



# “Connecting With Good People and Good Plants”: Community Gardener Experiences in New York State During the COVID-19 Pandemic

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Community gardens are collective projects in which participants collaborate to maintain a garden. They provide many biophysical and cultural ecosystem services, contributing to individual and community resilience and wellbeing. These benefits may be even more appreciated during a crisis such as the COVID-19 pandemic. However, since community gardens require efforts from multiple gardeners in shared spaces, the pandemic also exposed some of their vulnerabilities. This study focuses on the benefits community gardens have offered during the COVID-19 pandemic, the challenges the pandemic posed to sustaining community garden activity, and recommendations to address these issues moving forward. We conducted our study in four cities in New York representing a gradient of socioeconomic and biophysical characteristics: Binghamton, Buffalo, Ithaca, and New York City. We collected data from surveys and semi-structured interviews with community gardeners and analyzed them using mixed models and thematic coding. The primary benefits gardeners derived from their community garden experiences were: a sense of connection with other gardeners, their communities, and nature; mental and physical wellbeing; and a safe space of refuge. In addition to material shortages (e.g., seeds), the biggest challenge gardeners faced due to the pandemic was the limited degree of socializing in the gardens resulting from personal behavioral changes and rules imposed by gardens. Despite the challenges, gardeners reported enjoying the 2020 garden season. The pandemic also created opportunities for gardens to serve their communities, such as organizing programs for composting, food donation and distribution, and home gardening. Our findings suggest that community gardens can be resilient sites of reprieve during crises such as the COVID-19 pandemic, providing essential benefits for gardeners and local residents. To sustain community garden resilience, we recommend community gardens and gardeners cultivate connections and diversity, within and between the biological and human communities of their gardens.

**Keywords:** resilience, wellbeing, restorative commons, urban gardens, ecosystem services, social learning

## INTRODUCTION

The COVID-19 pandemic poses many challenges to individual and community health and wellbeing.

Community gardens are collective projects in open spaces where gardeners collaborate to maintain a garden (Centers for Disease Control Prevention, 2020). As such, they are places where environmental challenges, social isolation, and food security issues can all be ameliorated. However, because community gardens require efforts from multiple gardeners in shared spaces, the pandemic also exposed some of their vulnerabilities and may have jeopardized their benefits to individuals and communities.

For individuals, participating in a community garden can offer a source of fresh, typically organic produce and improve dietary habits through on-site education (Wakefield et al., 2007; Centers for Disease Control Prevention, 2020; LeGreco and Douglas, 2021). One study found that adults with a household member who participated in a community garden were 3.5 times more likely to consume fruits and vegetables at least five times daily (Alaimo et al., 2008). Access to community gardens is of particular importance to the 39.5 million Americans the USDA has estimated currently reside in food deserts (Rhone et al., 2017): geographic areas where residents have few to no accessible options for securing affordable and healthy foods (Ghosh-Dastidar et al., 2017). For such individuals, gardening communally provides a lifeline to fresh fruits and vegetables that would otherwise be unavailable. Beyond nutrition and food security, community gardens contribute to individual health by providing an outlet for reducing stress, promoting a sense of wellbeing, and serving as a social gathering place, thus alleviating loneliness (Lovell et al., 2014).

The emotional and psychological benefits of human-nature connection may be particularly important as rates of mental health concerns in the general population rise during the pandemic (Ettman et al., 2022). Informed by the substantial body of literature demonstrating the benefits of gardening on multiple dimensions of wellbeing (Block et al., 2011; Soga et al., 2017; Spano et al., 2020), some studies have explored how gardening can provide therapeutic benefits, promote relaxation, and help foster a sense of connection amid the strain of the COVID-19 pandemic. For example, Marsh et al. (2021) and Egerer et al. (2022) showed gardeners felt an increased emotional connection to nature during the pandemic, providing them therapeutic benefits during stressful times. Similarly, gardening has been found to help alleviate stress and improve mental or psychological wellbeing during the pandemic (Corley et al., 2020; Giraud et al., 2021; Sia et al., 2021; Theodorou et al., 2021; Egerer et al., 2022).

At the community-level, community gardens can function as “restorative commons” when they provide publicly-accessible, non-excludable open space managed through shared governance. The “restorative” aspect of community gardens emerges when they contribute to “the health and wellbeing of individuals, communities, and the landscape” (Campbell and Wiesen, 2009, p. 11). Community gardens bolster the health and wellbeing of communities by providing spaces where civic engagement and environmental stewardship intersect (Krasny and Tidball, 2009).

They can play important roles in community development and empowerment (King, 2008), mobilizing resources for advocacy, and providing places where community members can build relationships and come together to celebrate cultural traditions (Saldivar-Tanaka and Krasny, 2004). Community gardens can also be spaces that allow for social learning and knowledge-sharing among gardeners and garden visitors (Krasny and Tidball, 2009). In terms of aiding the health and wellbeing of the landscape, community gardens entail tending the land. This may involve ecologically restoring plots of land that have been neglected or degraded (Krasny and Tidball, 2009; Campbell and Wiesen, 2009). For cities, community gardens can beautify vacant lots, revitalize communities in industrial areas, revive public parks, decrease violence in some neighborhoods, and improve social wellbeing through strengthening social connections (Centers for Disease Control Prevention, 2020).

