census tracts (≥40%) had middle-class garden participants and an average 62% of residents with a bachelor's degree (Table 6).

[TABLE 6 ABOUT HERE]

Table 6 also shows that the racial makeup of garden participants was similar to the racial makeup of neighborhoods, with some over-representation of White participants, and, more consistently, under-representation of Latinx participants that reached statistical significance in paired t-tests of difference in means. Among census tracts with lower-than-average (<58%) White residents, rates of White garden participants (45% on average) were significantly ($p = .004$) higher than rates of White neighborhood residents (31% on average); however, these rates were similar within census tracts with at or above-average (≥58%) rates of White residents: on average, 76% of garden participants were White and 77% of neighborhood residents were White (Table 6). Rates of Black participants and residents were also very similar within neighborhoods with below-average (<14%) rates of Black residents (6% vs. 5% on average). The average rate of Black participants (31%) was more than five percentage points lower than the average rate of Black residents within census tracts with more Black residents (≥14%), but this difference lacked statistical significance in a difference in means t-test ($p = .23$; Table 6). The average rate of Latinx participation (3%) was significantly ($p = .001$) lower than the average rate of Latinx residents (6%) in census tracts with few Latinx residents (<18%), and significantly ($p = .016$) lower (on average, 26% of participants were Latinx and 38% of residents were Latinx) among census tracts with higher rates of Latinx residents (≥18%; Table 6).

Discussion

These results provide only limited support for my first hypothesis that the benefits of community gardens will track with participant demographics. While there are correlations between some of the benefits and gardener demographics, these relationships are overpowered by the impact of garden locations. Although existing work demonstrates a focus on basic needs and resisting structural oppression in more inclusive gardens (White 2018; Myers et al. 2020), these findings provide only limited support for a more widespread relationship between healthy food access frames and increased working-class or non-White community gardeners (Hypothesis 1a). Gardens where the manager chose healthy food access as the primary benefit of the garden in our survey were more likely to have working-class and poor participants than middle and upper-class participants. While these factors had a statistically significant correlation and regression coefficient, this relationship did not remain statistically significant after controlling for neighborhood demographics in the regression model, and there was no association between healthy food access and any measures of gardener race.

Scholars have also highlighted the exclusionary impact of gardens focused on sustainability and aesthetics (Aptekar 2015; Becker and McClintock 2020). However, I also find only limited support for a focus on symbolic food labels impacting the race or class makeup of community gardens (Hypothesis 1b). The use of symbolic food labels was associated with participants being working-class and poor rather than middle- or upper-class in the correlation matrix and regression model, however this relationship was no longer statistically significant once neighborhood demographics were included in the regression model. I also find that managers focusing on symbolic food labels was correlated with fewer Latinx participants. However, once gardener class was included in regression models predicting the number of Latinx garden participants, the relationship between symbolic food labels and Latinx gardeners was no longer statistically significant.

I find more consistent support for my second set of hypotheses, that gardener demographics will be shaped by neighborhood demographics, as assumed in existing scholarship (Braswell 2018; Butterfield 2020). In neighborhoods with higher median household incomes and higher rates of educational attainment, community garden participants were more likely to be

higher-class, as Hypothesis 2a predicted. Similarly, in neighborhoods with higher rates of White residents, community gardens had fewer Black and Latinx participants (when measured together) and fewer Latinx participants (when measured independently), as Hypothesis 2b predicted.

In fact, a comparison of the models indicates that neighborhood demographics may be a more important predictor of community garden participant demographics than the benefits garden managers focus on. For the most part, the models that included neighborhood demographics had the best fit, as measured by Akaike information criterion, Bayesian information criterion, and Pseudo R^2 (see Tables 4 & 5). In addition, no relationships between benefits and participant demographic measures remained statistically significant at the .05 level once neighborhood demographics were included in the model.

