



Why don't people plant trees? Uncovering barriers to participation in urban tree planting initiatives

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ABSTRACT

Urban tree cover is inequitable in many American cities, with low-income and non-white neighborhoods typically having the least coverage. Some municipal and non-profit tree planting programs aim to address this inequity by targeting low-income neighborhoods; however, many programs face lack of participation or resistance from local residents. In this study, we aimed to uncover the economic, social, cultural, and physical barriers that community leaders face in planting trees and fostering engagement in a neighborhood with low tree canopy. In collaboration with an urban greening nonprofit in Philadelphia, Pennsylvania (US), twenty in-depth interviews were conducted with community leaders in a low canopy neighborhood, North Philadelphia. Half of these leaders were already involved with local tree planting programs, while the other half were not. Findings reveal that despite broad appreciation for trees and greenspaces, there are concerns about the risks and costs residents assume over the course of a tree's life cycle, the threat of neighborhood development and gentrification associated with trees, limited plantable space, and limited time and capacity for community organizations. Additionally, these barriers to participation may be amplified among low-income and communities of color who face the legacies of historical tree disservices and municipal structural disinvestment. Addressing community concerns regarding the long-term care of trees beyond the initial tree planting would likely require further programmatic support. Overall, this research highlights the complexity of addressing inequities in tree canopy and the importance of integrating resident and community leader perspectives about disservices and management costs into tree planting initiatives.

1. Introduction

Urban tree canopy (UTC) provides a variety of environmental, social and health benefits to urban neighborhoods by reducing local temperatures, lowering energy use and absorbing stormwater runoff (Roy et al., 2012; Pataki et al., 2021). Urban forestry and urban greening initiatives such as tree planting and vacant lot greening have also been linked to reduced crime (Kondo et al., 2016), increased social cohesion (Fisher et al., 2015; Jennings and Bamkole, 2019) and a variety of public health benefits (Ulmer et al., 2016). However, multiple studies have revealed that cities in the United States (US) typically have an inequitable distribution of UTC (Heynen et al., 2006; Watkins and Gerrish, 2018; Schwarz et al., 2015). Specifically, wealthier and whiter neighborhoods

with higher rates of homeownership tend to benefit from higher levels of UTC. Recent research has sought to uncover the historical drivers of these inequities, such as redlining (Locke et al., 2021) and urban renewal (Roman et al., 2021a). Furthermore, structural differences in urban form such as housing density (Heynen, 2003; Roman et al., 2018), and a lack of municipal plans that address gaps in UTC (Kolosna and Spurlock, 2019) have contributed to persistent UTC inequities in US cities.

Many US cities have set UTC targets and launched tree-planting initiatives to achieve the many benefits of trees (Hauer and Peterson, 2016; Eisenman et al., 2021). Some local programs seek to address UTC inequities by planting more trees in neighborhoods with low UTC (Nguyen et al., 2017), yet there continue to be challenges because of

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variable participation in tree planting programs (Carmichael and McDonough, 2018). For example, in free tree programs, neighborhoods of higher socioeconomic status tend to request more trees (Donovan and Mills, 2014; Locke and Grove, 2014). This varied participation has exacerbated existing inequities in UTC within American cities, rather than increasing canopy cover in low canopy neighborhoods.

Some research has examined the differential participation rates of different social groups in urban tree planting and giveaway programs. Demographic factors have been tied to increased participation, with residents more likely to request a tree or respond positively to local representatives from planting programs if those residents are homeowners living in older homes, long-time residents, and women who are employed (Greene et al., 2011; Donovan and Mills, 2014; Locke et al., 2015; Nguyen et al., 2017). Residents may also have different motivations for planting trees, including shade and aesthetics (Summit and McPherson, 1998; Locke et al., 2015) and desire to create a habitat for wildlife (MacDonald et al., 2020).

There are barriers to participation and ongoing engagement in tree planting initiatives, particularly among low-income and minority neighborhoods. For instance, in Holyoke, MA, tree recipients faced challenges in following through with tree maintenance in coordination with local partners and government agencies (Breger et al., 2019). Residents may also be unaware of tree planting initiatives in their locality (Conway et al., 2021). Furthermore, some communities are resistant to planting trees in their neighborhoods. Carmichael and McDonough's studies (2018, 2019) on tree planting efforts in Detroit, MI revealed that residents have been resistant to municipal tree planting efforts because of the citywide neglect of trees that increased the burden of stewardship among residents, as well as negative experiences with tree damage to infrastructure. Neighborhood change and the green gentrification phenomenon (Anguelovski et al., 2018) can also be a concern for residents. For instance, in Portland, OR, yard and street tree planting was associated with gentrification at the census tract level (Donovan et al., 2021). Additionally, a growing awareness that trees provide disservices, such as infrastructure conflicts (e.g. trees damaging utilities and buildings), detrimental health impacts (e.g., allergies), and nuisance concerns (e.g., the hassle of falling leaves) (Roman et al., 2021b) can make trees undesirable for some residents. Tree planting campaigns generally promote ecosystem services (Seamans, 2013) and may neglect to recognize these disservices, or to address their impacts on communities.

Our study expands upon emerging research on barriers to participation in urban tree planting programs within low-income and minority neighborhoods. Specifically, our research seeks to identify the contextual economic, social, cultural, and physical factors that limit or facilitate participation in community-led programs. We focused on North Philadelphia, a neighborhood in Philadelphia, PA which currently faces low UTC and limited engagement in tree planting efforts. Our goal was to (1) understand why community leaders have or have not participated in tree planting initiatives, (2) uncover these leaders' perceptions regarding why people in their neighborhoods want or do not want trees and (3) discover socio-structural barriers and facilitators for equitable tree planting. We conclude with a discussion regarding how tree planting initiatives can better address the concerns and needs of community leaders from low UTC neighborhoods.