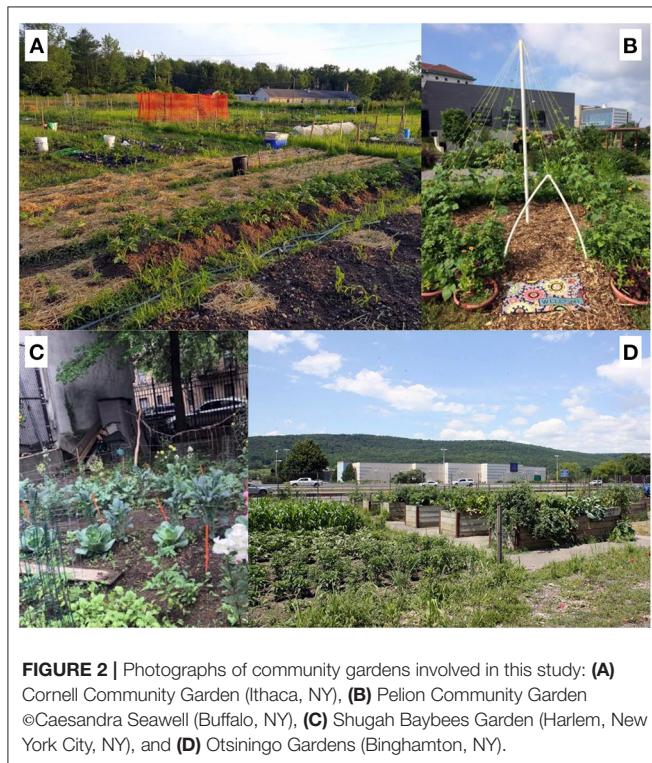
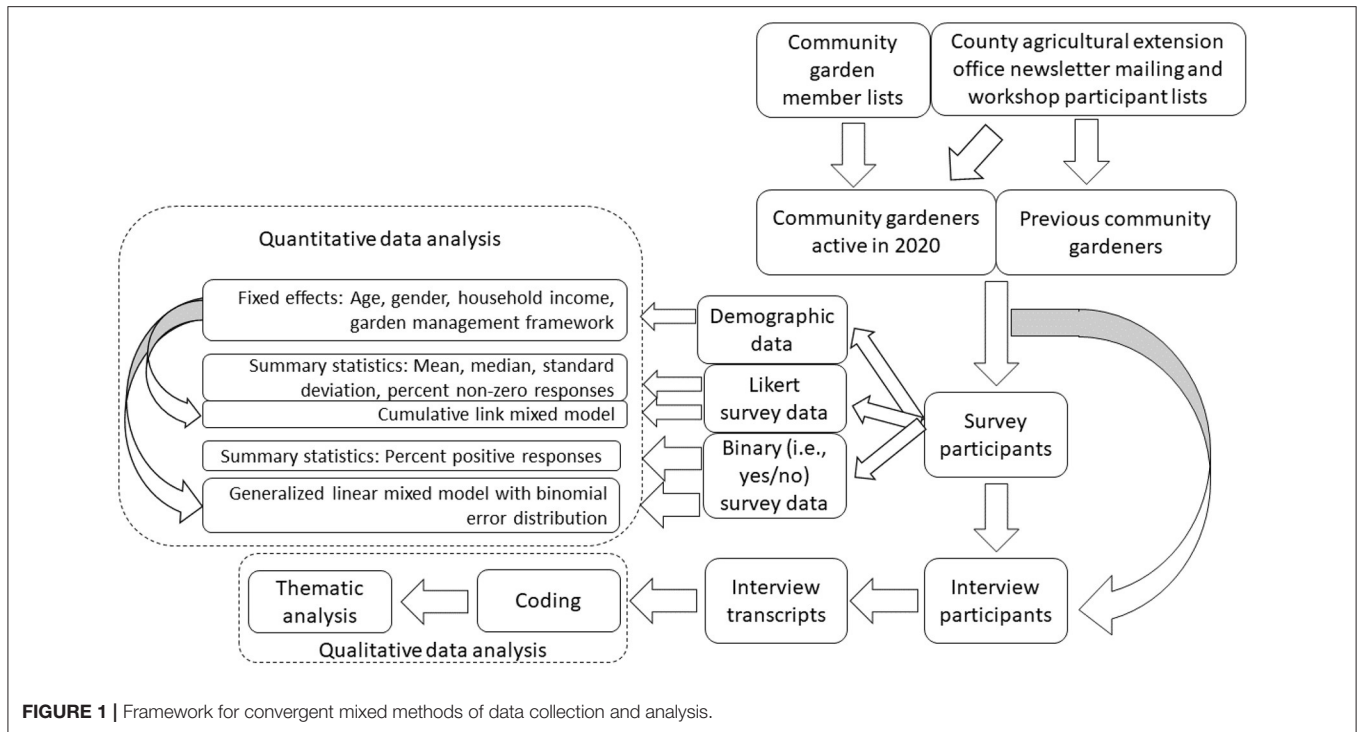
Prior to the COVID-19 pandemic, the number of community garden sites was increasing in the U.S. According to the Trust for Public Land, between 2012 and 2018 the number of community garden plots in the 100 largest U.S. cities increased by 44% (The Trust for Public Land, 2018). There was a concern that a crisis, such as a pandemic, would derail the growth in community garden participation (Birky, 2009). However, the COVID-19 pandemic substantially increased peoples’ interest and participation in gardening in general, including community gardening (Schoen et al., 2021) as pandemic-related lockdowns, supply chain issues, and inconsistent regulations exacerbated the longstanding plight of food insecurity for U.S. households, exposing the fragility of the nation’s food system (van der Ploeg, 2020; Weersink et al., 2021).

Much of the research on gardening during the pandemic published to date has focused on private home gardens and may not reflect the unique opportunities and vulnerabilities of community gardens. One of the studies addressing the benefits of community gardens during the pandemic found that participants in community planting programs had better mental health than those who did not, and even non-participants who lived in the communities surrounding the gardens had better mental health than those who lived in an area without a community garden (Kou et al., 2021). Likewise, Schoen et al. (2021) found that rising interest in community gardening during the pandemic was partially motivated by a desire to self-supply produce.

Our research provides insight into community gardener experiences during the 2020 growing season of the COVID-19 pandemic across four cities in New York State: Binghamton, Buffalo, Ithaca, and New York City. The aim of this study was to better understand the pandemic’s impacts on community gardener experiences, including the challenges they faced; how community gardens adapted to these challenges; and how they might continue to improve moving forward.

## METHODS

We investigated the following research questions:



1) What are gardeners' primary motivations for and benefits from participating in community gardens, and how did these change in light of the COVID-19 pandemic;

- 2) How did gardens change in order to adapt to the pandemic;
- 3) What were the challenges and barriers gardeners experienced as a result of these shifts;
- 4) Were there any positive opportunities that arose as a result of the pandemic; and
- 5) What are recommendations gardeners might offer to improve their experiences, particularly in light of the pandemic?

To address these questions, we used a convergent mixed methods approach (Figure 1), in which quantitative survey data and qualitative interview data were collected in parallel, analyzed separately, and subsequently integrated. We chose this design for its efficiency, particularly in collaborative projects, allowing us to deploy data collection instruments quickly (Creswell and Plano Clark, 2011). The survey and interview data instruments (Supplementary Information) complemented one another to fully address our research questions. The convergent mixed method also allowed us to compare and contrast the results from both survey and interview instruments to bring additional insights beyond what would be obtained by either separately.

We collaborated with community garden organizations in Binghamton, Buffalo, Ithaca, and New York City (Brooklyn and Harlem), New York (Figure 2). These sites represent distinct socioeconomic and biophysical characteristics, including population density, demographics, urban development, community garden size, and site history (Table 1). They also included two distinct community garden management approaches that are common throughout the United States: private-plot gardens, in which a common piece of land managed by a community-based garden organization is divided into plots that are allotted to and independently maintained by distinct



individuals or groups; and communal-plot gardens, in which a garden is collectively maintained by a group of community members who all contribute to the work and benefit from the harvests (Lee and Matarrita-Cascante, 2019).

We hosted and administered the surveys using the Qualtrics online platform (Qualtrics., 2021). We recruited participants in several ways to broaden our sample and to include a breadth of perspectives. First, managers of collaborating gardens sent out the survey link to their listservs. We also contacted the Cornell Cooperative Extension offices in our study sites' counties, asking them to distribute the survey link *via* their newsletters and email lists of gardening workshop participants. The latter distribution channel provided an opportunity to contact active gardeners, as well as people who were interested in joining a community garden or had been members of community gardens in the past but who did not participate in one during the 2020 season.

Survey data ( $n = 56$ ) were cleaned to remove submissions responding to fewer than half of the questions. We calculated summary statistics for different groupings of respondents depending on the response variable. Grouping variables included city, garden location urban development [i.e., either urban, suburban, or rural as defined by population density as per Pozzi and Small (2002)], garden name, garden management approach (i.e., communal- or plot-based), educational attainment, immigrant status, race, zip code, household income bracket, and gender. For binary variables, we calculated the percentage of positive responses. For Likert and numeric variables, we calculated mean, median, standard deviation, and percentage of non-zero responses. We also used modeled response values with respondent age [given that COVID-19 poses a disproportionate risk for older people (O'Driscoll et al., 2021)], gender [given changing family care-taking dynamics due to COVID-19 and gender-based differences in community garden experiences (Dolley, 2020; Philpott et al., 2020; Lopez et al., 2021)], household income [given that food insecurity disproportionately impacts poorer people (Laborde and Martin, 2020)], and their community garden management approach (given gardens' unique opportunities, vulnerabilities, and responses to the COVID-19 pandemic) as fixed effects and the city where the respondent gardened (or would have gardened) as the random effect in R (R Development Core Team, 2020). The type of mixed model depended on the type of response variable being modeled. For Likert data, we used cumulative link mixed models using the ordinal package's *clmm* function (Christensen, 2019) as described in Agresti (2018). For binary variables, we used generalized linear mixed models with a binomial error distribution using the *glmer* function in the *lme4* package (Bates et al., 2015) as per Zuur et al. (2009). Significance was determined at  $\alpha = 0.05$ .

The interview participants ( $n = 26$ ) (Table 2) were survey respondents who volunteered for follow-up interviews, or gardeners who contacted us directly upon hearing about the study from their social networks, garden managers, or extension offices. Using a semi-structured interview protocol, we conducted and recorded the interviews remotely *via* Zoom. We then transcribed the interviews verbatim and coded the interview transcripts using NVivo software (NVivo, 2020). We developed the initial code book based on our research questions (etic

codes) and emergent insights from the survey and interview data (emic codes) (Hitchcock and Nastasi, 2011). We established intercoder reliability by coding a sample interview transcript and running a coding comparison query between the three coders. We checked that the percentage agreement and median Kappa coefficient for all codes were  $>95\%$  and 0.5, respectively. We refined and clarified any codes that did not meet these criteria to finalize the codebook (**Supplementary Materials**). After coding all interviews, we conducted a thematic analysis based on the coded materials, which we refined iteratively to identify key themes in the interviews related to our research questions (Lester et al., 2020). Finally, we used crosstab analysis in NVivo to identify patterns in codes between participant characteristics (selected based on significant fixed effects from survey result analyses) and NVivo matrix coding queries to identify concordant and incongruent codes.