Further, a comparison of demographics across different sub-categories of census tracts indicates that, overall, gardener demographics match neighborhood demographics with respect to race and class, with the important exception of Latinx residents being consistently under-represented among gardeners and White residents being over-represented among gardeners in areas with lower rates of White neighborhood residents. This finding brings important clarity to the regression outcome findings that lower rates of White neighborhood residents was associated with higher rates of Latinx gardeners. While we may see more Latinx gardeners in areas where rates of White neighborhood residents are low, the rates of Latinx gardeners are still likely lower than the rates of Latinx residents in that neighborhood, and White residents are likely over-represented among gardeners in these areas. Importantly, the demographic comparisons show consistent representation of Black residents among gardeners; no statistically significant differences in means were found between rates of Black residents and Black gardeners. The overall class of participants was also consistent with the income and education rates of neighborhoods, though I was unable to compare means for these measures and assess statistical significance.

Taken together, these findings provide support for the conceptual model I propose herein (Figure 1). This model theorizes that community garden locations will set the stage for participation, as is consistent with my findings that garden locations, measured here as neighborhood demographics, overshadow the correlations between garden framing (benefits) in shaping participant demographics. At the same time, the use of healthy food access and symbolic

food label frames are correlated with participant demographics, supporting the theorized role of framing in the cycle of representation, framing, and accessibility. Lastly, the finding that participant and neighborhood demographics are mostly, but not entirely, consistent indicates that garden locations are not shaping participation alone, and therefore further supports the role of the representation, framing, and accessibility cycle in shaping participant demographics within the context of garden locations.

Conclusion

Ample research demonstrates the wide-ranging benefits of community gardens (Ferris et al. 2001; Twiss et al. 2003; Draper and Freedman 2010; McCormack et al. 2010; Corrigan 2011). However, impacts on who participants in, and therefore benefits from, community gardens are less well-understood. Some existing work makes assumptions about the relationship between garden locations and participant demographics (Braswell 2018; Butterfield 2020). Other work demonstrates that the frames and goals focused on within a garden can shape their accessibility among different demographics, which ultimately impacts representation of different groups within the garden (Aptekar 2015; White 2018; Becker and McClintock 2020; Myers et al. 2020). Still others highlight the importance of representation within community gardens, both for garden tenure (Drake and Lawson 2015) and for helping to improve garden accessibility through shaping the goals and frames used in the garden (Armstrong 2000a; Mundel and Chapman 2010). Each of these studies highlight an element of a more complex set of factors impacting who participates in community gardens, but many lack consideration of the interplay between garden locations, goals and frames, accessibility, and representation. As a whole, this body of work also lacks wide-spread measures of garden participant demographics.

The present study brings these works together in developing a model explaining garden participation (Figure 1) that conceptualizes representation, goals and frames, and accessibility as having a collectively iterative impact on who participates in community gardens, but one that is situated within the location of the garden. Further, this study uses national-level data on community garden participant demographics, goals/frames of their community gardens, and demographic makeup of garden locations to begin to test this conceptual model. I considered the relationships between (1) garden framing and participant demographics, and (2) garden locations

and participant demographics. I find that neighborhood demographics seem to play a more central role in shaping what racial and class groups participate in community gardens than the benefits community gardens focused on. However, I also find evidence that the benefits gardens focus on are correlated with participant demographics and may function to exclude Latinx residents from participating in community gardens.

In developing the conceptual model presented in Figure 1, I connected existing scholarship to theorize that garden participation is an iterative process situated within community garden locations (Armstrong 2000a; Mundel and Chapman 2010; Aptekar 2015; Drake and Lawson 2015; Braswell 2018; White 2018; Becker and McClintock 2020; Butterfield 2020; Myers et al. 2020). The locations of community gardens shape who is available to participate. At the same time, an iterative cycle of representation, framing, and accessibility plays a role in shaping garden participation. Gardeners and organizers can shape the goals and/or frames the garden uses, and these frames and goals impact garden's accessibility, often by impacting who feels welcome in the garden. Without limitations on garden accessibility, gardeners should be representative of the communities in which their gardens are located. But gardens lacking accessibility among certain demographics may fail to fully represent their local neighborhoods. This lack of representation may then lead to garden closure stemming from a lack of community interest. If and when community gardens remain, current gardeners continue to shape the goals and frames of the garden, which continue to impact garden accessibility and further community representation, and so on.