2. Methods

2.1. Study area

Philadelphia, PA is currently the sixth-largest city in the US, with a majority-diverse population of 42% Black or African American, followed by 40% White (non-Hispanic) and 15% Hispanic (U.S Census Bureau, 2020). It is also known as America's poorest large city, with a poverty rate of 24.3% (U.S Census Bureau, 2020). As of 2018, tree canopy covers 20% of Philadelphia, with enormous variation across neighborhoods

(O'Neil-Dunne, 2011, 2019). Both government agencies and nonprofit organizations within the city are working to increase UTC in low UTC neighborhoods through tree planting and giveaway initiatives (Nguyen et al., 2017). We partnered with the Pennsylvania Horticultural Society (PHS), a leading urban greening nonprofit in the Philadelphia region. We focused on North Philadelphia because PHS considers this area to be 'high priority' for tree planting opportunities based upon a combination of indicators including low UTC, high population density, high crime, and low household income. North Philadelphia neighborhoods have experienced decades of disinvestment, with long periods of population loss and substantial urban renewal programs, leading to substantial vacant residential and industrial land, unemployment, lack of jobs, and high housing costs with older housing stock (Adams et al., 1991, 2017). Specifically, we focused on neighborhoods within the city planning districts of North, Lower North and River Wards (Fig. 1). Park spaces in the study area include East Fairmount Park, Hunting Park, Tacony Creek Park, and numerous other smaller parks and recreation centers, although many of these greenspaces have been identified in city planning documents as needing overdue maintenance (PCPC, 2014, 2015, 2018). These plans also suggest opportunities for planting trees along streets, in commercial areas, and at schools. Notably, North Philadelphia has high housing density, with rowhomes (a form of attached housing common in northeastern US cities) often having little or no yard space, making street trees a prime opportunity for planting on residential blocks.

Historically, increases in UTC within North Philadelphia have been tied to factors such as urban renewal policies, with depopulation and demolition of housing leading to unintentional tree growth on vacant lots (Roman et al., 2021a). Additionally, some past tree cover gains are attributable to targeted greening interventions (Roman et al., 2021a). PHS ran a 'Greene Countrie Towne' program from the 1970's-1990's aimed at involving low-income residents in the beautification of neighborhoods and development of urban gardens (Rosan and Pearsall, 2017). PHS now operates a vacant lot greening program, LandCare, and an urban gardening program, Garden Tenders, as well as a tree planting and stewardship program, Tree Tenders (TT); the latter is the focus of our study. There are additional tree programs in the city, such as a yard tree giveaway program called TreePhilly run by Philadelphia Parks & Recreation (PPR) and the Fairmount Park Conservancy.

Our study engages the long-standing TT program to examine barriers to participation with tree planting. Founded in 1993, TT and other urban greening programs at PHS were formed, in part, to compensate for municipal disinvestment. Notably, when TT was founded, the city agency responsible for street tree and park management had undergone drastic budget and personnel reductions (Roman et al., 2021a). The TT program provides free trees to Philadelphia residents—primarily street trees, but also trees for planting at other locations, such as lawns at religious institutions and schools. The TT program has a semi-autonomous structure that encourages neighbors to engage with each other for tree stewardship. Specifically, TT neighborhood-based groups leaders are volunteers responsible for tree planting in their own communities. These TT leaders are required to take a nine-hour course about tree planting and care, tree benefits, and community organizing strategies (Roman et al., 2018). PHS provides free trees and logistical support for planting days each spring and fall, but TT leaders themselves solicit planting requests from neighbors and coordinate planting. Street tree locations are approved by PPR arborists, and these arborists select species suitable to each site. Post-planting maintenance is the responsibility of tree recipients, with PHS staff emphasizing that residents need to routinely irrigate their trees for the first two years, although some TT leaders support maintenance to varying degrees (e.g., watering reminders, pruning and soil pit care). Most TT groups also participate in Tree Checkers, which is an extension of TT to remind homeowners of tree care guidelines and to support citizen science monitoring of recently planted trees (Roman et al., 2018). Some TT leaders also participate in TreePhilly and/or other urban greening