## RESULTS

### Motivations and Benefits

From the interviews, the major themes of connection and wellbeing emerged as the key motivations for, and benefits of, being a community garden member. To a lesser degree, gardeners noted they joined the community garden in part because they did not have adequate conditions to cultivate a garden at home (e.g., yards that were small, non-existent, inaccessible, or shaded, or had poor or polluted soil). The COVID-19 pandemic had no bearing on this motivation.

According to surveys, the highest-valued benefits gardeners derived from participating in community gardens were: providing tasty, fresh, and healthy food; exercise; connection to nature; and education (Figure 3). Social interaction and relationships were deemed less important according to the surveys. The median responses indicated that the importance of these benefits generally did not change from years prior to the 2020 season, and any changes that we observed were not significant. Gardeners' expectations for the 2020 garden season were largely met with a few exceptions (Table 3). Age was consistently a significant fixed effect influencing the importance of several benefits; older people were generally less interested in community gardens' capacity to provide tasty food ( $\beta = -2.817$ ,  $p = 0.005$ ), fresh food ( $\beta = -3.330$ ,  $p < 0.001$ ); healthy food ( $\beta = -3.536$ ,  $p < 0.001$ ); food stability ( $\beta = -0.104$ ,  $p < 0.004$ ); and sufficient food ( $\beta = -2.628$ ,  $p = 0.009$ ). They were also generally less satisfied with their garden experiences in 2020.

### Connecting With People

The community gardens in our study, regardless of management approach, provided spaces that brought people together. The most common interview response regarding gardeners' motivations to join community gardens were friends and family who were already gardeners. Interview participants understood gardening as a source of connection to their loved ones and heritage. In certain cases, they joined the community garden anticipating socializing with friends who also were garden members. P2, a young gardener at a plot-based garden in

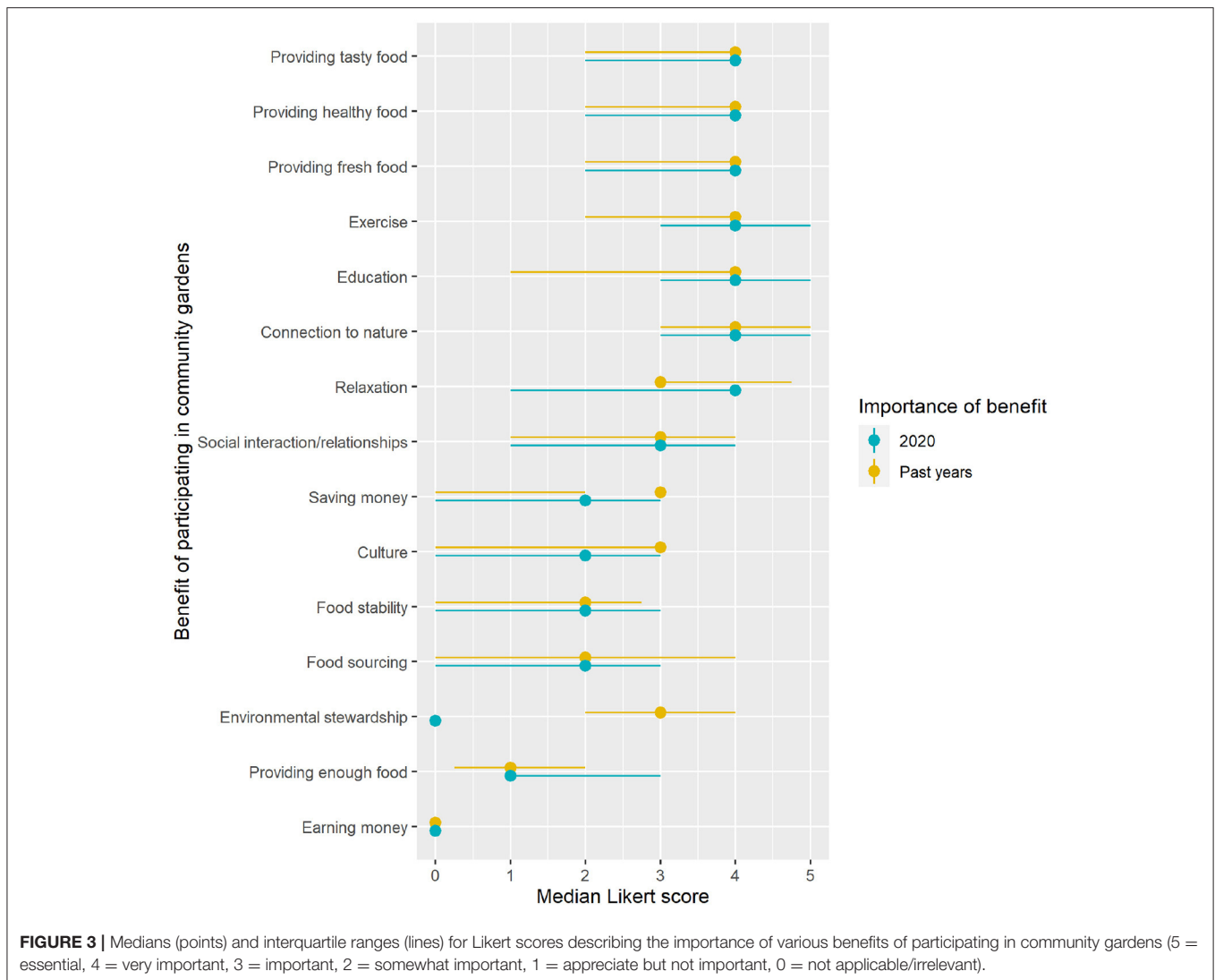
**TABLE 1** | Descriptive statistics of the urbanized areas containing the community gardens involved in this study (Census Reporter, 2021), community garden management approach (i.e., private allotment plot or communal), and the number of survey and interview participants from each garden involved in our study.

Urban area	Urbanized area population density (people/mi <sup>2</sup> )	Urbanized area median per capita income (USD)	Urbanized area median age (years)	Garden	Community garden management approach	Instrument	<i>n</i>
Binghamton	1,982	27,956	37	Otsiningo Gardens	Plot-based	Interview	1
						Survey	3
				Pine Street Community Garden	Plot-based	Interview	0
Buffalo	2,439	33,768	40	Lincoln Community Garden	Communal	Survey	2
						Interview	0
				FeedMore WNY Garden	Communal	Survey	1
						Interview	1
				Putnam Street Community Garden	Plot-based	Survey	3
						Interview	1
				Pelion Community Garden	Communal	Survey	1
		Interview	0				
Ithaca	2,213	30,276	24	Jewish Family Services Community Garden	Communal	Survey	1
						Interview	1
				Cornell Community Garden	Plot-based	Survey	2
						Interview	10
				West Village Community Garden	Communal	Survey	19
		Interview	1				
Brooklyn	36,901	37,352	36	Ithaca Community Garden	Plot-based & Communal	Survey	1
						Interview	2
				Floral Avenue Community Garden	Communal	Survey	2
						Interview	1
				Prospect Heights Community Farm	Communal	Survey	1
		Interview	2				
Harlem	9,537	38,830	35	Maple Street Garden	Communal	Survey	17
						Interview	0
				Nehemiah Ten Greenthumb Garden	Plot-based	Survey	1
		Interview	1				
Harlem	9,537	38,830	35	Shugah Baybees Garden	Communal	Survey	2
						Interview	1
						Survey	1

Note that survey and interview participants are not exclusive.