The present findings demonstrate the impact of community garden locations on gardener representation. Resident demographics of garden locations predict the demographic make-up of the participants of existing gardens. The class of participants of gardens in neighborhoods with higher median household income and education rates was higher, on average, and gardens in neighborhoods with higher rates of White residents had lower rates of Black and Latinx participants. When comparing the race and class makeup of neighborhood and garden demographics, we see a similar pattern, though some over-representation of White residents and under-representation of Latinx residents was observed. Overall this supports existing work that draws conclusions about garden accessibility based on their locations (Braswell 2018; Butterfield 2020). Given the contrasting findings about the race and class make-

up of community garden locations (Braswell 2018; Butterfield 2020), future work should further explore this relationship, keeping in mind the implications for garden participant demographics established here. Garden locations were also stronger predictors of community garden demographics than the goals or frames focused on in the gardens, further demonstrating their importance to shaping participation.

However, I do find some correlations between frames and participant demographics that are not meaningless, despite their lack of statistical significance once neighborhood demographics were considered. The base associations between the use of symbolic food labels and lower rates of Latinx and working-class participants, and between a focus on healthy food access and the working-class, yield some support for a broader importance of specific goals and frames among different groups of community gardeners (Aptekar 2015; White 2018; Becker and McClintock 2020; Myers et al. 2020). The disappearance of these associations once neighborhood demographics were controlled for suggests that representation may play an important role in shaping these goals and frames. In other words, garden participants may impact what frames are used in their garden more than the frames shape who participates. As Armstrong (2000a) and Mundel and Chapman (2010) outline, intentional representation of social leaders within specific groups in a community garden can establish it as more accessible among that group, in part through shaping garden goals and frames to be more inclusive.

At the same time, the associations between the use of symbolic food labels and lower rates of Latinx and working-class participants may help explain my finding that Latinx residents are consistently under-represented among gardeners. Existing research demonstrates how a focus on health and environmental outcomes valued by White and well-educated gardeners at the expense of the values of non-White and working-class gardeners can exclude non-White and working-class participation in that garden (Aptekar 2015; Becker and McClintock 2020). The pressure for a garden to focus on these more exclusive values may stem, in part, from non-profits and institutional actors outside the garden (Aptekar 2015; Becker and McClintock 2020). Here a focus on symbolic food labels, perhaps not even originating from gardener representation, may be similarly excluding Latinx and working-class gardeners.

Taken together these findings support the conceptual model outlined in this paper (Figure 1). Locations play an important, perhaps even foundational, role in shaping garden

participation, as demonstrated by the representation of neighborhood residents among community gardeners. At the same time, some of the goals and frames of community gardens were correlated with participant demographics, providing support for the role of framing in the cycle of representation, framing, and accessibility that I theorize as contributing to garden participation. In particular, this cycle may explain my finding that Latinx residents are under-represented among gardeners. Frames supporting symbolic food labels may be limiting the accessibility of gardens among this demographic.

One factor that may help explain the present findings is the link between lack of representation and the closure of community gardens. Drake and Lawson (2015) demonstrate that a lack of participation often leads to garden closure, and both Armstrong (2000a) and Mundel and Chapman (2010) outline the importance of representation for ensuring garden participation through garden frames and accessibility. Kolb (2022) argues that a similar pattern functioned to limit the impact of food desert interventions. These interventions focused on the goal of improving health and nutrition, instead of the larger goals of community investment among food desert residents; as a result, these programs largely ended without much success (Kolb 2022). The present findings of gardens being largely representational is likely impacted, at least in part, by the closure of gardens that lacked resonance with local community residents. Because the data used here did not include closed gardens, this impact is not clearly identifiable. However, future work exploring how representation, frames and goals, and accessibility shape participation should strive to more directly consider gardens that close, perhaps using longitudinal methods.

Limitations

One important limitation of this study stems from the data on the demographics of the gardeners being reported by garden managers, rather than by participants themselves. This presents an opportunity for reporting bias to affect the results I present here. In fact, there were a couple notable indications of reporting bias in variables measuring numbers of White, Black, and Latinx gardeners. As these questions were open-ended on our survey, some managers, instead of providing numbers or estimates, wrote justifications for not providing this information that relied on color-blind racist framings (Bonilla-Silva 2010). One example of this is a garden manager

who, instead of providing any racial demographic estimates for their garden participants, wrote "we are all the HUMAN race". Another respondent indicated that they did not track this information instead of providing estimates. Other respondents who did provide racial demographics of their garden participants may have been impacted by similar social pressures to not acknowledge race or racial differences.