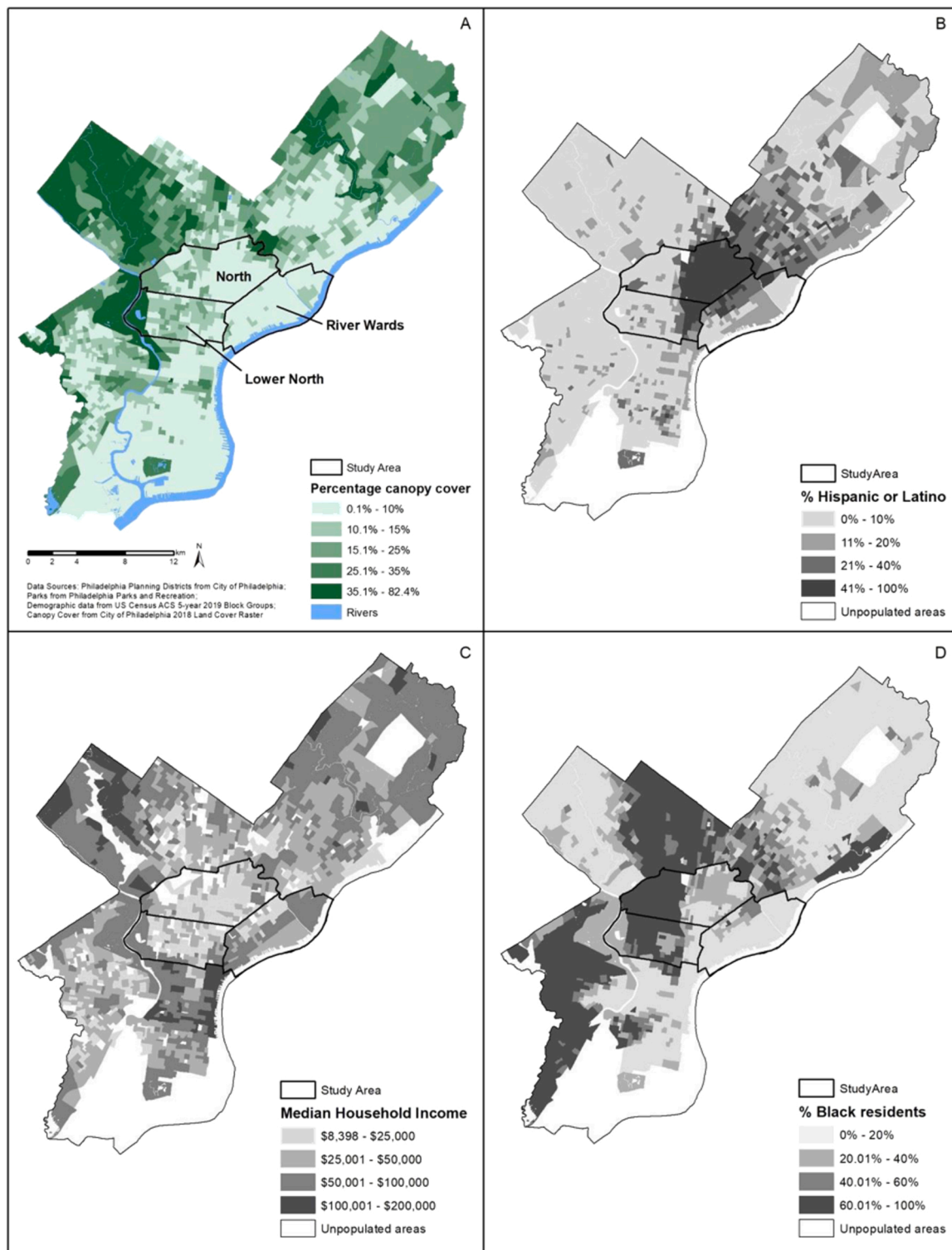


Fig. 1. Study area.

initiatives.

For context in the interpretation of our findings, we briefly review here the responsibility for tree-related damages in Philadelphia. Street trees fall under the jurisdiction of PPR, but such trees are owned by the adjacent property owner. PPR is responsible for approving street tree plantings and removals, and this agency removes and prunes hazardous street trees, with tree inspections carried out by municipal arborists, although PPR does not currently have a proactive street tree inspection

and pruning cycle. Property owners are responsible for sidewalk maintenance, including sidewalk problems related to trees, as well as for sewer laterals which tree roots occasionally infiltrate (PPR, 2019). Trees located on private properties that are not street trees, including trees located along alleyways, in yards, and in vacant lots, are the responsibility of property owners (Muse, 2014; PPR, 2019). In cities across the US, legal responsibility for built infrastructure damage and injuries from falling street trees and tree limbs (e.g., trees that fall in storms), as

well as sidewalk trip and fall injuries related to trees, varies depending on circumstances, including whether or not the city was aware of hazardous conditions (Kronthal, 2010) as well as local ordinances (Fracassa, 2017). Negligence is a common underpinning for litigation related to tree damages in the US (Mortimer and Kane, 2004).

2.2. Study approach

We closely collaborated with PHS staff, who have a long history of working with Philadelphia communities, to ensure a transdisciplinary approach to each phase of this project, including conceptualization, development of the research design, and interpretation of findings. We recruited and conducted 20 in-depth interviews with community leaders involved in urban greening efforts in North Philadelphia. This included community development organizations, neighborhood block clubs, schools and churches. Our interview sampling strategy was designed to gain a wide range of perspectives of leaders active in the area, spanning a range of participation levels in PHS programs. Specifically, we asked the 10 group leaders who were directly involved in the TT program and from the selected study area to participate, including five groups that have existed for more than five years and plant frequently, and five newer or less-frequent planting groups. For the purpose of comparing group leaders from TT and community leaders from non-TT programs, we recruited the remaining 10 interviewees from various community organizations unaffiliated with the TT program. Out of these non-TT interviewees, some had connections with PHS through its other initiatives (e.g., LandCare, Garden Tenders). These non-TT community leaders who are already affiliated with PHS were viewed by TT staff as prime candidates for involvement with the TT program, but have not yet gotten involved. Other recruited interviewees had not previously participated in any PHS programs but were identified as potential tree-planting partners by the PHS team. All interviewees were either in charge of tree-planting activities or community outreach, as well as residents of the surrounding neighborhoods.

All interviewees were recruited via email or social media. An interview script was developed (see Appendix) and included the following topics: experiences with tree planting initiatives (including TT), street trees and other greenspaces in the community, and community motivations and barriers in tree planting. All interviews were conducted remotely either over the phone or video conference from June–August 2020. Conversations were recorded and transcribed. To anonymize the data, interviewees were assigned a code, labeled with a ‘T’ for a TT leader or ‘N’ for non-TT community leader (e.g., interviewee T1 is a TT leader). The interview transcripts and notes were then reviewed and coded for common themes using a grounded theory approach until data saturation was reached (Charmaz and Belgrave, 2012).