**TABLE 2** | Case classifications of interview participants used for quote identification in this manuscript.

Participant #	Age (years)	Gender	Race	Household income bracket (USD)	Educational attainment	Garden community	Garden management approach	Garden urban development
P1	30	Female	Black	\$12,501–25,000	Bachelor or equivalent	Harlem	Plot-based	Urban
P2	27	Female	White	>\$100,000	Masters or equivalent	Ithaca	Plot-based	Suburban
P3	33	Female	Asian	>\$100,000	Doctoral or equivalent	Ithaca	Plot-based	Suburban
P4	NA	Male	White	>\$100,000	Doctoral or equivalent	Ithaca	Plot-based	Suburban
P5	58	Female	White	\$75,001–100,000	Masters or equivalent	Ithaca	Plot-based	Suburban
P6	49	Male	Asian	\$50,001–75,000	Doctoral or equivalent	Ithaca	Plot-based	Suburban
P7	34	Male	White	\$75,001–100,000	Masters or equivalent	Ithaca	Plot-based	Suburban
P8	68	Female	White	>\$100,000	Masters or equivalent	Brooklyn	Communal	Urban
P9	39	Female	Asian	\$75,001–100,000	Doctoral or equivalent	Ithaca	Plot-based	Suburban
P10	33	Female	White	\$25,001–37,000	Bachelor or equivalent	Ithaca	Plot-based	Suburban
P11	53	Male	Asian	\$50,001–75,000	Doctoral or equivalent	Ithaca	Plot-based	Suburban
P12	48	Male	White	\$25,001–37,000	Masters or equivalent	Brooklyn	Communal	Urban
P13	NA	NA	NA	NA	NA	Buffalo	NA	Urban
P14	71	Female	White	\$50,001–75,000	Bachelor or equivalent	Buffalo	Communal	Urban
P15	NA	NA	NA	NA	NA	Buffalo	NA	Urban
P16	47	Female	Asian	\$12,501–25,000	Masters or equivalent	Ithaca	Communal	Suburban
P17	36	Female	White	>\$100,000	Masters or equivalent	Ithaca	Plot-based	Suburban
P18	66	Female	White	\$50,001–75,000	Masters or equivalent	Buffalo	Plot-based	Urban
P19	34	Male	Two or more	\$75,001–100,000	Masters or equivalent	Harlem	Communal	Urban
P20	48	Male	White	>\$100,000	Bachelor or equivalent	Ithaca	Plot-based	Suburban
P21	NA	NA	NA	NA	NA	Buffalo	Communal	Urban
P22	NA	NA	NA	NA	NA	Binghamton	Plot-based	Suburban
P23	33	Non-binary/Gender fluid	Two or more	\$37,001–50,000	Bachelor or equivalent	Buffalo	Communal	Urban
P24	NA	NA	NA	NA	NA	Ithaca	Plot-based	Suburban
P25	NA	NA	NA	NA	NA	Ithaca	Plot-based	Suburban
P26	70	Female	White	\$25,001–37,000	Bachelor or equivalent	Harlem	Plot-based	Urban



Ithaca, articulated their intent to garden with friends, which was upended by the pandemic:

“We have a couple friends [who] gardened at that garden last year, and I think we had planned on joining the garden prior to the pandemic hitting the US. It was initially going to be a social thing where we all go to the garden together and like you know, bring some chairs and talk about tomatoes or whatever. Obviously, that changed, and we did have a garden plot right next to our friends, but we didn’t really plan on going at the same time or anything like that because of the garden rules.”

Gardeners also often talked about the process of forming connections in terms of community building, which was the second most common motivation mentioned by gardeners we interviewed: to contribute to and benefit from the community that arose in and around the garden. Many gardeners mentioned the importance of their garden as a place to socialize, both

for gardeners and for other members of the community. In many cases, this happened just in chatting casually with other gardeners. Socializing also occurred during moments of social learning by exchanging advice, tips, and techniques. For example, P22, a gardener in Binghamton, noted, “I am also interested in the community aspect of it where we can get to know each other and share techniques, and you’re always learning things from other people.” Community gardens also provided space for cross-cultural exchange, with P2 observing, “Another cool thing about the garden was there [were] a lot of people from different countries and speaking different languages.” For some, the opportunities for socializing and connection that community gardens provided were particularly important during the pandemic, as P19, who gardened at a communally-managed garden in Harlem, pointed out:

“I think the one [benefit] is social interaction. I think that’s huge. I think that because there’s enough space in the garden, and in this

**TABLE 3 |** Respondents' median Likert scores (interquartile ranges presented in brackets) for gardeners' satisfaction with the benefits provided by participating in the 2020 community garden season, the significant fixed effects correlated with these scores (NA, 1 = very unsatisfied, 2 = somewhat unsatisfied, 3 = neither unsatisfied or satisfied, 4 = somewhat satisfied, 5 = very satisfied).

Benefit of participating in community gardens	Satisfaction with 2020 garden season benefit	Significant fixed effects on satisfaction with 2020 season
Providing tasty food	5 [4,5]	NA
Providing fresh food		
Providing healthy food		
Connection to nature	5 [4, 5]	Age ( $\beta = -0.077$ , $\rho = 0.004$ )
Exercise	4 [4, 5]	Male ( $\beta = 1.713$ , $\rho = 0.036$ )
Education	4 [3, 5]	Age ( $\beta = -0.061$ , $\rho = 0.005$ )
Relaxation	4 [4, 5]	Age ( $\beta = -0.081$ , $\rho = 0.003$ )
Culture	3 [0, 4]	NA
Saving money	3 [0, 4]	NA
Social interaction/relationships	3 [2, 4]	Age ( $\beta = -0.054$ , $\rho = 0.028$ )
Environmental stewardship	NA	NA
Food stability	NA	NA
Food sourcing	NA	NA
Providing enough food	4 [4, 5]	NA
Earning money	0 [0, 1.5]	NA

time, you are able to socialize which is really huge. And especially in terms of the loneliness and depression that we're facing in these times, that was really beneficial."

### Connecting With Nature

The community gardeners we surveyed and interviewed also made it clear that one of the primary benefits they enjoyed was the connection they formed with the ecological community and the place itself. Some framed this in terms of environmental stewardship by growing pollinator-friendly plants, like P3, a gardener from a plot-based garden in Ithaca, who "introduce[d] ladybugs to all our plants, and we did coordinate on some things like what pollinator plants we wanted to attract like native pollinators." Another example of this was from gardens in Harlem and Brooklyn that administered a community-wide program for collecting and composting food waste, which would then be used to nourish the garden's soil. Gardeners recognized the reciprocal relationship between themselves and the gardens. P1 said they enjoyed participating in the community garden because:

"Just contributing to the community and finding other people who do the same as well...I'm always here for networking, connecting with good people, good people and plants... When we have harvested goods, they give not just to the people who give to the garden, but to the community who show up... I'm giving

back, but it's also going to give back to me, because the compost is going to turn back into soil; then I'll plant food in it, and that will give back to me."

### Connecting Despite COVID-19

One way in which connection was maintained through and in community gardens during the pandemic was food sharing. Most gardeners said they shared the same amount or more produce than in previous seasons, with some mentioning being more acutely aware of food insecurity in their community, such as P10, a gardener in Ithaca, who said:

"I gained more of an appreciation for the value that gardening has for people individually. Especially for food security... Everyone was going through the shock waves of not being able to get the food they wanted at the supermarket and to know I could go to the garden to get some fresh tomatoes and not have to worry was pretty great."

In the interviews, urban gardeners generally spoke more about the importance of the gardens for building community and providing food security for non-gardeners during the pandemic. For example, P12, a gardener from Brooklyn, said their garden developed a new food sharing program in 2020.

"Anyone who wanted to donate their plot for this season was being asked if they wanted to do that, we would take care of it, water it, grow it, and give it to people in the community that needed help. Maybe a third of the garden did that. We have been giving away produce every Sunday morning, and it has been word of mouth, but we put a sign out front with 'are you experiencing food insecurity because of COVID?'. It has been an honor system. We don't ask; we just give stuff away. It has been really nice."