We also did not provide definitions of class in our survey when asking managers to identify the class makeup of their gardens, which may have resulted in inconsistent interpretations of class among garden managers. Future work should consider more accurate and consistent mechanisms for measuring the racial and class makeup of community gardens. The body of literature discussed here would also benefit from analyses that more closely aligned the racial and class measures of community garden participants with those of the surrounding census tracts or geographic areas explored.

Relatedly, our measures of participant demographics, particularly race, were limited by missing data. Further issues with missing data stemmed from garden managers not providing the locations of their gardens. While we attempted to address this by finding garden addresses from publicly available information through Google, we were unable to match many gardens with census tracts accurately. However, it is important to note that little data on community gardens includes demographic information on garden participants or the neighborhoods in which they are located. While future work should do more to recruit survey participants or find creative ways to collect this information on a broader scale, the present study uses the best data available to answer questions about the demographics of community gardens and the neighborhoods in which they are located.

Implications

Along with bringing together literature on community garden accessibility and representation to develop and test a conceptual model of garden participation, these findings inform policymakers and community organizers by outlining and demonstrating the complex factors impacting community garden representation. Community garden locations are important for shaping what demographics are represented among gardeners, but the goals and frames

focused on within community gardens can simultaneously limit the garden accessibility, and subsequently representation, especially for Latinx residents.

Although the present research suggests that locations may be stronger drivers for garden participation than the benefits focused on within the garden, there are several considerations that should be made when establishing a new community garden. New gardens should ensure their tenure by incorporating organizational and leadership practices that meet the needs of the communities they are in (Armstrong 2000a; Mundel and Chapman 2010). Thoughtful listening and intentional involvement of established community leaders may help support the pathway from representation to accessibility for all community members (Armstrong 2000a). Garden leadership should take special care to establish these connections in communities where residents face time and resource limitations or historical social marginalization that may prevent them from more actively sharing their goals or needs. These practices should be employed as early in the garden development process as possible to ensure the garden location, as well as frames, meet the needs of those it is intended to serve. Support from non-profits and institutional actors may also be critical for addressing some of infrastructural issues gardens often face, especially in dis-invested communities. Struggles with land access and quality, water access and affordability, and support from local government are all common challenges for community gardens (Cohen et al. 2012; Drake and Lawson 2015). However, non-profits and institutional actors should exercise self-criticism and restraint to avoid impacting the goals and frames of the gardens they support, as this may have a detrimental impact on garden accessibility, subsequent community representation, and even garden tenure.

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Tables

Table 1. Variable Definitions Table

	Name	Definition	Responses and Coding
Outcome Variables	# of Gardeners White	Number of White gardeners as identified by garden managers	Count measure
	# of Gardeners Black and/or Latinx	Calculated sum of the number of Black gardeners and Latinx gardeners as identified by garden managers	Count measure
	# of Gardeners Black	Number of Black or African American gardeners as identified by garden managers	Count measure
	# of Gardeners Latinx	Number of Latino/a or Hispanic gardeners as identified by garden managers	Count measure
	Typical Class of Gardeners	How would you describe the typical class of the garden participants?	1=Poor; 2=Working-Class; 3=Middle-class; 4=Upper-class
Predictor Variables	Greater Good	Primary benefit of garden as identified by garden managers: “Environmental benefits”	0=No; 1=Yes
	Community	Primary benefit of garden as identified by garden managers: “Social benefits/Increased social network” OR “Community organizing/building”	0=No; 1=Yes
	Healthy Food Access	Primary benefit of garden as identified by garden managers: “Food affordability and access”	0=No; 1=Yes
	Self-Empowerment	Primary benefit of garden as identified by garden managers: “Self-empowerment/Self-reliance”	0=No; 1=Yes
	Symbolic Food Labels	Primary benefit of garden as identified by garden managers: “Participation in local, organic, fresh food”	0=No; 1=Yes
Control Variables	Total # of Gardeners	Total number of gardeners identified by garden managers	Count measure
	Median Household Income Neighborhood	Median household income of the census tract in which the garden is located (measured in $1,000 increments)	Continuous measure
	% Bachelors Neighborhood	Percent of the 25 year-old or older residents of the census tract in which the garden is located who have a bachelors degree or more education	Continuous measure
	% White Neighborhood	Percent of the residents of the census tract in which the garden is located who identify as White	Continuous measure