3. Results

The interviews revealed several key themes regarding both barriers to equitable participation in urban tree planting programs, as well as community facilitators and other motivating factors for tree planting in North Philadelphia. Barriers included hesitancy regarding tree disservices and potential financial burdens, the increasing presence of developers changing neighborhood dynamics, and overburdened community leaders facing limited space, time and resources. While distinctions between interviewees associated with the PHS TT program and those not involved were included in data analysis, no major thematic differences were found. Our results are therefore reported with all 20 interviewees pooled.

3.1. Community facilitators for tree planting

Interviews with both TT and non-TT leaders highlighted the diversity of community efforts working towards urban tree planting and stewardship, including the maintenance and development of greenspaces

such as parks, recreational centers, urban gardens and sidewalk plantings. The large majority of interviewees described an overall desire for increased greenspace rooted in a strong childhood or cultural tie to greenspaces, widespread awareness of the social and health benefits of greenspace, and a desire for increased community connection offered by tree planting programs.

When asked how they got involved in urban greening projects, such as gardening or park restoration, 11 interviewees described a childhood or cultural exposure to the benefit of greenspaces. For instance, one woman described her neighborhood’s general desire for greenspace with “A lot of our families came from Puerto Rico or the Dominican Republic, so they came from areas with a lot of trees. They understand the importance of trees and the difference trees can make in their lives” (T10). Urban greening activities such as planting a tree or growing a small backyard garden helped these residents maintain a tie to their heritage and cultural upbringing. This was particularly powerful in one neighborhood known for its Puerto Rican heritage, where a local pastor described how one park tree painted with the Puerto Rican flag has become a cultural symbol for the surrounding community’s love for greenspaces.

Other residents described how growing up in a rural environment motivated them to help develop similar greenspaces within their current urban neighborhoods. When asked why he got involved in the TT program, a TT leader explained; “I grew up with my mother planting, having a garden plot... The family is from the south, so I grew up with some of those things... It’s a custom I wanted to bring as much as I could to the north” (T2). Another non-TT community leader answered that her desire for more trees was connected with the fact that she “grew up in a place that’s more green than my current neighborhood” (N1).

3.1.1. Desirable community greenspaces

This desire for more greenspace often took the form of little ‘pockets’ of green that can be enjoyed by neighborhoods without access to the city’s larger parks or recreational centers. One leader communicated how not every neighborhood has room for bigger greenspace, so “it’s nice to have like these smaller little pockets” where people claim ownership over vacant lots to plant gardens or keep cool (T1). Investments in cleaning up vacant lots or establishing a program for free planters on sidewalks were often celebrated. Stories were shared regarding how increased participation in these greening efforts have helped decrease dumping and gun violence, as well as improve mental health. For example: “We’re doing everything we can to try to turn down the violence and if planting more trees brings more humanity to our community, then that is what you do” (T5).

The quotations above show how community leaders found ways to connect planting trees and stewarding greenspaces to larger social and cultural issues within the community. According to most TT leaders, tree planting was used to better their community on many fronts, including helping to “bring people out to communicate and congregate” (T2), especially in tree-lined blocks that were perceived as desirable and cooler in the summer months. When one leader was asked why he got involved in TT, he expressed: “it grew out of wanting to be a part of something that was going to build healthy relationships in our neighborhood” (T7).

3.1.2. Strategies for successful tree planting initiatives

The aforementioned connection between trees and building community was a motivating factor for many TT leaders. Seven interviewees either started TT groups or got involved in other community initiatives to build relationships with their neighbors. Leaders described how partnerships with other community organizations helped motivate fellow neighbors to get involved and plant their own trees. A few interviewees expressed the usefulness of attending community meetings. Churches were helpful in spreading awareness of tree services in the city (3 mentions), while school plantings (2 mentions) were discussed as successful examples of tree partnerships in the community. This network building was essential for providing volunteers for tree planting events, with high school students and church youth groups being popular

sources for these volunteer requests.

Several organizers described the power of ‘good’ examples, and how the success of one street tree often spread through the neighborhood and promoted others to request trees. For example, one leader excitedly shared, “After we planted the first set of trees, the neighbors who said they didn’t want trees, requested trees” (T10). Community leaders explained that residents who got involved in other urban greening programming, such as urban gardens and building flower planters, were reportedly more likely to get involved in tree planting, as their connection to trees became a part of the process of beautification of the entire block (see Fig. 2).

3.2. Community barriers

Despite a general desire for increased greenspace, many community leaders described frequent barriers they encountered when engaging with tree-planting or other greening projects. This included tree disservices and the fear of future financial burden, frustration with developers, communication barriers, limited space for tree pits, and competition with larger organizational goals.

3.2.1. Tree disservices and financial burdens

By far the most common barrier mentioned by interviewees was the fear of future financial burden caused by tree disservices to residential or business properties. Examples of tree disservices included structural damages, such as roots damaging sewer line and sidewalks, or fallen trees or branches on buildings. In particular, 75% of interviewees mentioned the cost of tree removal, care or structural repair as a prohibiting factor. This barrier is amplified in a low-income neighborhood. One community leader shared her concern as follows: “In particular, when we are working with people who are low to moderate income, [fixing tree damage is] not just an inconvenience, it’s a huge expense that might break up a household. So that’s a real consideration... that some people have gone broke because they could not afford to fix something so major” (N3). Another leader described similar hesitation prior to accepting a free street tree; “They want to make sure whatever you are doing is going to be good for them and won’t cost them. That’s their main concern—is this going to cost me down the road?” (T10). Another stressed the cost of care “a few hundred dollars or thousand to have a tree removed is unbearably high for

our community. I kind of understand people are nervous about it. That can be several months of rent to get a big tree removed” (T7). These concerns also included the fear of liability from tree damage, such as the possibility of sidewalk lifting causing a trip hazard.