### Wellbeing

Relaxation was an important benefit for many surveyed gardeners, and the related theme of wellbeing resonated throughout the interviews. Many gardeners talked about the mental and emotional motivations for and benefits from participating in their community garden. Many expressed appreciation for their garden as a place that provided not only the opportunity for socializing and connecting with others, but also a place they could go to find solitude. During the pandemic, this was particularly important for some gardeners. P17 from Ithaca articulated this, saying:

"I also think it definitely played a heavier part in my mental health... [Before the pandemic] sometimes I would skip going. Now, if I skip going...I need to get outside and have alone time. Family members are in the house, and it's a way to get away from all that."

Gardeners also appreciate their gardens as peaceful places of refuge from the hectic world, as mentioned by P12 in Brooklyn, who said, "It just stops the clock, the pace of our modern lives; it slows everything down and it makes you look at a whole other process that is unfolding in its own time." Gardeners also reflected on the meditative aspect of gardening, bringing



them more fully to the present moment. For instance, P19 in Harlem said, “[The urban garden] was a place of relaxation and meditation, a place where I could just focus on the earth, and I would say it was definitely really therapeutic to me in that time.” During such moments, gardening offers opportunities for self-reflection and a means for practicing acceptance. One participant even shared that gardening served as therapy for her as she grieved her husband’s death. Many gardeners expressed that the stresses caused by the COVID-19 pandemic only underscored the importance of community gardens in fostering mental wellbeing.

Related to the reciprocal relationships gardeners establish with their gardens, gardeners mentioned the importance of how gardening gives them a sense of purpose, especially in the context of COVID-19, when work and other events and activities had been canceled. P7 from Ithaca noted, “it was one of the things that we could in fact actually do this year,” and P6, also from Ithaca, said, “I probably felt a lot more comfortable setting aside time for the garden; not having that expectation of showing up somewhere certainly made it easier to feel comfortable taking...whatever time I needed to go there.” Gardeners discussed how gardening created a sense of responsibility, which helped overcome inertia, malaise, anxiety, and depression due to the COVID-19 pandemic to actively engage out in the world.

Reflecting on the importance of gardening as a form of exercise expressed in the surveys, interviewed gardeners also talked about the physical benefits of gardening, again, particularly during the COVID-19 pandemic. Gardening provided gardeners a reason to leave the house at a time when many were living in lock-down conditions. It also provided a break from doing desk work while working from home, as noted by P4 from Ithaca, who said, “It was a distraction...I’m working from home, so anything to get over that.” Gardeners appreciated how time in the garden meant time outside in the fresh air. Several also mentioned their garden as a good place for children to have the chance to run around. Along with the physical benefits, many gardeners also noted their appreciation for the quality of the food they grew in their gardens, which helped keep them accountable for eating healthily. For the gardeners we spoke with, their participation in a community garden was less about ensuring food security in terms of calories, and more to ensure they could get the varieties and quality of food they preferred.

## Challenges, Barriers, and Opportunities

In addition to the impact of COVID-19 on the benefits gardeners derived from community gardens, we also sought to understand other challenges and barriers gardeners faced in participating in community gardens during the 2020 growing season, as well as new opportunities brought about by the pandemic. Interviews revealed that the biggest challenge most gardeners faced due to the COVID-19 pandemic was a lack of social connection due to restrictions on garden access and guests, event cancellations, gardeners being reticent to socialize, and choosing to work at times when the garden was not busy.

### Disrupted Connections

Although many gardeners appreciated community gardens’ capacity to cultivate social relationships and build community,

the COVID-19 pandemic had mixed effects on the sense of connection they were able to derive in the 2020 season. In interviews, more gardeners expressed feeling isolation in the gardens (14) than feeling a greater sense of connection (5) due to COVID-19. Gardeners talked about noticing less socializing taking place in the garden, with P3 observing, “this is really a different world. You’re really antisocial gardeners now.”

Sometimes the lack of socializing was a voluntary choice on the part of gardeners who were guarded due to concerns over COVID-19 transmission, particularly in early days of the pandemic. For example, some gardeners said they chose to work in the garden during times when few other people would be there. For instance, P2, a gardener in Ithaca, said:

“I don’t think it really had that community atmosphere as much. A couple times, we’d go out and there’d be someone who was playing music while gardening, so we got a little bit of that vibe. Most of the time we tried to go when no one else was really there so we didn’t have to worry about things as much... We were planning on having it as a social kind of thing. We ended up not doing that, and so it didn’t really feel like a community garden; it was just like our garden away from home.”

Similarly, some gardeners worked more efficiently to limit their time in shared spaces, like P11, another Ithaca gardener, who said, “I had a short work time, so I worked hard. I reduced my communication with my neighbor. Normally, I like talking to them, but this reduced my talking time.” This guardedness and reticence to socialize was not necessarily a sign they did not care about their fellow gardeners; a few people explicitly mentioned increased concern about their neighbors and community, including P26, a gardener in Harlem, who said, “We call more now... Now, for example, for a whole month, if I don’t see my neighbor, I call and ask if everything is okay.”

In other cases, reduction in socializing was due to new COVID-19 regulations stipulated by the garden managers for health and safety reasons. Survey responses showed that these new rules were largely supported by gardeners and did not negatively impact community gardeners’ experiences in 2020. For example, while many people expressed missing events that were typically held in the garden but needed to be canceled due to pandemic -related restrictions, others observed that hosting events virtually rather than in-person had the unexpected benefit of making them more accessible. Similarly, “members only” policies implemented by a few gardens made some of those gardeners uncomfortable with the newly instated exclusivity and engendered a sense of isolation from the community. As P12, a gardener in Brooklyn, mentioned, “We closed the garden [to non-members] because of COVID, but then it started to feel like just a private garden club; the people that were members had keys but then no one else could come in...” P24 similarly reflected about their garden in Ithaca:

“I think the new sort of rules around visitors were a little bit limiting... If I was hanging out with someone and we were looking

to do something outside, it was no longer an option to go to the garden plot together because, for obvious reasons, that wasn't allowed this year."

A few gardeners in communal gardens said they did not have access to their garden and lost the garden as a place to socialize altogether. That said, a subset of these gardens reopened later in the season. P8, from one such garden in Brooklyn, recalled, "The whole thing was [initially] closed, and everything was just haywire as far as normal contributions to the garden went, and... the requirement for doing open hours was gone, because there were no open hours."

### Material Challenges

The pandemic introduced new material challenges and barriers besides the typical issues posed by pests, poor soil quality, and the weather, which affected gardener experiences and community garden viability across our study sites. In particular, gardeners mentioned COVID-19 driven supply chain disruptions limiting availability of materials like seeds, seedlings, compost, and soil. P6 from Ithaca said, "A lot of places were sold out of the varieties that I wanted. I think that was probably the biggest hurdle." By contrast, while some encountered limited seed selection, others were able to get the basics of what they wanted to grow, as indicated by P19 from Harlem, who said, "I met a really awesome guy who has a farm upstate...so we got a lot of plugs [from him], and then I was able to access plenty of seeds from the hardware store." Compared to previous purchasing habits, some gardeners also mentioned they were doing more shopping online for their gardening supplies.

Material deficiencies also impacted a limited subset of garden organizations. One garden was unable to source compost, which had previously been a shared resource for their garden community. Furthermore, some gardens' rules impacted material accessibility for gardeners, such as recommendations against gardeners sharing tools with each other or eliminating shared tools altogether. Although the overwhelming majority of gardeners largely agreed with new COVID-19-related rules, several gardeners saw the decision to eliminate shared tools as excessive in hindsight, referencing other gardens that chose to continue making shared tools available with the expectation gardeners would sanitize them after use. P20 pointed out that, among Ithaca gardeners:

"Things have changed in terms of how we react to the idea that there's transmission. There was a lot of, I can't say overreaction, but there were lessons learned... Shared equipment, providing a wheelbarrow...I would lobby that we can safely provide that equipment."