Table 2. Descriptive Statistics Table

Variable Name	Response	Count	%
Estimated Gardener Class (N=151)	Poor	14	9.27
	Working-Class	58	38.41
	Middle-Class	74	49.01
	Upper-Class	5	3.31
Greater Good (N=154)	No	150	97.40
	Yes	4	2.60
Community (N=154)	No	116	75.32
	Yes	38	24.68
Healthy Food Access (N=154)	No	114	74.03
	Yes	40	25.97
Self-Empowerment (N=154)	No	146	94.81
	Yes	8	5.19
Symbolic Food Labels (N=154)	No	94	61.04
	Yes	60	38.96

Continuous Variables

Variable Name	Mean	Median	SD[12]
Number of Garden Participants White (N=126)	63.29	25	201.87
Number of Garden Participants Black (N=125)	22.31	2	172.65
Number of Garden Participants Latinx (N=124)	8.13	1	33.5
Median Household Income Neighborhood (N=194)	70.23	71.08	31.14
% Bachelors Neighborhood (N=194)	38.14	34.55	20.48
% White Neighborhood (N=194)	53.59	55.6	24.84

12 The reader may notice the positive skew in the race variables presented here; this results from these being count variables with many instances of gardens having few participants in each of these categories. I address this skew by using Negative Binomial regression, which uses a distribution that matches this positive skew, to model these variables.

Table 3. Correlation Coefficient Matrix for Community Garden Frames and Garden Participant Demographics

	Greater Good	Community	Healthy Food Access	Self-Empowerment	Symbolic Food Labels
Estimated Gardener Class	.13 [.13]	-.056 [.49]	-.23** [.0047]	-.10 [.22]	.23** [.0040]
Percent of Gardeners White	.097 [.28]	-.12 [.17]	-.065 [.47]	.0054 [.95]	.12 [.17]
Percent of Gardeners Black	-.083 [.36]	.029 [.75]	.075 [.41]	-.037 [.68]	-.076 [.40]
Percent of Gardeners Latinx	-.034 [.71]	.13 [.14]	.10 [.27]	.12 [.18]	-.20* [.027]

Notes: P-values in brackets; N = 122; Garden participant race variables measured as percentages of participants of that garden; + P < .10, * P < .05, ** P < .01, *** P < .001

Source: Community garden survey (2015-2017); American Community Survey 2014-2018 Estimates (U.S. Census Bureau 2019)

Table 4. Odds Ratios from Ordinal Logistic Regression of Participant Class on Measures of the Primary Benefits of a Community Garden

	Benefit Model 1	**Benefit Model 2**	**Neighborhood Model 1**	**Full Model 1**	**Full Model 2**
Healthy Food Access	.27* [.10, .74]			.41 [.13, 1.31]	
Symbolic Food Labels		2.74* [1.088, 6.87]			.66 [.21, 2.08]
% White Participants	1.039** [1.023, 1.055]	1.038*** [1.022, 1.054]	1.037** [1.015, 1.059]	1.036** [1.014, 1.058]	1.037** [1.015, 1.060]
Neighborhood Income			1.036** [1.014, 1.059]	1.036** [1.013, 1.059]	1.037** [1.015, 1.060]
Neighborhood Education			1.043** [1.011, 1.076]	1.039* [1.0071, 1.072]	1.047** [1.013, 1.083]
% White Neighborhood			.99972 [.974, 1.026]	1.0029 [.977, 1.030]	.9986 [.973, 1.025]
Pseudo R^2	.19	.18	.38	.39	.39
AIC	162.43	164.37	129.57	129.26	131.06
BIC	174.70	176.64	146.75	148.90	150.69

Notes: Odds Ratios listed; 95% Confidence Intervals in brackets; N = 86; Neighborhood Income is median household income measured in $1,000; Neighborhoods measured as census tracts; + P < .10, * P < .05, ** P < .01, *** P < .001

Source: Community garden survey (2015-2017); American Community Survey 2014-2018 Estimates (U.S. Census Bureau 2019)