Another major concern tied to tree disservices was tree debris, such as fallen limbs, leaves and berries, and the possibility of this leading to neighborhood disputes. For example, one leader described the frustration of participants who plant trees but did not anticipate the maintenance related to tree debris: “when leaves fall, somebody’s got to clean them up and when on a block, when the leaves fall they just don’t fall in your yard. they fall and the wind carries them all up and down your block” (T5). Here, leaders found that tree planting could become a point of contention for neighbors when tree recipients failed to keep up proper tree maintenance or clean up after tree debris.

Residents were often focused on the future of the tree, as 75% of interviewees felt that residents did not have the knowledge or ability to care for the tree into maturity, particularly with the risk of tree disservices. One leader explained: “If I’m a homeowner and someone tells me I need a tree in front of my house, at first it’s a beautiful idea. Then you have to think about it—what kind of tree is this going to be? What about when it falls over? Who is going to take care of it? What happens when the roots grow?” (N5). Some tree organizers encountered residents who wanted to avoid increased responsibility over a living object that they felt likely to cause challenges down the road, describing; “It is more than [the tree] tearing up the pavement, it’s the overarching mindset of people that they don’t want a tree on the block or especially in front of their house that they will ultimately be responsible for” (T2). Not all leaders encountered this mindset among property owners, however, a level of hesitancy surrounding tree care was a common barrier.

Community leaders also described how residents were concerned with how to get information and resources about street tree maintenance when they needed it. A few described feeling alone or unable to handle the care of the tree without financial help from the same service that connected them with the free tree for planting. This was a particularly acute concern with elderly residents. One tree organizer described that he often receives calls from senior residents to come out and help with tree care, despite the TT program asking applicants to take a large role in tree care for the first 2 years. As part of his work at a local nonprofit, this leader works with these senior residents to get them the support they

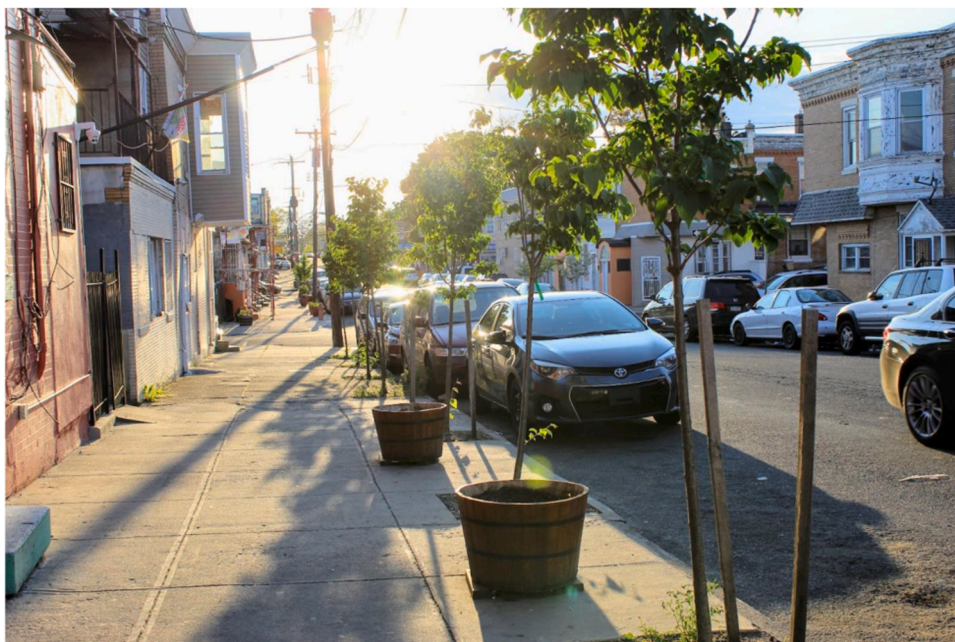


Fig. 2. Newly planted tree-lined block in North Philadelphia. Photo by Gabriella Paez.

need, often showing up to pull up weeds or prune trees (T9). Other residents also face confusion regarding who is responsible for tree care. This led to feelings of unease regarding the care and cost of trees, even street trees which are formally under the city's jurisdiction (6 interviewees).

'Word of mouth' descriptions of historical tree problems in the neighborhood reinforced fears of tree disservices and financial burden of trees in neighborhoods. Most interviewees could provide a story of 'someone they knew' who struggled with removing a 'dangerous' tree or had a large bill associated with a sidewalk lifted due to tree roots, such as; *"It's always a challenge to find people who want trees. People have had some bad experiences in the past. It happens pretty frequently when we ask someone if they want a tree, they have a story of someone they know or someone on their block had a tree back in the day on their sidewalk and it got huge and it was dangerous"* (T7). Most of these stories were passed down from neighbor to neighbor, and many TT leaders described the barrier of gaining the trust of residents to plant a new tree where the legacy of 'bad trees' remains.

Four TT leaders described a legacy of understaffed and underfunded city government departments that left many older trees unmaintained for years. For example, one TT leader described: *"It's hard to argue with a resident in their 70s about trees not being destructive when they've lived in this neighborhood for 50 years and they can tell you about the damage that they've seen"* (T1). Stories of lack of proactive tree management, such as pruning and prompt removal of dead trees, add to the perception that trees will become a financial burden for residents and local businesses.

3.2.2. Neighborhood development and gentrification

Forces of development and gentrification were mentioned as a barrier for tree planting by 50% of interviewees. Developers were described by community leaders as failing to be a partner in tree planting efforts, either from not planting trees, ignoring community voices at zoning meetings, or planting a tree that was not the appropriate size or species. TT leaders reported that an increased presence of developers within neighborhoods represented a lost opportunity for new tree plantings, rather than working together to address low UTC. As one leader described, *"[Developers] cut down all the old trees right on [avenue]. And brought in a contractor who did a terrible job of planting new trees"* (T1). Additionally, developers were seen as not making the right decisions regarding tree species, nor having a long-term maintenance plan for tree care (T3).