Along with this, some gardeners talked about running into challenges due to a lack of knowledge, time, energy, physical resources, and/or human resources. The COVID-19 pandemic brought a boom of gardeners for some gardens and a bust for others. Several gardens in this study, typically larger, more established gardens with a plot-based management style, had

more gardeners than ever due to high interest. On the other hand, some gardeners from smaller or communally-managed gardens talked about their gardens struggling to keep up with maintenance due to a lack of volunteers, and how the responsibility to keep the garden going fell on a pared-down number of staff or volunteers. P14 from Buffalo said, "Only having two in the [communal] garden, it was a lot more physical work, and I think we're all getting older." Similarly, in reflecting on the challenges facing the communal garden they participated in, P23, also from Buffalo, said:

"Over the summer we had planned on bringing in a few different volunteer groups to sort of revamp the garden and get things together. Naturally we weren't able to bring on any volunteer groups because of coronavirus...two [staff] kind of collaborated together with a few...interns to get our garden really up and running again."

### Safety Concerns

Perception of safety of community gardening during the COVID-19 pandemic was not a function of gardener age, race, gender, income, or other gardener characteristics. However, it was correlated to garden management type, with a greater percentage of members from communally-managed gardens seeing their garden as a safe space (43%) than those with plot-based management (33%). Additionally, 56% of plot-based gardeners reported being less sociable in the gardens in 2020 relative to previous years (compared to 28% of communal gardeners) and talked about the corresponding decline in the social benefits of participating in their community garden. As P3—who participated in a plot-based garden in Ithaca—said:

"We just wave but definitely weren't as social with people in the plots next door to ours...I would actually work on the far side of my planting area if they were on the side of their plot that was close to mine. It was a deliberate 'give them space, give me space' kind of thing... almost antisocial behavior to plot mates."

These trends in guardedness were also reflected in varying feelings of disconnection. Plot-based gardeners discussed not socializing or talking to their neighbors as a change in behavior. In discussing his relationships with other gardeners in his plot-based garden in Ithaca, P11 stated, "Normally I like talking to [my neighbor], but this reduced my talking time." Ithaca particularly stood out as a community where gardeners became atomized in their own plots within their garden. The demographics (i.e., educational attainment), garden management style (i.e., dominated by plot-based management), and urban development (i.e., suburban) in Ithaca influenced which participants were more likely to express feelings of isolation and less likely to engage with others in their community garden. For instance, those with advanced degrees were more likely to express feeling isolated (100%) compared to those with less education (33%). Similarly, gardeners in suburban, plot-based community gardens were more likely to avoid socializing (72%) compared to those in urban and communally-managed gardens (14%).

Even so, several gardeners in suburban, plot-based gardens said they considered the garden a safe space for socializing, such as P24, who said, “things started to look up with things sort of loosening and thinking more about, you know, that the garden would probably be a pretty safe space to occupy, I... signed up,” when reflecting upon the decision to join a plot-based garden in Ithaca. For a few participants in suburban gardens, concern about safety and COVID-19 transmission also gave them pause when it came to food sharing. They generally still shared their garden produce with friends and family, whereas donation seemed a bigger component of food sharing in urban gardens. Overall, most gardeners did not change their food sharing habits due to COVID-19.

### Barriers

Whereas, challenges were commonplace, very few interview participants expressed any outright barriers to participation. Similarly, only 36% of survey respondents felt the COVID-19 pandemic raised substantive obstacles to their gardening experience. Not quarantines, high costs, lack of childcare, public transport, materials, time, information, or interest, nor closure of knowledge resources or gardens posed an impediment to their garden experiences ( $x = 0$ : Not a barrier/impediment). Even health concerns barely registered as a barrier ( $x = 0.5$ ). By and large, in our sample, those who wanted to participate in community gardens were able to do so. That said, those with higher household incomes were less impacted by high costs and lack of public transport ( $\beta = -1.562, p = 0.024$ ). Of those barriers mentioned during interviews, some were personal, including several would-be gardeners who decided not to participate in the 2020 season because either they themselves were at high-risk for COVID-19 or they were living with others who were. Another participant talked about the overwhelming pressures of other responsibilities that led to their abandonment of their garden responsibilities. Other barriers mentioned were organizational, in that some gardens did not accept new members, or had a cap on membership causing waiting lists, or, in the case of one person, their community garden was closed due to space concerns and financial constraints exacerbated by COVID-19.

### Opportunities

It was just as common for gardeners to talk about the opportunities as the challenges they found in the 2020 growing season. Many gardeners talked about the pandemic providing opportunities for developing new programs, such as food donation, composting, seed starting, online courses, Victory-style Gardens [gardens planted at home residences modeled after those cultivated during wartime to supplement rations (Music et al., 2021)] (e.g., Freedom Gardens, so named to avoid wartime connotations), and volunteering to care for plots of sick members. Many of these new programs aimed to support gardeners along with the broader community, making the community garden into more of a community resource, and were an outlet for service and caring for others during difficult times. For instance, in discussing the new Freedom Gardens program offered by a community garden organization in Buffalo, P21 said:

“Some people [said]...you just pivoted on a dime to Freedom Gardens and that’s great. And I had other people say to me that’s not part of your mission. You’re community gardens. Why are you bothering spending your time and resources and staff time and money on residential gardens? And my answer is we make a community where they are, and if you’re in a pandemic and people need food and they can’t get to [a] community garden or they don’t feel safe going into community gardens, we are going to do everything we can to open those gardens...it’s a ‘both and’.”

Gardeners expressed increased awareness of food insecurity in their communities and made efforts to contribute to food donation programs. The new programs relied upon gardens being able to be flexible with shifting mission objectives and funding sources to support them. Several gardeners noted they had more time or flexibility in timing since they were working from home and not pursuing activities outside of work. At least one gardener talked about how they were able to devote more time to the garden because they had lost their job due to the pandemic.

### Gardeners’ Recommendations

Finally, we considered what gardeners themselves would recommend to improve their community garden experience and overcome challenges they faced, particularly in the context of the COVID-19 pandemic. Overall, during interviews, gardeners talked about being satisfied during the 2020 growing season, along with their ability to overcome challenges in ways that did not detract from their community garden experience. The majority appreciated the decisions taken by their community garden managers to keep the garden running and keep gardeners safe in light of the COVID-19 pandemic.

Notwithstanding their overall satisfaction with the 2020 community garden experience, most gardeners had suggestions for improvements, particularly in the context of the COVID-19 pandemic. From the survey data, only 16.3% of respondents claimed they had everything they needed for a successful and fulfilling garden season. Some gardeners offered suggestions for things they would like to see implemented in their garden to address the vulnerabilities the pandemic exposed, such as physically changing the garden, offering opportunities for safely developing community connections among gardeners, and extending their garden’s outreach to their broader community.

### Information and Knowledge-Sharing

The most common recommendation (52.7% of respondents) was for more information about gardening, particularly in an online format (47.2%). P1, a self-described less-experienced gardener who joined the garden during the pandemic proposed establishing apprenticeship-type programs that would pair new gardeners with long-time gardeners or Cooperative Extension-certified Master Gardeners. P8, a more experienced, 68-year-old gardener echoed this, suggesting the creation of a Garden Ambassadors program to introduce the garden to the community and provide gardening guidance to newcomers, saying:

“For someone who is not familiar...with gardening or with the organization or social situation that is involved with a community



garden, I think it could be intimidating. And I think that it would be a really good thing to have some kind of garden ambassadors or something.”

### Garden Accessibility

Making their garden more accessible for community members, particularly school children, was another common refrain in the interviews. P23 from Buffalo suggested, “I like the idea of being intentional about bringing in small groups of people to enjoy time there,” and P8 from Brooklyn added, “It’s a great thing for kids to learn about, and I think the more accessible, and, you know, friendly community gardens can be made...the better.” This connects with another recommendation to increase educational opportunities for the community through the garden.

Some gardeners proposed various physical alterations to community gardens that might help restore some of the sense of community lost amid the pandemic, such as establishing a dedicated outdoor dining and event area. A few interviewees recommended changing the layout of their garden to facilitate physical distancing, including bigger plot sizes, and to make it more visible to members of the surrounding community. P15 from Buffalo articulated this, saying:

“It was configured as a small plot here, a small plot there, a small plot somewhere else. I think that was a problem...I think if in a perfect world, there would be an acre, an acre and a half plot somewhere...in kind of a central location that’s central to the community that needs to be served...”

