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# Health Lens Analysis of Urban Agriculture Policy Cambridge, MA

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## Executive Summary

Urban agriculture has increasingly been recognized for its potential to improve public health in variety of ways – in addition to increasing cultivation of healthy foods, it can strengthen the social fabric of a community, encourage physical activity and mental health, and deliver ecological benefits. Emergent technologies also show promise for hydroponic and vertical food-growing businesses.

The City of Cambridge has a legacy of promoting public health through initiatives and partnerships that increase healthy food access. And, the City and region contain several non-profit, school-based, and for-profit urban agriculture-related entities and programs. Responding to the interest in urban agriculture and recognizing the benefits it can deliver, in recent years, Cambridge has focused efforts on developing a policy and strategies to promote and allow more urban agriculture activities in the City. In 2017, Cambridge successfully passed public health regulations and a zoning ordinance for beekeeping, and it is actively developing policies and guidance for farming, henkeeping, and the sale of agriculture products.

Concurrent with the policy and guidance development, the Cambridge Public Health Department partnered with the Metropolitan Area Planning Council to conduct a Health Lens Analysis (HLA) with the objective of taking a closer look at the urban agriculture policy's potential implications for public health. The HLA investigates potential health impacts of urban agriculture as they relate to four determinants of health: social, economic, nutritional, and environmental factors. It makes recommendations for ensuring the urban agriculture policy is implemented in such a way that promotes health, mitigates negative health impacts and promotes equitable engagement in urban agriculture.

## Summary Findings and Recommendations

Presented here are the summary findings of how urban agriculture and the proposed policies may influence the determinants of health: social, economic, nutritional, and environmental factors. Recommendations are also presented that articulate approaches for equitable implementation of the urban agriculture policies that maximize health benefits and minimize negative health impacts.

The full Health Lens Analysis follows, providing an overview of Cambridge's efforts to promote urban agriculture; an introduction to the health lens analysis framework; and an in-depth analysis of social, economic, nutritional and environmental health determinants that draws on topical research, local conditions, and qualitative findings. These sections present the findings in full, and reiterate recommendations.

# Social Impact

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## Summary Findings

*Of all the benefits credited to urban agriculture, its ability to deliver social benefits is consistently cited as the most significant.*

*We anticipate urban agriculture policies would likely increase social capital, and positively influence community health outcomes.*

## Recommendations

1. Reduce and remove barriers to participation, actively promote urban agriculture and provide outreach and education
  - a. Develop a fund to encourage urban agriculture that could subsidize or cover cost of permitting and urban agriculture equipment that might otherwise be cost-prohibitive for individuals or organizations.
  - b. Maintain and publicly share information on urban agriculture organizations and schools that provide opportunities for public participation.
  - c. Prioritize urban agriculture initiatives that maximize opportunities for public access, participation, and enjoyment, whether these are ground-level, indoor, rooftop or other types of operations.
  - d. Prioritize urban agriculture initiatives on sites that are in neighborhoods with greater need and fewer resources.
  - e. Encourage urban agriculture initiatives to apply universal design standards, particularly where the initiative will be open to the public.
  - f. Support and encourage urban agriculture initiatives to plant culturally diverse crops. Engage with the immigrant community to understand what crops are in demand.
  - g. Prioritize participation in urban agriculture by those most likely to experience social isolation, including new immigrants, older adults, and those with disabilities.
  - h. Support renters in engaging in urban agriculture activities at their homes or at satellite locations (i.e. community gardens, city farms, school gardens). Accomplish this through workshops, community events, and urban agriculture education programs.
  - i. Develop a guidance document that is comprehensive in scope and provides information on how to engage in urban agriculture activities that will be newly allowed via the passage of the Cambridge policies, and that also provide guidance on a range of related topics. Example topics to include are:
    - Beekeeping
    - Henkeeping
    - Commercial Farming
    - Community Gardening
    - Community Agriculture Organizations
    - School Gardening and STEAM Curriculum
    - Medical Healthy Food Prescription Programs
    - Composting
    - Food Retail
    - Food Donation

# Economic Impact

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## Summary Findings

*Urban agriculture has been found to impact a variety of economic factors, though there is more evidence for some than others. The greatest opportunities for commercially viable enterprises and good jobs may be in high-tech food production.*

*Considering a variety of factors, we anticipate the Cambridge urban agriculture policy would likely both improve and impair economic conditions, and have both a positive and negative impact on health.*

## Recommendations

2. Mitigate potential negative economic impacts of urban agriculture. Urban agriculture has been found to spur increased property values, which may contribute to gentrification and increasing housing cost-burden and displacement.
  - a. Prioritize resident engagement and interests in neighborhood urban agriculture projects to mitigate negative impacts.
  - b. Minimize negative economic impacts to residents and in neighborhoods most at-risk. These include children, single mothers, Latinx, Black, and residents born outside the U.S, and the neighborhoods of North Cambridge, the Port, East Cambridge, and Wellington-Harrington.
3. Increase local workforce capacity and opportunities.
  - a. Encourage job training that prepare the local workforce with skills that match the needs of the sector. Prioritize workforce preparedness and training for those most at-risk.
  - b. Encourage creation of living wage jobs and career pathway opportunities.
  - c. Support high-tech, intensive food production toward fostering workforce development, food security, and innovation.