Difficult experiences with developers and community gardens also left community leaders feeling that residents were reluctant to get involved in tree-planting efforts. Developers were described as destroying small gardens set up and maintained by neighbors in vacant lots. There are *"residents who put a lot of energy into revitalizing a green-space only to have the developer decide 'alright, I'm going to take care of this now and build on it and just decimate what you build'"*, said one community organizer (N3). Thus, the fear of increased developer presence in the neighborhood may discourage future residents from getting invested in maintaining and developing community greenspaces, including trees. Community leaders expressed frustration with developers for ignoring a community desire for more greenspaces; *"Our neighborhood is very appreciative of open spaces but every time that a developer comes in with a four floor high new construction and they say no backyard, people go crazy"* (N1). In this case, opportunities to develop new greenspaces on community or private land remain limited, while the demand for tree planting persists.

Leaders in North Philadelphia also feared decreased involvement due to a rise in renters living in new residential developments, since renters are not able to make decisions about trees on their rental properties. Property managers or landlords who did not live in the area were mentioned as less invested in either planting trees on their property or agreeing to renters participating in the TT program. Absentee landlords were difficult for TT leaders to contact or uninterested in beautification efforts. Renters were described as less interested in maintenance than

homeowners due to short-term leases. Even if organizers encountered renters willing to participate in planting or caring for a street tree, the requirement of property owners to sign off on any street tree planting limited this involvement; *"A lot of people in our neighborhood are renting so they don't have that agency to decide whether or not a tree gets planted where they live"* (N3).

3.2.3. Communication and relationship barriers

Communication between community leaders and longtime residents was described as a barrier when TT leaders did not reflect the larger demographic of the surrounding neighborhood. One leader described her fear, *"One of the things I struggle with is because we are all new, [and] I think representation is a part of it. We are a white group"* (T3). In defining herself as leading a group that was majority 'new' residents and 'white', this leader outlined the potential conflict in making decisions for a historically Black or Brown neighborhood community that has encountered rapid displacement among longtime residents. Gentrification was also mentioned as creating a difficult dynamic within tree-planting efforts, with a change in resident demographics leaving both older and newer residents feeling left out of the community planning process. Some TT organizers find themselves to be new neighbors in the communities they are serving and feel as if they are unable to connect with a large part of the residents who are older, or more established. Older residents were mentioned quite frequently (50% of interviewees) as being a difficult to reach population, due to long held concerns about tree damage and difficulty communicating with via technology such as social media or email.

Language barriers were a challenge for TT leaders trying to involve residents whose primary language is Spanish. One leader found that Spanish-speaking community residents *"are interested but if they don't understand what is happening, if they don't receive info in their language, there is no incentive to get involved"* (T10). While PHS TT staff developed entirely Spanish language trainings and print materials in 2018, four interviewees stressed that more needs to be done in the translation and development of other resources regarding tree-planting education and advocacy in North Philadelphia.

Lastly, some non-TT interviewees mentioned a general mistrust of outside agencies, as there is a perception that these agencies are not going to engage with residents long-term or listen to the real needs expressed by community members. This mistrust prevents further partnership with an organization such as PHS which operates on a city-wide basis, rather than a more locally operating neighborhood organization that has spent years building relationships with residents. One religious leader explained the need for further developed connections with the community; *"[It shouldn't be] not just once every five years when part of a strategic plan, you gotta plant the seeds to the relationship in a community, and just like a tree, you gotta prune it, cultivate it, check up on it, and then it becomes not just a one and done deal"* (N5). These responses describe how long-term relationships with tree-planting organizations may help residents feel supported and not 'talked down to' in regards to broader tree-planting goals.

3.2.4. Limited space, time, and resources

A few emphasized how lack of space in neighborhoods was a significant barrier, particularly in planting trees with large enough canopy to feel the cooling effects desired by both residents and organizations like PHS. Limited space in North Philadelphia due to dense residential housing adds to this pressure of ensuring that every available space is utilized for a tree pit. One leader described her frustration with *"missed opportunities when we have a finite number of opportunities to plant trees with ecological impact"* (T4).

Forty percent of interviewees mentioned struggling with limited time and resources by communities facing other significant problems such as gun violence, drug addiction, and food insecurity. The community at large is often asked to get involved in a wide range of activities, and participation in tree plantings becomes just one of those many 'asks' by

local nonprofit organizations. This was compounded when community leaders described a general concern of ‘asking too much’ of often overworked community volunteers. One leader described this dilemma: *“Ultimately people are volunteering a lot of their time and energy [to many organizations and groups] to make things work...I have to approach this from a moral and ethical standpoint, like what is reasonable to ask, and... if people are passionate about affecting neighborhood change and recognize that it comes at the expense of their time and energy. I’m here to support them and make it work, but if people are not in a position to give that time and energy, I have to respect that too”* (N3) Another leader echoed this concern; *“Most people are stretched thin when it comes to having time to get everything done”* (T1) In these cases, leaders who are interested in increasing tree planting often find themselves competing with a host of other initiatives that may take precedence for residents and community organizers.