Table 5a. Incident Rate Ratios from Negative Binomial Regression of Black & Latinx Participants on Measures of the Primary Benefits of a Community Garden

	Combined Black and/or Latinx				
	Benefit Model 3	**Benefit Model 4**	**Neighborhood Model 2**	**Full Model 3**	**Full Model 4**
Healthy Food Access	.96 [.54, 1.72]			1.057 [.62, 1.81]	
Symbolic Food Labels		.80 [.49, 1.33]			.77 [.47, 1.26]
Class of Garden Participants	.46*** [.32, .65]	.48*** [.35, .68]	.60* [.39, .925]	.60* [.39, .94]	.59* [.39, .92]
Neighborhood Income			1.0021 [.9921, 1.012]	1.0022 [.9921, 1.012]	1.0026 [.9925, 1.013]
Neighborhood Education			1.0013 [.986, 1.017]	1.0015 [.986, 1.017]	1.0035 [.988, 1.020]
% White Neighborhood			.981*** [.971, .9915]	.981*** [.971, .9914]	.981*** [.970, .9909]
Constant	1.28 [.49, 3.33]	1.21 [.54, 2.72]	1.586 [.72, 3.49]	1.52 [.63, 3.67]	1.63 [.74, 3.59]
Alpha	1.01*** [.70, 1.46]	1.00*** [.69, 1.45]	.85*** [.59, 1.24]	.85*** [.59, 1.24]	.84*** [.58, 1.23]
Pseudo R^2	.036	.037	.061	.061	.062
AIC	558.19	557.49	548.03	549.99	548.96
BIC	568.05	567.35	562.83	567.26	566.22

Notes: Incident rate ratios (similar to odds ratios) listed; 95% Confidence Intervals in brackets; Total number of gardeners included as exposure variable; N = 87; Neighborhood Income is median household income measured in $1,000; Neighborhoods measured as census tracts; + P < .10, * P < .05, ** P < .01, *** P < .001

Source: Community garden survey (2015-2017); American Community Survey 2014-2018 Estimates (U.S. Census Bureau 2019)

Table 5b. Incident Rate Ratios from Negative Binomial Regression of Black & Latinx Participants on Measures of the Primary Benefits of a Community Garden (Continued)

	Latinx				
	Benefit Model 5	**Benefit Model 6**	**Neighborhood Model 3**	**Full Model 5**	**Full Model 6**
Healthy Food Access	1.11 [.35, 3.46]			1.51 [.53, 4.31]	
Symbolic Food Labels		.48 [.20, 1.16]			.53 [.24, 1.17]
Class of Garden Participants	.66 [.33, 1.31]	.75 [.42, 1.34]	1.77 [.80, 3.88]	2.09 [.84, 5.17]	1.73 [.79, 3.78]
Neighborhood Income			.9905 [.970, 1.011]	.9903 [.969, 1.012]	.9936 [.973, 1.015]
Neighborhood Education			1.0036 [.972, 1.036]	1.0046 [.974, 1.037]	1.0061 [.976, 1.037]
% White Neighborhood			.965*** [.949, .982]	.964*** [.948, .981]	.966*** [.955, .982]
Constant	.28 [.040, 1.96]	.27+ [.067, 1.056]	.25* [.076, .84]	.153* [.03, .87]	.24* [.072, .78]
Alpha	3.075*** [2.05, 4.61]	2.95*** [1.96, 4.43]	2.28*** [1.49, 3.50]	2.25*** [1.47, 3.46]	2.17*** [1.41, 3.34]
Pseudo R^2	.0069	.013	.049	.050	.054
AIC	413.25	410.76	400.26	401.65	399.89
BIC	423.02	420.53	414.92	418.75	416.99

Notes: Incident rate ratios (similar to odds ratios) listed; 95% Confidence Intervals in brackets; Total number of gardeners included as exposure variable; N = 85; Neighborhood Income is median household income measured in $1,000; Neighborhoods measured as census tracts; + P < .10, * P < .05, ** P < .01, *** P < .001

Source: Community garden survey (2015-2017); American Community Survey 2014-2018 Estimates (U.S. Census Bureau 2019)

Table 5c. Incident Rate Ratios from Negative Binomial Regression of Black & Latinx Participants on Measures of the Primary Benefits of a Community Garden (Continued)