# Nutritional Impact

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## Summary Findings

*Urban agriculture has been promoted for potential nutritional benefits that come from increased consumption of the food produced.*

*We anticipate that passage of the urban agriculture policies would likely improve the nutrition of Cambridge residents, and positively impact health.*

## Recommendations

4. Ensure food insecure residents benefit from urban agriculture.
  - a. Provide outreach and educate residents about opportunities to grow and produce food. Ensure avenues for engagement are easy and affordable.
  - b. Ensure locally-grown or -raised food is affordable and accessible through mechanisms such as municipal institutional procurement efforts; local food incentive programs, such as SNAP-matching; backpack programs; and strengthening donation channels.

# Ecosystem Impact

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## Summary Findings

*Urban green spaces, inclusive of urban agriculture, can promote mental and physical health, and support positive health outcomes.*

*We anticipate the Cambridge urban agriculture policy will likely improve ecosystem health and positively impact public health.*

## Recommendations

5. Mitigate potential negative environmental impacts of urban agriculture.
  - a. Reduce exposure to air pollution by allowing urban agriculture away from highways and other major air pollution sources.
  - b. Provide residents with guidance for safe gardening, beekeeping, and henkeeping.
6. Prioritize participation in urban agriculture by those with limited opportunities to do so.
  - a. Conduct an urban agriculture site suitability analysis to identify public and private land and rooftops that could be conducive to urban agriculture activities, and make the results publicly available. Use the results of this analysis to guide public investments in urban agriculture.
  - b. Coordinate with universities and other large property owners and explore opportunities for urban agriculture initiatives on their land, particularly those that allow for public access and participation.
  - c. Where possible, expand opportunities to engage in urban agriculture on public land. HLA Focus group members suggested this could be accomplished through public community farms.

# Introduction

## Cambridge Promotes Healthy Food Environments

Cambridge has long-promoted community health by creating conditions for healthy food environments in the City. Cambridge maintains 14 community gardens with nearly 500 plots, and its community garden policy<sup>1</sup> prioritizes equitable use by residents. Its Healthy Markets Program<sup>2</sup> provides neighborhood markets with technical assistance to stock healthy food options. The City supports the seven farmers markets in operation, three of which accept SNAP<sup>a</sup> and two HIP<sup>b</sup>. Cambridge Public Schools received accolades<sup>3</sup> for the healthy meals it serves students, and partners with CitySprouts<sup>4</sup> to integrate school garden programs at its school. These are examples of some of the many ways Cambridge proactively promotes policies, systems changes, and environmental improvements that lead to better community health.

## Urban Agriculture Policy

In recent years, these efforts have extended to developing a policy and strategy to promote urban agriculture activities across the City.

Urban agriculture encompasses many farming and agricultural practices, including community gardening, commercial farming, beekeeping and henkeeping, and high-tech food production systems, like hydroponics and rooftop growing systems. Urban

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a Supplemental Nutrition Assistance Program

b Healthy Incentives Program

c The Urban Agriculture Task Force is comprised of members from the Cambridge Public Health Department, Community Development Department,

agriculture activities have a range of positive effects on social, nutritional, economic, and ecological conditions. As examples, urban gardening and agriculture can help build social capital, provide opportunities for entrepreneurship, increase access to healthier food options in low income neighborhoods, and deliver eco-system services. These effects support community health.

Cambridge chose to develop a comprehensive urban agriculture policy, compelled by the benefits it delivers - particularly those related to equitably increasing the availability of healthy and fresh food - one of the four priority areas for the City identified in the Community Health Improvement Plan priorities.

In 2013, the Cambridge City Council issued an order to look into developing an urban agriculture ordinance for the city. This action established the Urban Agriculture Task Force,<sup>c</sup> and initiated a multi-year process of research, stakeholder engagement, and community outreach.

Extensive feedback from neighborhood meetings, interviews, and focus groups revealed overwhelming support for urban agriculture in Cambridge. Cambridge's efforts align with state goals as well, and the Massachusetts Food Policy Council, MA

Conservation Commission, residents, community organizations, and the MA Department of Public Health.

Department of Public Health, and MA Department of Transitional Assistance have all echoed or championed them.

Through this process, the City researched and drafted comprehensive policy to allow for a greater variety of urban agriculture activities to take place in a greater variety of areas within the City. **In 2017, Cambridge successfully passed public health regulations and a zoning ordinance for beekeeping, and it is actively developing policies and guidance for farming, henkeeping, and sale of agricultural products.**

The **beekeeping policy** newly allows the keeping of domestic honeybees to promote pollination, honey production, and increasing public knowledge and education of agricultural practices that maintain public health and safety. Associated public health regulation addresses human health, through best management practices; mitigating environmental hazards, such as pest infestation; promoting public health and mitigating disease; and notifying neighbors. The zoning ordinance specifies in which privately-owned areas of the City beekeeping may take place and allows beekeeping as an accessory use. The ordinance sets standards for signage for notifying those in proximity to bees. The regulation further sets standards for size and placement of beehives and apiaries.

The **henkeeping policy**, if adopted, would newly allow for keeping and housing of hens for egg production. Draft public health regulations address issues similar to the beekeeping policy to ensure public health and safety, and prevent nuisance or human disease pathways. The draft zoning ordinance similarly specifies the areas where henkeeping is allowed and standards for chicken

coops and equipment. The draft regulation prohibits keeping roosters and free-ranging hens.