### Garden Networks and Mutual Aid

Additionally, gardeners proposed creating community garden networks where gardeners from different gardens can share ideas, experiences, and resources. Gardeners also discussed recommendations for improving connections between their garden and the broader community. For example, some gardeners we interviewed said they would like to see more collaboration with mutual-aid groups in their communities to make their garden into more of a community resource. This was also borne out in the example of several gardeners whose motivations for participating in the community garden included its function as a community resource in light of the pandemic. As P12 from Brooklyn pointed out, the pandemic “kind of re-centered the garden as a place that could give back to the community and versus just like a hobby kind of thing you are just going to plant some seed, but it was like actually a tangible thing that we could do.” This could entail organizing food and seed exchanges or establishing more of a social media presence to facilitate connections between garden members and with the broader community. In particular, gardeners from Buffalo and Brooklyn talked about their hopes to continue the Freedom/Victory Garden programs their gardens started during the pandemic to allow those who did not feel safe in the community garden to grow food at home. As P8, also from Brooklyn, stated:

“The garden is, right now, intending to continue the Victory Garden in the next season. I don’t know if it’s been you know,

officially established or whatever, but I think that, you know, until we get world peace and everybody has enough to eat, which is not happening immediately, I think it would be a really good thing to continue, and I believe that only happened because of COVID.”

Others articulated more organizational alternatives, such as holding collective work days to lighten the burden of care for the garden and give gardeners opportunities to build relationships with each other by working together. P6, a member of a plot-based garden in Ithaca, said, “I have a cooperative mind, so it seems like with just a little bit of effort we can make everyone’s life a lot easier by [collectively] piling our rocks over there [outside the garden] at the beginning of the season.”

## DISCUSSION

### Community Garden Connections During COVID-19

Our findings suggest that community gardens could be resilient sites of reprieve and relative normalcy for their gardeners during the COVID-19 pandemic and other crises. Generally, gardeners’ primary motivations for and benefits from participating in their community garden were not substantially impacted by the pandemic. Each community garden implemented new rules to reduce risk of COVID-19 transmission, and for the most part these rules were supported and upheld by gardeners. While the community gardeners in our study experienced a mix of opportunities and challenges during the 2020 growing season, very few encountered outright barriers preventing them from participating at all in their garden.

Community gardens are typically places for socializing and relationship-building. The majority of community gardens in our study were able to offer gardeners safe spaces to socialize and participate in a collective endeavor linking them to their broader socioecological community (Svendsen, 2009). Interviewed gardeners consistently praised community gardens as places for cultivating positive connections with others, which Birky (2009) also identifies as a key component of the community garden experience. This aligns with studies that have found community gardens to be hubs for community building (Saldivar-Tanaka and Krasny, 2004; King, 2008). To our surprise, however, social relationships were not rated as particularly important in the survey. It may be that gardeners did not recognize the importance of this benefit prior to the disruption of the pandemic, and the dissatisfaction with the social interaction in their community garden in 2020 may have undermined how respondents rated its importance for that season. It may also have been that gardeners who were more outgoing were more likely to participate in the interviews.

The COVID-19 pandemic negatively impacted community building for many participants, who indicated they were not satisfied with social relationships in their community garden during the 2020 season due to COVID-19-related rules and behavior changes. Similar to Mejia et al. (2020), we found that community gardens offered a space gardeners felt was safe on the whole, but even so, many indicated their gardens felt less social during the 2020 growing season than in previous years.



This feeling of isolation was particularly acute among gardeners maintaining private plots. Even so, the separation afforded by this management approach did not necessarily translate into a greater feeling of safety, compared to gardeners working in communal gardens.

Our findings show that community gardens can also be refuges where gardeners and community members can find peace, solace, relaxation, and solitude. These characteristics are all the more critical given the mental health crisis exacerbated by COVID-19. Our results corroborate the growing number of studies demonstrating the therapeutic benefits of spending time in nature, and particularly gardens (Mahbub Hossain et al., 2020; Pfefferbaum and North, 2020; Rajkumar, 2020; Kumar and Nayar, 2021).

The community gardeners in our study reported creating meaningful connections with nature through their gardens at a time when COVID-19 restrictions confined many to spending most of their time indoors. Spending time in nature is important for physical and mental wellbeing (Frumkin et al., 2017), and during the pandemic people have exhibited increased interest and involvement in community gardens (Lin et al., 2021; Mullins et al., 2021; Schoen et al., 2021; Theodorou et al., 2021), perhaps more uniformly than other forms of greenspaces (Rice and Pan, 2021). Our study supports research showing that community gardening is a unique way to connect with nature and foster socioecological resilience. Gardens provide places for peace and solace as well as belonging, with the added dimension of gardeners' physical connections to the place through tending the plants and the soil (Krasny and Tidball, 2009). For many gardeners, being part of their community garden offered them a way to connect socially and ecologically with something greater than themselves. This finding supports the argument that active stewardship through community gardening links the individual to the collective in ways that are restorative in and for public space (Svendsen, 2009).

Unlike outdoor recreation, the active stewardship of community gardens provides gardeners with additional purpose while spending time in nature, and promotes a more intimate, positive relationship between people and their broader ecological community. This has been particularly important during the COVID-19 pandemic. Participants noted they were thankful for the sense of responsibility they derived from their community garden because it helped them get out the door and gave them something tangible to do during a time when many other events and options for recreation or entertainment were not available. Similar to findings from Giraud et al. (2021), some participants indicated their gardens fostered eudemonic wellbeing as caring for plants provided a sense of purpose. This highlights the reciprocal relationship several of our interviewees expressed having with their gardens. Similar to Marsh et al. (2021) findings, participants in our study reiterated that gardens were therapeutic, in part due to their creating a space for experiencing and connecting to nature in a reciprocal manner. The practice of cultivating a garden alongside others directed gardeners' attention to caring for living things in the present, which could be of particular importance during a pandemic that highlighted the uncertainty and fragility of life and good health. All of these

benefits corroborate the findings of other studies regarding community gardens' role in maintaining participants' wellbeing and resilience in the face of the additional stresses and challenges imposed by the pandemic (e.g., Theodorou et al., 2021; Egerer et al., 2022).

## Lessons for Community Garden Resilience

Our findings suggest that the community gardens in this study demonstrated successful adaptability and resilience in the face of the crisis caused by the COVID-19 pandemic. Some of this resulted from community gardens' capacities to support the resilience of individual gardeners, but there were also collective features of the gardens themselves underlying their emergent resilience. Perhaps the most important of these is diversity (Krasny and Tidball, 2009). For example, our results suggest gardens whose membership is dominated by inexperienced gardeners may be more threatened by a crisis because they lack the knowledge, experience, or confidence needed to manage a community garden. Community gardens with primarily older gardeners may find maintenance challenging if members do not feel comfortable working in the garden due to the greater risk posed to them by a virus such as COVID-19 or lack the physical ability to overcome labor shortages, as was the case for one of the gardens in our study. A mentorship program, as proposed by our study participants, could help address such knowledge and labor gaps. Similarly, community gardens should build relationships with other local organizations to build diverse networks (Saldivar-Tanaka and Krasny, 2004; Krasny and Tidball, 2009; Svendsen, 2009). For example, gardens with primarily younger, less-experienced members could pair with local elder care facilities and Master Gardener organizations, and those serving older communities could collaborate with local schools.

Another factor that can contribute to community gardens' resilience is diversity of management styles. Several communally-managed gardens in our study struggled to stay running due to COVID-19-related labor shortages and group work restrictions. On the other hand, some plot-based community gardens struggled to provide gardeners with the full social experience they had hoped for. A combination of management styles within individual gardens, such that some areas are communally-managed and others are plot-based, could provide a sense of community and safety for members, depending on their personal preferences. It could also help gardeners with individual plots to deal with large-scale challenges such as rocky soil, which need to be addressed through collaborative efforts between gardeners.