	Black				
	Benefit Model 7	**Benefit Model 8**	**Neighborhood Model 4**	**Full Model 7**	**Full Model 8**
Healthy Food Access	.988 [.48, 2.05]			1.16 [.55, 2.47]	
Symbolic Food Labels		1.26 [.64, 2.48]			1.11 [.55, 2.26]
Class of Garden Participants	.35*** [.23, .53]	.33*** [.21, .51]	.29*** [.16, .54]	.29*** [.16, .54]	.29*** [.16, .54]
Neighborhood Income			1.0071 [.9955, 1.019]	1.0071 [.9956, 1.019]	1.0069 [.9953, 1.019]
Neighborhood Education			1.0019 [.983, 1.021]	1.0030 [.984, 1.023]	1.0011 [.982, 1.021]
% White Neighborhood			.9915 [.976, 1.0071]	.9908 [.975, 1.0068]	.9918 [.976, 1.0075]
Constant	1.15 [.37, 3.60]	1.15 [.41, 3.25]	1.65 [.52, 5.28]	1.54 [.46, 5.16]	1.62 [.51, 5.20]
Alpha	1.69*** [1.13, 2.51]	1.67*** [1.12, 2.49]	1.64*** [1.10, 2.44]	1.63*** [1.10, 2.43]	1.63*** [1.10, 2.43]
Pseudo R^2	.048	.049	.055	.056	.057
AIC	431.77	431.31	432.62	434.47	434.54
BIC	441.64	441.18	447.42	451.73	451.80

Notes: Incident rate ratios (similar to odds ratios) listed; 95% Confidence Intervals in brackets; Total number of gardeners included as exposure variable; N = 87; Neighborhood Income is median household income measured in $1,000; Neighborhoods measured as census tracts; + P < .10, * P < .05, ** P < .01, *** P < .001

Source: Community garden survey (2015-2017); American Community Survey 2014-2018 Estimates (U.S. Census Bureau 2019)

Table 6. Descriptive Statistics by Above-Mean & Below-Mean Sub-Categories for Income, Education, & Racial Make-up of Census Tracts

				Mean Values Within Sub-Category					
Census Tract Category	Gardener Class	Tract Income	Tract Education	Gardeners White	Tract White	Gardeners Black	Tract Black	Gardeners Latinx	Tract Latinx
Low-Income	*Working (51.02%)*	*$39,907*	26.46%	58.40%	53.45%	17.12%	18.50%	11.93%***	20.66%***
High-Income	*Middle (73.68%)*	*$95,177*	59.28%	69.82%	64.93%	6.55%	7.86%	10.95%	13.77%
Low-Education	*Working (50.00%)*	$44,371	*20.18%*	55.07%+	47.61%+	16.85%	20.15%	16.50%**	24.84%**
High-Education	*Middle (69.77%)*	$84,183	*61.89%*	71.95%	69.57%	8.05%	7.40%	6.13%*	10.28%*
Low-White	Working (45.71%)	$51,765	27.54%	*45.13%***	*31.3%***	18.55%+	25.59%+	20.85%*	29.92%*
High-White	Middle (59.62%)	$72,315	49.72%	*75.80%*	*76.75%*	8.43%	5.95%	4.96%**	9.38%**
Low-Black	Middle (53.97%)	$69,786	45.69%	68.21%	64.08%	*5.61%*	*4.78%*	13.28%**	19.4%**
High-Black	Working (41.67%)	$48,986	27.95%	50.67%	43.73%	*30.58%*	*37.68%*	6.98%+	13.04%+
Low-Latinx	Middle (51.79%)	$65,469	44.64%	71.52%	70.13%	13.06%	14.53%	*3.01%***	*6.17%***
High-Latinx	Middle (41.94%)	$61,481	33.85%	48.75%*	37.39%*	11.48%	12.64%	*26.29%**	*38.38%**

Notes: Neighborhoods measured as census tracts; Neighborhood Income is median household income measured in $1,000; paired t-tests performed for measures of racial makeup; + P < .10, * P < .05, ** P < .01, *** P < .001

Source: Community garden survey (2015-2017); American Community Survey 2014-2018 Estimates (U.S. Census Bureau 2019)

Figures

Figure 1. Conceptual Model Explaining Community Garden Participation