The draft **farming policy** would promote cultivation of vegetables, fruit, and fish. Overarching objectives of the policy are to increase healthy eating, neighborhood food system and ecological resilience, and promote food businesses and initiatives and community resilience. Home gardening in residential districts and commercial greenhouses and gardening in some areas in the City are currently allowed activities;<sup>5</sup> the draft zoning ordinance would allow new uses including **commercial rooftop, vertical, hydroponic, freight container, aquaculture and aquaponic food production**, among others, and it would make these activities allowable in more districts than where commercial food production is currently allowed. The zoning ordinance would also establish standards for farming structures, placement, and size requirements. The public health department will establish guidance for soil safety, and materials for raised beds to reduce potential exposure to soil contaminants that could be harmful to young children. Accessory composting, aquaculture, and aquaponics activities would follow Massachusetts laws and be referenced in the Cambridge policy.

The comprehensive urban agriculture policies would overwhelmingly promote the **sale of agricultural products**. The draft zoning ordinance stipulates where agricultural products may be sold, including on-site, community supported agriculture, and farmers markets. Public health regulations for beekeeping address commercial sale of honey, referencing the food retail and wholesale permits required to do so, and the issuing agencies.

Henkeeping public health regulations and farming soil safety guidance could similarly include these references, as appropriate.

Though not articulated in the newly passed beekeeping policy, the urban agriculture policy also seeks to promote **food production for donation**. Food donation is protected under the Bill Emerson Good Samaritan Food Donation Act and the Massachusetts Good Samaritan Law. As such, increased food production made possible through the passage of Cambridge policy could also support more donations of locally-produced vegetables, fruit, and other agricultural products.

With the passage of the beekeeping policy, the City established a **procedure for implementation**. The Commissioner of Public Health promulgated the public health regulations under the authority of M.G.L. c.111§31, which are enforced by the Public Health Department; the City Council ordains zoning ordinances, which are enforced by the Inspectional Services Department. Prospective beekeepers must apply for and receive a permit from the Public Health Department, which must be renewed annually. The fee for the permit is \$50. A panel, made up of members designated by the Commissioner of Public Health reviews applications, which includes inspecting the property of the proposed beehives and holding a public hearing, for which the panel notifies applicants, property owners, and abutting neighbors. After successful review, the panel issues a permit. The approach to implementing the beekeeping policy can serve as a model for the future passage of the other urban agriculture policies.

In their passage, the urban agriculture policy language will exist as integral elements of the zoning ordinance and separate public health regulations and guidance documents. To make it easy for potential farmers, beekeepers, and henkeepers to interpret the urban agriculture policy and partake in urban agriculture activities in the City, the Cambridge Public Health Department and the Community Development Department will jointly develop a comprehensive guide to urban agriculture that lays out clear and simple guidelines for application and permitting processes.

# Health Lens Analysis

## The Health Lens Analysis Framework

Promoting community health is central to Cambridge's motivations for encouraging urban agriculture. As such, concurrent with the drafting of the urban agriculture policies and the passage of the beekeeping policies, the City investigated the potential and likely health impacts that the passage of UA policies would have through this Health Lens Analysis (HLA).

**A HLA, simply put, is an assessment of potential policy implications for health outcomes.** It shares characteristics with Health Impact Assessments (HIAs), and is often a process implemented as part of a Health in All Policies (HiAP) strategy. The approach for conducting an HLA is both methodical and iterative, and seeks to answer the general question:

*“How and to what extent do we anticipate proposed policy will positively and negatively impact public health?”*

With a better understanding of health implications, the objective of an HLA is to inform drafting of policy and recommend implementation strategies in ways that maximize health benefits and minimize or eliminate negative health impacts.

The following Cambridge Health Lens Analysis of Urban Agriculture Policy investigates this question as it relates to a range of conditions that urban agriculture activities influence, and makes recommendations for ensuring urban agriculture policies have the greatest possible positive health impacts.

The HLA framework includes five stages. These stages are iterative; that is, once new information is gained during the HLA process, previous stages can be revisited and refined to improve policy development. The South Australia Health Department, which uses an HLA during policy development across all government agencies describes the five stages as follows:<sup>6</sup>

1. **Engage:** establish and strengthen collaborative relationships with relevant stakeholders, including agencies, community members, and others.
2. **Gather Evidence:** use qualitative and quantitative evidence to identify connections between public health targets and policy goals.
3. **Generate:** develop evidence-based policy recommendations and reports.
4. **Navigate:** guide the recommendations through the decision-making process
5. **Evaluate:** assess the effectiveness of the HLA: evaluate the HLA process itself, determine whether the HLA recommendations were adopted into the final policy, and measure the health outcomes and impacts of the policy.

To the extent possible, this HLA includes the stages typical of HLAs. The Cambridge Public Health Department and the multi-stakeholder Urban Agriculture Task Force were the core team in

this process, with **engagement** including focus groups with urban agriculture practitioners and advocates, the Cambridge Pathways group and Literacy Ambassadors, and interviews with topical experts. Qualitative and quantitative **evidence was gathered** from those engaged in the HLA process, local research and reports, topical urban agriculture and public health research, and secondary data sources on demographic and environmental characteristics. This report synthesizes this research, and **generates** evidence-based recommendations for maximizing health benefits of urban agriculture. Because Cambridge’s urban agriculture policies are in active development, the HLA process does not assist with **navigating** approval and implementation of the recommendations, nor does it include a formal **evaluation** process. As the HLA process is an iterative one, these stages should be addressed as the urban agriculture policies are developed and passed as components or in total.