Community Development Corporations (CDCs), who often partner with free tree initiatives, were also limited in their participation by larger organizational funding and goals. Leaders described the need for programming to be ‘community driven’, and thus determined by what community members define as their greatest needs. *“There’s like a mindset around like wanting to just provide direct services, resources, goods [and] relief as opposed to doing that sort of longer term, like tree planting”* (N3), explained one organizer. Thus, a few community leaders who were interested in tree planting felt constrained by larger organizational prerogatives, especially programming funded by grants. Particularly during the COVID-19 pandemic, programming that could be seen as providing ‘direct relief’ to residents, such as food distribution, were prioritized over greening efforts. For example, one community group organizer explained how *“[Trees] don’t seem like the most urgent thing that my neighborhood needs”* (N2). While all interviewees mentioned the value of trees, other issues took higher priority.

4. Discussion and conclusion

Our results supported the findings of previous studies on barriers to participation (Breger et al., 2019; Donovan et al., 2021; Carmichael and McDonough, 2018, 2019), yet also extends this research by illustrating how contextual socio-economic factors produce these barriers. Our interviewees in North Philadelphia indicated that barriers to participation in tree planting emerged despite the general desire for greenspaces in the neighborhood. Although these community leaders recognized the value of trees, they often struggled to find residents who were able or willing to take on new trees. This lack of interest in tree-planting efforts suggests the importance of understanding how tree planting programs operate and function within a low-income and historically disinvested community of color. Expectations for volunteer participation in tree-planting programs may be amplified by structural differences, creating uneven barriers for increasing urban greening initiatives in areas impacted by distributional inequities.

Broader trends in neoliberal governance have pointed to uneven spatial distribution of city services over decades, with disinvestment often tied to a lack of municipal development of new greenspaces, or care for existing ones (Roman et al., 2021a; Heynen, 2003). In many cases, these neighborhoods, often Black and Brown communities, are left to ‘make due’, creating their own form of ‘DIY’ urbanism in the form of maintaining or creating urban gardens on abandoned plots of land (Kinder, 2016). Greening interventions on vacant lots have been shown to improve mental health and perceptions of safety (South et al., 2018; Branas et al., 2018), however, our research illustrates why residents may become hesitant to invest significant time and energy on land that is susceptible to new construction or development.

These findings also provide a new perspective on resistance to tree planting due to concerns about gentrification. In Portland, OR, tree planting can contribute to rising median home sales prices (Donovan et al., 2021). In North Philadelphia, community leaders described how extensive residential development was driving removal of trees and community gardens. These developer-driven processes made some

residents skeptical of tree-planting initiatives and reluctant to plant trees. Our study highlights the challenges these initiatives face when municipalities frame predominantly Black and Brown spaces as ‘open’ and ready for private investment (Clement and Kanai, 2015). Integrating community voices early in the planning process for tree planting campaigns, including reaching out to landlords, renters and residents with language barriers, may assuage some of these community concerns.

Similar to Carmichael and McDonough’s (2018, 2019) research on street tree planting in Detroit, we found that the legacies of past municipal disinvestment in North Philadelphia remain a powerful deterrent for increasing community participation in tree planting. Previous research has shown that increases in UTC result from long-term commitment and deliberate planning at the institutional level (Roman et al., 2017). Similarly, neighborhood-centered civic engagement around tree planting and care requires the same kind of investment (Fisher et al., 2015). Our research illustrated that stories about tree disservices, such as broken sidewalks and dangerous limbs, circulated around communities and deterred residents from planting trees in the future. This was especially the case after decades of budgets cuts to parks management, leading to citywide under-funded municipal forestry work and deferred tree maintenance (Roman et al., 2021a). The City of Philadelphia has recently worked to address such concerns in a forthcoming urban forest strategic plan, called the Philly Tree Plan, which is framed around environmental justice and equity. This plan intends to improve communication between PPR and residents, strengthen heritage tree protection, create tree planting requirements for developers and align with community concerns by emphasizing the need to carry out proactive maintenance to rebuild community trust (City of Philadelphia, 2022). The plan also has a potential recommendation to have the City assume responsibility for sidewalk repairs related to street trees, which is part of a broader move towards reducing tree burdens for residents. (San Francisco recently assumed responsibility for sidewalk tree damage, see Fracassa, 2017). Given that community leaders in our study expressed deep concerns about tree costs and damages, local urban forestry programs may benefit from outreach and communication strategies that clarify legal responsibility for trees in different circumstances (Mortimer and Kane, 2004; Bennett, 2010).

Our findings also suggest that focusing on educating residents about tree benefits might fail to address their concerns about tree disservices. The ecosystem disservices of urban trees include built infrastructure conflicts and health and safety issues, which dovetail with management costs such as cleanup after storms or removal of dead trees (Hauer and Peterson, 2016; Roman et al., 2021a). The community leaders in our study were keenly aware of these disservices; they and the residents they serve envisioned tree-related challenges materializing years after planting day. Many community leaders feel that not enough support is provided to residents beyond the initial planting. Although PHS supports tree monitoring programs to understand young tree survivorship and overall maintenance (Roman et al., 2018), these strategies alone may not acknowledge the reality that many residents within low-income communities cannot afford to contribute the time, energy, and labor required for tree care, especially over the many decades that trees might live. Our study suggest a need to provide additional assistance to residents for tree maintenance over the life cycle of a tree, but further research is needed to understand the type of support that would be most effective.

All in all, we identified a mismatch and tension between the ‘ask’ of participation in tree-planting initiatives and the current capacity of community members and leaders to accomplish equitable tree-planting goals. Specifically, we found a temporal disconnect between programming offered by tree-planting initiatives (e.g., recruiting tree recipients, education about tree benefits, free trees) and the long-term needs around community tree stewardship (e.g., resources and support for maintenance, tree removal or preservation policies). Offering a wider variety of support for residents beyond the provision of free trees may help address barriers to participation. Our findings suggest that

technical, financial and education assistance may be useful and warrant further study, including small grants to cover the labor of paid community leaders or neighborhood youth for continued tree maintenance (Roman et al., 2015; Nguyen et al., 2017), insurance for possible property damage due to tree disservices (Fracassa, 2018) and increased communication with residents after the act of tree planting. Extending support and resources may help address community needs and concerns regarding the decades-long responsibility of tree care.