Such an arrangement might also help address gardeners' concerns about the governance structures of their gardens. For example, some gardeners in larger, communally-managed gardens said they would like to have more flexibility and less top-down management, while a few gardeners from plot-based gardens suggested more of a centralized organizational structure. Our study suggests a cross-scale approach may be beneficial to quickly adapt to changing conditions. Some decisions could be left for individual gardeners to make as they prefer, others may need to be decided on by all members, and some decisions could be delegated to committees of gardeners, depending on their

urgency and scope, as described in Fox-Kämper et al. (2018). Ultimately, there is no uniform approach to determine which user groups should make which decisions in a garden, as this depends on each garden's context.

Several community gardens in our study struggled to adapt to new COVID-19 regulations and recommendations early in the pandemic when there was more uncertainty about COVID-19 transmission. Here, both the smaller and the larger community gardens had advantages in our sample. Small gardens could fly under the radar of regulations, and their small number of members allowed them to fall under limits on group gatherings. Larger gardens were deemed essential community-serving organizations, and the resources they had at their disposal allowed them to provide support to their gardeners amid the challenges of the pandemic.

Community gardens' unique characteristics also presented vulnerabilities to the pandemic which may manifest similarly in other times of crisis. Typically, community gardens provide venues for social learning, and sharing knowledge is one way gardeners build strong interpersonal relationships (Krasny and Tidball, 2009). During the 2020 growing season, decreased sociability in the garden may have reduced opportunities for social learning to take place. In particular, some newer community gardeners in our study expressed being challenged by their lack of knowledge, similar to Sia et al. (2021) finding regarding challenges faced by new home gardeners during the pandemic. The pandemic also impacted material resource sharing between gardeners (e.g., tool-sharing prohibited, limited resources, etc.). These inconveniences were not barriers, however, and we saw examples of some gardens overcoming them by providing sanitizing and handwashing stations or implementing community composting programs. Similarly, some gardens helped facilitate socializing by holding outdoor events with limited attendance, hosting virtual events, and providing social media platforms for interactions between members. These approaches may be useful for addressing the isolation felt particularly acutely by gardeners in plot-based community gardens during the 2020 season.

Cultivating networks within community gardens as well as between gardens and the broader community in which they are situated can help overcome challenges to sustain and improve the adaptability of community gardens. Nested (i.e., smaller networks integrated within larger networks), and small-world (i.e., most network components are not directly connected, but most components are related by a small number of intermediate connections) networks are resilient because they efficiently balance the precarity of isolation and the stability of fully-connected lattice networks (Csermely, 2006). The community gardens in our study that operated in isolation encountered resource scarcity and threats to access that may have been circumvented by partnering with larger organizations, city government, and local businesses. Similarly, forming networks with other community gardens can allow exchange of ideas and information to improve gardeners' experiences (Svendsen, 2009). In turn, community gardens can also contribute to the networks of which they

are a part by serving as restorative commons: providing food, greenspace, and opportunities for public gathering and social learning.

Community gardens in our study demonstrated their commitment to supporting their broader socioecological communities in a variety of ways. For example, some gardens implemented new programs such as food waste collection to bolster compost production or provided Freedom/Victory garden kits to community members who did not feel comfortable coming to the garden to enjoy the benefits of gardening at home. Community gardeners also continued sharing their produce with others in their community, whether with friends and family, by donating to food pantries, or by offering pick-up times when anyone could come by for some produce. This supports recent studies demonstrating that the positive effects of gardens on wellbeing extend to the broader community (Corley et al., 2020; Kou et al., 2021). Because they are community-oriented, community gardens can extend benefits beyond individual participants and in so doing serve as restorative commons (Campbell and Wiesen, 2009) even during a global crisis such as the COVID-19 pandemic.

## Limitations

While the community gardens included in this study represented a distinct socioeconomic and biophysical cross-section of gardens and gardeners in New York, the overall sample size of survey participants ( $n = 56$ ) was relatively small. Despite its interaction with other socioeconomic factors in affecting experiences, motivations, and inequalities, we ultimately did not include race as a factor in our quantitative analyses to prevent model overfitting given our small sample size. In addition, the 26 interview participants were predominantly White and Asian individuals with higher educational degrees, with under-representation of Black/African Americans, no representation of Hispanic individuals, or individuals with limited educational attainment. There is a concern that those who agreed to complete the survey and/or be interviewed were not representative of the gardener populations at these sites.

We attempted to address the disproportionate representation of Ithaca gardeners in our sample by including "city" as a random effect in our models. Even so, this may have biased our results comparing the effects of individual gardeners' characteristics on their responses. For instance, differences we saw in feelings of isolation between those urban and suburban community gardeners could also have been a confounding effect, as many suburban gardens had plot-based management (including most Ithaca gardens), while more of the urban gardens were communally-managed, making it impossible to disentangle the effect of garden management approach and urban location.

Future studies should attempt to consider a wider range of community gardeners to reflect a more complete range of experiences of this diverse group. It would also be interesting to directly compare the experiences of community and home gardeners. Finally, there is uncertainty about how lasting the

phenomena observed during the pandemic will be, which must be established before determining substantive shifts community gardens should take to support gardeners.

## CONCLUSION

The COVID-19 pandemic substantially increased peoples' interest and participation in gardening in general, including community gardening. If community gardens are to continue flourishing in their capacity to help gardeners manage stress, connect with nature, and increase food security throughout and beyond the COVID-19 pandemic, they must continue to evolve, particularly to retain members and/or grow. In addition to the gardener recommendations shared in the Results section, this research reveals some of the unique vulnerabilities and opportunities the COVID-19 pandemic has presented in community gardens. Our findings can inform how community gardeners and garden managers cultivate their gardens as restorative commons for the public good. The challenges facing community gardens depend on their unique context, and our findings regarding differences between private-plot and communally-managed gardens demonstrate there are no one-size-fits-all recommendations for all gardens. We hope community garden organizations draw inspiration from this study to inform how they engage with their communities to adapt in times of crisis.

This study underscores the importance of keeping community gardens open and accessible. They provide sundry benefits to gardeners and the broader communities in which they are situated. Many of these benefits, such as exercise, relaxation, social connection, and food sovereignty, are all the more important to ensure physical and emotional wellbeing during times of crisis, such as the ongoing pandemic. Community garden organizations need to do more to facilitate social interaction, as this valued benefit was substantially curtailed in 2020. Community gardens also can serve as nature- or eco-therapy to help address the increased rates of mental illness during the pandemic. Finally, we concur with recommendations that policy makers play an important role in the broader community to take planning and public health measures to ensure all citizens have access to gardening, given its multiple benefits for health and wellbeing. Given the low risk of COVID-19 fomite transmission (Chen, 2021; Lewis, 2021; Mondelli et al., 2021) and transmission in open-air areas (PHE Transmission Group, 2020; Razani et al., 2021) if proper precautions are taken, communities should promote community gardens as safe spaces to work together and enjoy.

## DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because IRB exemption restrictions precluded sharing the collected human subjects data with anyone outside of the

research team. Requests to access the datasets should be directed to TF, [tbfalkowski@nmhu.edu](mailto:tbfalkowski@nmhu.edu).

## ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Cornell University Institutional Review Board for Human Participant Research. Written informed consent for participation was not required for this study in accordance with the national legislation and the institutional requirements.

## AUTHOR CONTRIBUTIONS

TF proposed this project, developed survey and interview instruments, distributed surveys, conducted interviews, coded interview transcripts, conducted thematic analysis, analyzed survey data, and wrote the manuscript. BJ proposed this project, developed survey and interview instruments, conducted interviews, conducted thematic analysis, and wrote the manuscript. DR proposed this project, developed survey and interview instruments, and wrote the manuscript. AD proposed this project, developed survey and interview instruments, coded interview transcripts, and revised the manuscript. SD and TS proposed this project, developed survey and interview instruments, and revised the manuscript. AA proposed this project and developed survey and interview instruments. All authors contributed to the article and approved the submitted version.

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## SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fsufs.2022.854374/full#supplementary-material>



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