### Social and Environmental Conditions Influence Health

The HLA promotes and is informed by an understanding of health as “a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity,”<sup>7</sup> and that health is essential for communities to thrive.

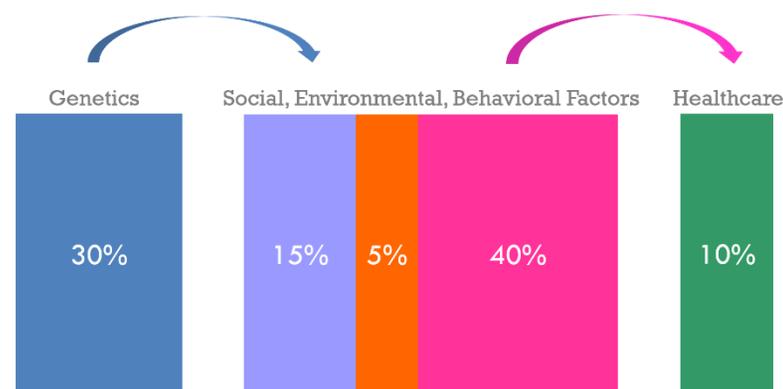
Health results from a range of factors. Genetics, individual behavior, and health care access and quality,<sup>d</sup> all influence health, but increasingly it is recognized that **the social, economic, and physical conditions into which people are**

<sup>d</sup> Genetic factors include biological characteristics and predisposition to disease. Individual behavioral factors include eating habits and physical

**born, live, learn, work, play, and age have a far greater impact on how long and how well people live.<sup>8</sup>**

Figure 1 estimates the degree to which health is influenced by different factors, and shows that social and environmental factors, together with the individual behavior they enable or inhibit together significantly influence health.

Figure 1: Determinants of Health. Source: McGinnis et al, 2002



“**Social determinants of health,**” describe the degree of access to and quality of social and environmental conditions such as housing, education, employment, income, food, safe outdoor and neighborhood spaces, and social supports and relationships, as well as degree of exposure to pollution, racial segregation, violence, and discrimination.

Conditions like inadequate education, insufficient housing, and neighborhoods lacking green open spaces or healthy food retail options drive poor health. Low-income communities and people

activity. Healthcare factors are those related to the presence and use of health care services for prevention and treatment.

of color experience these conditions and associated negative health outcomes disproportionately more.

A growing understanding of the social determinants of health and the evidence of health inequities compels public policy that shapes social, physical and economic environments in ways that promote health. To achieve “health equity,” systematic changes to policy are necessary to invest in communities and ensure everyone has fair and just access to affordable and quality housing, healthy food, parks and open spaces for physical activity; clean water and air, good schools and jobs, and safe environments free from violence.

### Cambridge in Context

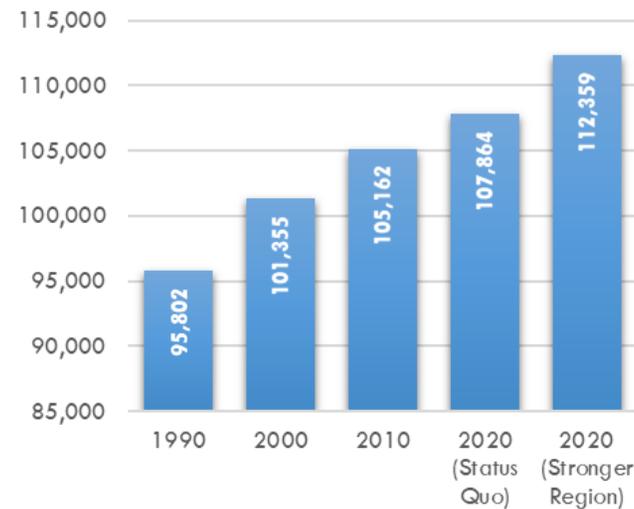
This HLA is also informed by broader conditions in Cambridge that influence the context within which urban agriculture is happening. Because population trends and economic and housing conditions may either enable or inhibit participation in urban agriculture activities, these are important to consider in the development of the City’s urban agriculture policy, its equitable implementation and delivery of health benefits.

#### *The City’s population is increasing*

Cambridge is the fifth largest City in Massachusetts and home to a vibrant mix of residents. More than 110,000 people live in the city,<sup>9</sup> including students attending one of several higher education

institutions, families, young professionals, and older adults. During the past several decades, the population has been growing.

Figure 2: Cambridge Population 1990-2010 (Census 2010), and 2020 Projections (MAPC)



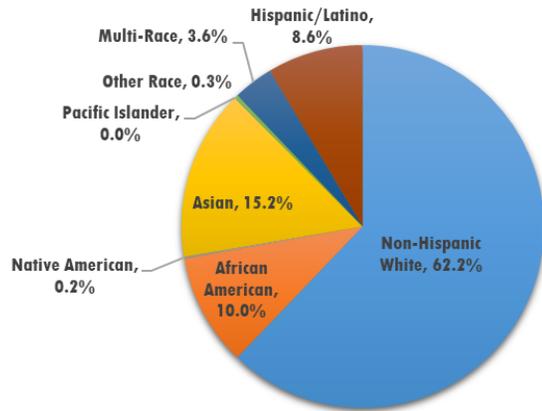
#### *Millennials, older adults, and people of color make up a larger part of the population*

Millennials and older adults (aged 25-34 and 60-74, respectively) represent an increasingly larger portion of the population.<sup>10</sup> And, since 2000 the City has also become more racially and ethnically diverse, with the change attributed most to an increasing percentage of Asian and Latinx<sup>e</sup> residents. Notably, in this time, the percentage of Black residents has

<sup>e</sup> The term Latinx is increasingly used as a gender-neutral alternative to Latino and Hispanic. The definition of Latinx and Latino both refer to the population of Latin American origin or decent.

decreased (-2.3 percent), and the City remains a majority-White city (62.2 percent).