Furthermore, our findings show that the priority needs of community leaders are not always aligned with urban tree planting. Our research demonstrated that many leaders juggle a host of other programs targeting challenges like gun violence and food insecurity. In the context of city services and nonprofit organizations hoping to increase UTC, tree-planting programs may overburden community leaders. Tree-planting and distribution programs that partner with existing initiatives aimed at supporting the tree planting, stewardship, and maintenance on public and private lands may help lessen this burden. For instance, the TT program is one of many initiatives at PHS aimed at the growth and development of greener and healthier urban communities in Philadelphia, including cross-program task forces on gentrification and community engagement. Other nonprofit organizations support related topics such as park stewardship and promoting fruit-bearing trees, and within city government, there are programs oriented around yard trees, street trees, parks, and recreation centers. Coordination within and across programs and agencies focused on urban greening efforts could streamline engagement opportunities for residents and community leaders. Tree-planting efforts in such communities may benefit from messaging centered on the social and human health benefits of trees that align with other community priorities, including increasing food security (Clark and Nicholas, 2013) and reducing crime (Kondo et al., 2016). Overcoming barriers to tree planting may require contextualizing trees among other community and neighborhood issues and providing communities with support throughout the tree life cycle. Further research could investigate how barriers to participation in tree-planting efforts in other city neighborhoods and across various urban contexts.

CRedit authorship contribution statement

Elizabeth Riedman: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft, Writing – review & editing. **Lara A. Roman:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Supervision. **Hamil Pearsall:** Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing, Supervision, Visualization. **Mindy Maslin:** Conceptualization, Methodology, Supervision, Resources, Writing – review & editing. **Tim Ifill:** Conceptualization, Methodology, Supervision, Resources, Writing – review & editing. **Dana Dentice:** Conceptualization, Methodology, Supervision, Resources, Writing – review & editing.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix. : Interview Questions

Introduction:

- 1) Just to start, can you tell me a little about yourself and your role at [organization/neighborhood]?
- 2) What first got you involved in your neighborhood?
- 3) Describe your neighborhood. How are things generally going? What do you observe are the greatest needs of your community?
- 4) What are the main priorities and goals of your neighborhood organization/ community garden?
 - a) Describe a recent project you are particularly proud of
- 5) How would you describe trees in your neighborhood? (health of trees generally)
 - a) Do you notice a difference between streets with trees and those without?
- 6) More generally, what has your experience with green spaces - such as parks and community gardens - in your neighborhood?
 - a) Is there a space in particular you are fond or proud of? Why do you like that space?
- 7) In your opinion, how do you believe residents view trees in your neighborhood?
 - a) Street vs yard vs park trees?
 - b) Most common benefits vs downsides
 - c) Which kinds of trees? Probe for: species, large trees vs small trees.

A. Perception of Current Initiatives (only for non-Tree Tenders):

- 8) In your organization's goals and programming (or plans), do trees factor in at all? If so, in what ways?
 - a) Is there a desire for more or less trees among your organization or for residents? Why?
- 9) Philadelphia Parks and Recs currently offers grants to sponsor yard tree giveaway events and PHS offers programming including free street trees, concrete removal where necessary. Have you come across their programs before?
 - a) Describe these experiences.
 - b) Have you been involved in any tree planting or care events through Pennsylvania Horticultural Society, TreePhilly or any other programs?
 - i) why or why not?
 - c) Has there been anything in particular that has prevented you from getting involved in these organizations in the past?
 - i) Probe for: wasn't asked, cost, time, knowledge, volunteers
- 10) If you had to guess, what do you believe are the biggest reasons residents do not get involved in tree plantings (or other community efforts)? How about your organization?
- 11) What do you think are the biggest reasons residents do get involved?
 - a) Describe those who do get involved. (Are there things they have in common with each other?) Who are they usually? How do they hear about these programs?

B. Experiences with Tree Tenders.

- 8) What motivated you to first get involved in Tree Tenders?
 - a) How did you hear of the program? (who, where, what)
 - b) What did you think of the training program when you first got started? (compared with today?)
 - c) Was there anything that deterred you from getting involved at the beginning?
- 9) Describe your role as leader or founder of your Tree Tenders group. How would you describe yourself to someone not familiar with TT?
 - a) Are you part of TT through some other group, e.g., a neighborhood civic association, a non-profit?

- 10) What has your experience with Tree Tenders thus far? (Generally)
 - a) Biggest obstacles in organizing, planning and maintaining street trees?
 - b) Success stories? Failures?
- 11) In your opinion, what does a successful TT group or community partnership look like to you?
 - a) What factors might lead to this?
- 12) What has been your experience with your neighborhood's efforts towards tree care and stewardship?
- 13) What do you perceive as the biggest challenge to getting others involved (with your TT group? How about in the TT's program in the city?
- 14) What do you think are the biggest reasons residents do get involved?
 - a) Describe those who do get involved. Who are they usually? How do they hear about these programs? Why do they or do not they stay involved/get more involved?

For all:

- 8) In a perfect world, who do you think should be responsible for tree maintenance? (city, nonprofit, residents)?
 - a) How come?
- 9) Probe for the following barriers or summarize.
 - a) Resources (money, labor, time)
 - b) Understanding of tree benefits/negative impacts
 - c) Relationship with city
 - d) Stewards/Ownership of tree- communication

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