Figure 3: Cambridge Population by Race and Ethnicity (ACS 2012-2016 5-year estimates)



Cambridge’s total land area is 6.4 square miles, 43 percent of which is used for residential purposes, resulting in a population density that ranks Cambridge as the 26th densest in the United States.

**Residents have comparatively high average incomes, but there is significant income inequality across race**

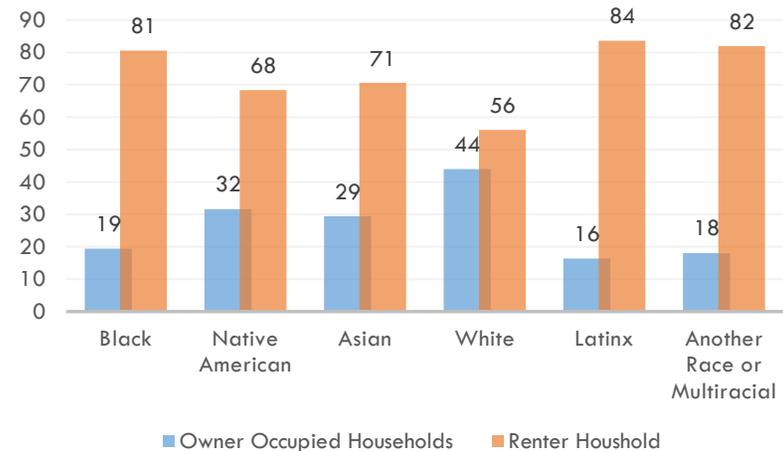
The median household income in Cambridge is \$83,122, compared with \$70,954 statewide.<sup>11</sup> Yet, when broken down by various factors, there is great variation in income levels throughout the City. While White residents have a median household income of \$98,073, Black residents’ median household income is more than three times less at \$32,558. Latinx (\$50,543)

and Asian (\$73,073) residents also outgain their Black neighbors.<sup>12</sup>

**Cambridge has a high percentage of renters, and a greater percentage of households of color rent their homes**

An estimated 63 percent of Cambridge housing units are rented, and the other 37 percent are occupied by owners. Most of Cambridge households are White (67 percent) and they represent the greatest percent of the City’s home renters and owners (38 percent and 29 percent, respectively). Proportionally across race, White households own their homes at a greater rate than Cambridge’s residents of color. The inverse is also true that residents of color rent their homes at a greater rate than Cambridge’s White households. This is shown in Figure 1 Figure 4. Broken down by housing tenure, owners (\$120,819) have nearly double the median household income of renters (\$66,077).

Figure 4: Housing Tenure by Race and Ethnicity (%), (Source: ACS 2012-2016, 5-year estimates)



**The following Health Lens Analysis seeks to answer:**

***How would implementation of Cambridge's urban agriculture policy affect and/or increase health?***

Each section evaluates the anticipated health impacts of Cambridge's proposed urban agriculture policies as they relate to the social determinants of health: social, economic, nutritional, and environmental factors and conditions. The analysis is informed by the draft policies, information and reports on current conditions in Cambridge, urban agriculture literature, and input by Health Lens Analysis focus group members and project partners.

Each section addresses the following:

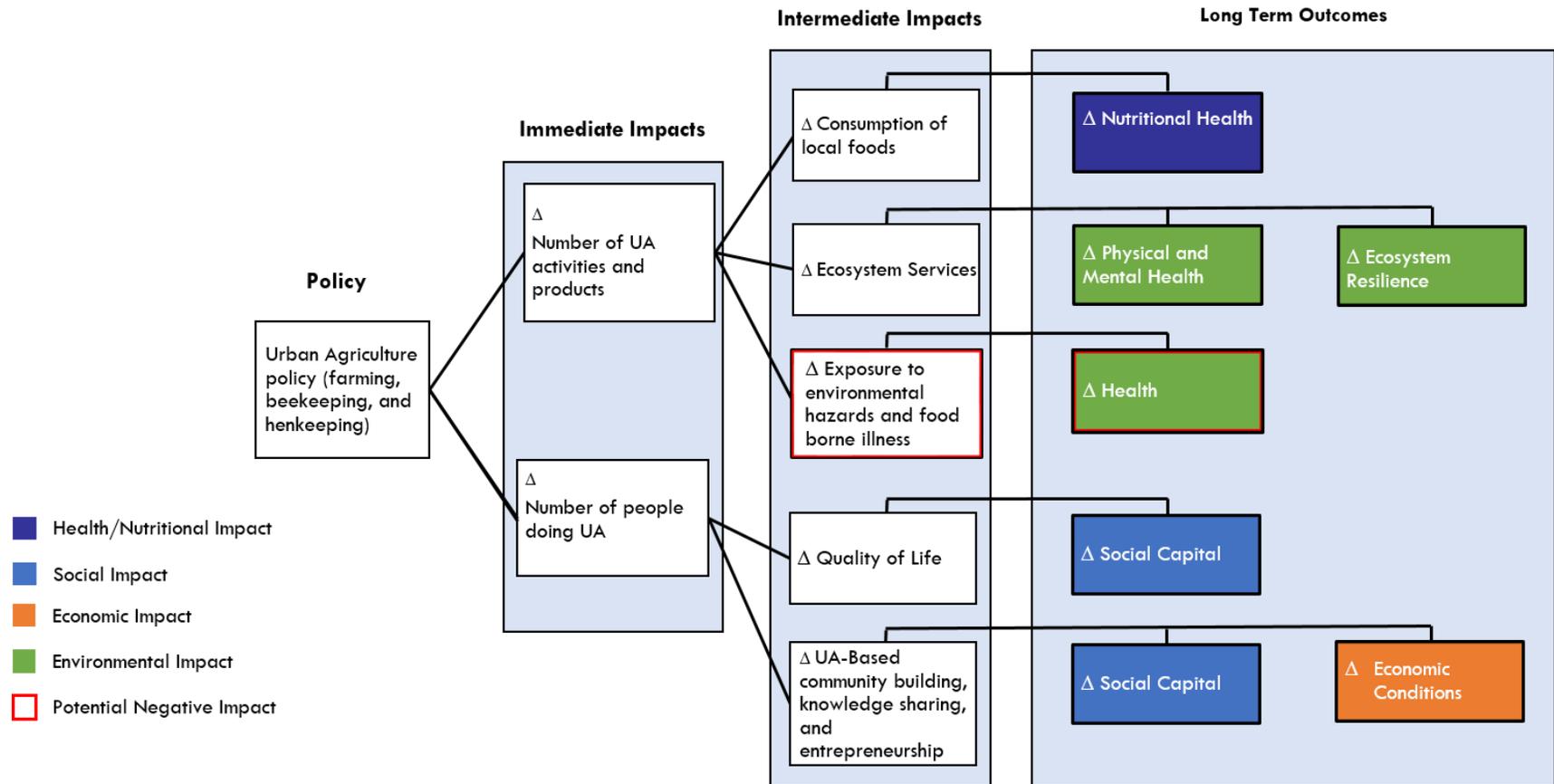
- An introduction to the health determinant and its impact on health
- Evidence of positive and negative health impacts of urban agriculture
- A description and diagram of the proposed urban agriculture policy's impact on health determinants
- Health Lens Analysis findings
- Recommendations for policy development and implementation

Summary findings and recommendations are presented in the opening of the report.

Figure 5 presents a comprehensive and simplified pathway diagram charting the expected changes and impacts on health determinants that would happen with the passage of the urban agriculture policies.

The Appendices include larger versions of this diagram and those in each of the HLA sections, as well as a link to the original files.

Figure 5: Pathways Diagram Summarizing Potential Impacts of Cambridge Urban Agriculture Policies



## Social Impact

*Of all the benefits credited to urban agriculture, its ability to deliver social benefits is consistently cited as the most significant.*

*We anticipate urban agriculture policies would likely increase social capital, and positively influence community health outcomes.*

### **Social Conditions Affect Health**

Social capital is typically defined in research as the, ‘resources imbedded in social networks such as norms and trust that can facilitate coordination and cooperation for people to achieve interests’.<sup>13</sup> Communities with high social capital, can influence and improve health.<sup>14</sup> On an individual level, participation in social networks can have the effect of decreasing stress; encourage healthier behaviors; and increase personal agency. And, where communities are rich with social capital - where there are high levels of trust and reciprocity - they can promote shared norms and equity, and they may be compelled to collective action and advocacy on behalf of the health of the community.

### **Current Conditions**

Since 2000, Cambridge has collected information on social capital via its biennial Citizen Opinion Survey, community forums, and demographic data from the U.S. Census. The questions in the Citizen Opinion Survey ask residents about the degree to which they feel welcome and able to participate in the community and government; the degree to which they participate in civic life; whether they have reliable access to the internet and devices; language barriers; and citizenship. Forums complementing this survey provide further insights into residents’ opinions of the dynamics that support or impede social capital. The 2017 Community Needs Assessment presents information gathered.<sup>15</sup>

Generally, Cambridge residents experience the City as a place supportive of building social capital. In 2016, nearly 70 percent described Cambridge having a ‘sense of community’, representing a majority of the responses. This is consistent with most years that the Citizen Opinion Survey has been administered, still it is a decline from the peak in 2014 (78 percent). Community forums reflected these responses, and described Cambridge as welcoming and supportive. Immigrants, youth, and seniors in focus groups similarly described a positive sense of community.<sup>16</sup>

Cambridge residents generally felt the City has a strong identity and deep social networks, but forum participants also voiced concern about gentrification and displacement, disruptive forces that threaten the sense of community. Cambridge has always been a transient city; people move to Cambridge at nearly double the rate of the state, and in several recent years over half the population has lived in Cambridge for less than 5 years. Housing costs have risen dramatically over the past decade, and those moving into Cambridge are increasingly wealthy enough to afford high housing costs. Where Cambridge is becoming unaffordable to residents with low or moderate incomes, this results in residents moving out of the City.<sup>17</sup>

Forum participants of the Cambridge Community Needs Assessment process described the population churn contributing

to a degradation of community social capital. Newcomers, they felt, were less engaged in community life; and seeing a higher proportion of them as young and childless, the opportunity for them to engage through schools and children's activities wasn't possible. Larger housing developments, they believe, also fail to facilitate a sense of belonging and connection. As a result of increased costs of living, participants noted, residents are working more hours, and have less time to build networks. On an organizational scale, community institutions, such as churches, are impacted as they see their membership decline and as less engaged with local community concerns. Where local businesses close as a result of changing conditions, the community loses important assets that facilitate community connections.<sup>18</sup>

The forum participants also described specific groups of residents, including immigrants, seniors, people of color, and low-income people as facing higher barriers to civic engagement and social capital. For immigrants, major hurdles include language barriers, poor social support networks, and limited opportunities to engage in civic life via their networks of families and friends that face similar language and cultural barriers. Seniors, particularly with health issues, can become isolated and less engaged. Participants also described systemic racism resulting in people having limited opportunities, and they criticized the City for what they observed to be its conflation of race and class. In contrast to these remarks, from 2000 to 2014, the Citizens Opinion Survey found that Cambridge was increasingly perceived to be 'a place welcoming to all races'. And in 2014, 53 percent rated Cambridge as 'excellent' on this measure. In 2016, just two years later, however, respondents perceived Cambridge to be less welcoming, and only 38 percent of

respondents rated Cambridge as excellent as 'a place welcoming to all races'.<sup>19</sup>

### **Cambridge Urban Agriculture Policy: Social Impacts**

The following section assesses the potential and likely impacts of the proposed urban agriculture policies in Cambridge on social capital and related factors that influence community health. Here we seek to answer:

*How would implementation of Cambridge's urban agriculture policy affect and/or increase social capital and health?*

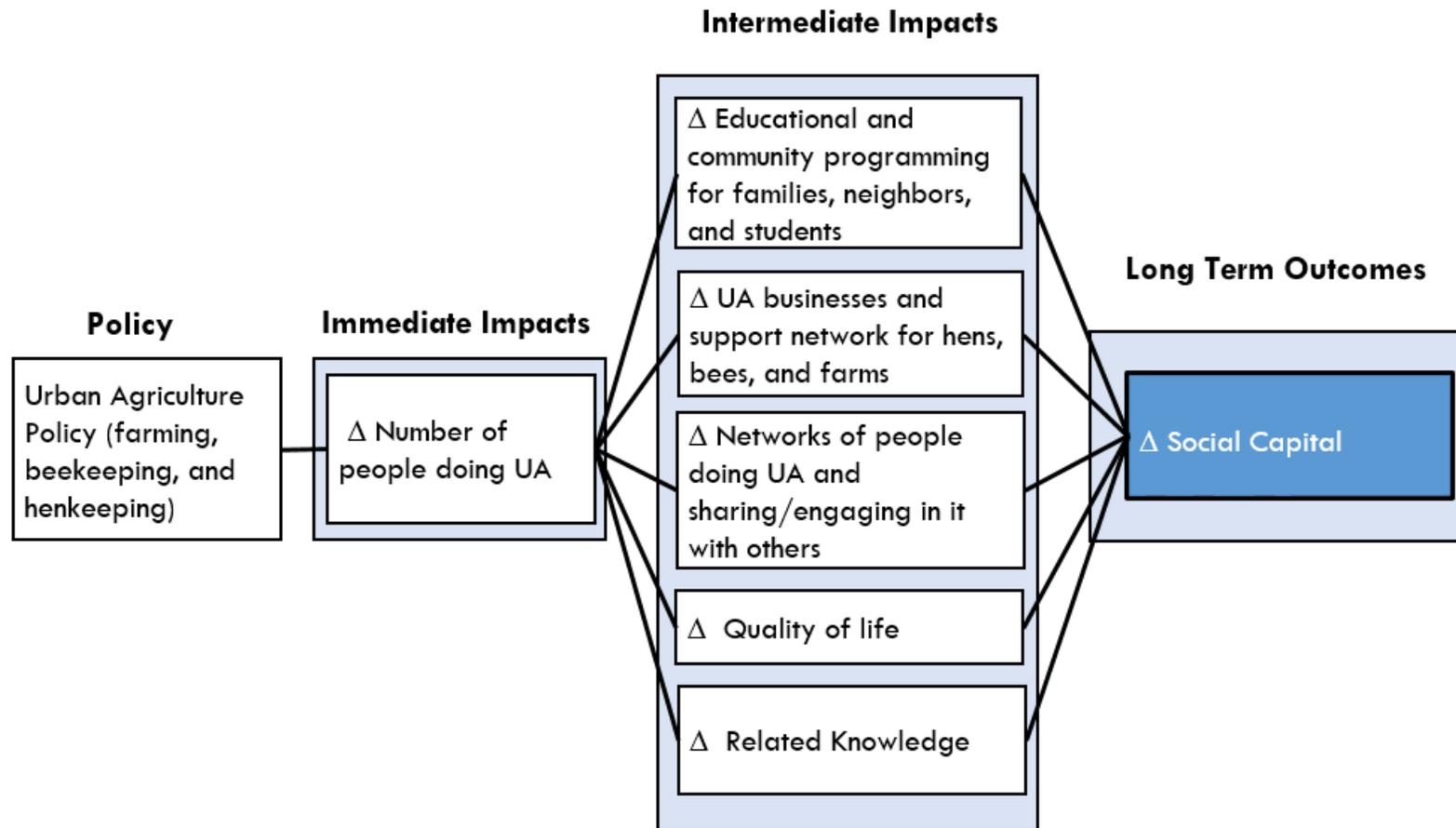
#### **Impact Pathways**

Figure 6 presents a pathways diagram that charts the potential changes related to building social capital that would occur with the passage of the policies and the increase in urban agriculture activities. Based on the activities the policies would support and based on evidence from literature, we expect that more people would engage in urban agriculture through a variety of means, and that this would foster building networks of individuals, groups, and businesses doing and organizing urban agriculture, and support greater community participation, building trust across practitioners, and exchanging and gaining knowledge and information. We anticipate these changes would likely increase social capital, and positively influence community health outcomes.

#### *Urban Agriculture: Social Impacts*

Of all the benefits credited to urban agriculture, its ability to deliver social benefits is consistently cited as the most significant.<sup>20,21,22</sup> Community farms create places for people to

Figure 6 Pathways Diagram of Potential Social Impacts of Cambridge Urban Agriculture Policies



socialize and work together. Where they engage individuals across the range of backgrounds, identities, experience, commonalities, and difference, these spaces can be important for fostering relationships, sharing knowledge, and building trust and reciprocity. The impact of such spaces extends beyond individual

relationship-building and can improve neighborhood conditions. Gardens that are cared for tend to also be vandalized less and improve a sense of safety;<sup>23</sup> and strong neighbor relationships can result in a deeper investment and concern for each other and the wider neighborhood. Where gardening facilitates agency

among its users, it can also be a vehicle for deeper civic engagement and addressing broader conditions.

A range of types of urban agriculture, including commercial or community urban farms and school gardening programs often deliver additional social benefits. Through formal or informal programming, they can be forums for education, leadership and skills development. As examples, urban agriculture can be used as a vehicle for youth development and employment; schoolyard gardening can be integrated and reinforced with science, nutrition, and other education curriculum; and commercial or community urban agriculture can be a mechanism for job training programs.

### Networks

An established network of organizations, programs, and businesses within and around Cambridge already engages in and promotes urban agriculture and food production. It includes school gardening programs, community gardens and farms, urban farming and gardening businesses, and hen- and bee-keeping associations.<sup>f</sup> Feedback from public meetings and focus groups pointed to the importance of the passage of the proposed policies in order to build these networks, and in particular to allow for beekeeping and henkeeping networks to more formally organize. Where the number, types, and strength of urban agriculture networks grow, a certain level of social capital is

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<sup>f</sup> Some of those involved in the Health Lens Analysis project include City Sprouts, the City of Cambridge as the manager of community gardens, the City of Cambridge as the manager of the Pathways Program, Green Cambridge, and ReCover Roofs.

likely to be generated between its members, in that there would be an increase in exchange of resources and information, as well as more partnerships and acts of reciprocity across them.

Focus group participants of the HLA project felt that urban agriculture entities play an important role in engaging people in urban agriculture activities and in providing outreach and education services to residents. And, they felt the passage of the urban agriculture policies would support growing and increasing capacity of the network. They noted schools, senior facilities, community gardens, and public housing developments as places that can play roles in promoting urban agriculture.<sup>g</sup> In particular, they pointed to school-age children and older adults as standing to benefit, in addition to the community at-large. Through urban agriculture activities at school, students could learn not only about growing produce, but also about keeping chickens and bees. Accessible gardening programs for older adults were also noted for their potential to provide a range of health benefits. Participants agreed on the importance of urban agriculture initiatives being accessible and visible in order to deliver benefits to Cambridge residents, and felt that school gardens, community gardens, and neighborhood farms would best facilitate participation and interaction between users. Worth mention, participants did not explicitly discuss the role of commercial businesses in facilitating participation in or educating the public, and instead identified non-profit organizations as doing so.

<sup>g</sup> In some cases, they provided examples of where that was already happening: one participant described the valuable gardening programming at her child's school, which is integrated into other nutrition and local food initiatives. Another participant described a raised bed gardens and gardening group at The Cambridge Homes, an assisted living facility.

## *Participation*

HLA focus groups had a strong sense that participation in urban agriculture activities can positively impact neighborhood social capital. They echoed what has been observed in urban agriculture research, and described these activities as compelling neighbors to build relationships with each other, and that the cumulative impacts of the activities over time fostered neighborhood agency and resilience. They believed community gardens and neighborhood chickens served as catalysts for interaction between neighbors, and that such conditions set the table for building and sustaining relationships, pointing particularly to the value of relationships forged intergenerationally, with immigrant residents, and with new neighbors. Participants described the value of information exchange that occurs through urban agriculture, and that it affords opportunities to engage children and youth in learning about food production, biology, and nutrition, as well as how to assume responsibility for the care of plants and animals. Where individual relationships foster cooperation and exchange, participants felt, this influences deeper engagement in the neighborhood generally and contributes to a sense of empowerment. They believed the social capital facilitated through urban agriculture improves individual wellbeing as well as overall community resilience.

## **Key Findings**

As a City with an historically and actively strong sense of community and identity that is experiencing higher costs of living, gentrification, displacement, and perceptions of increased racism, the strain on the community fabric is being felt. Generally,

these trends mirror those in the metro Boston area, and across the country in recent years, there has been a notable increase in racism and violence towards people of color. The forces that contribute to these issues are complex, and addressing them is outside of the scope of this project. Still, where urban agriculture fosters community cohesion and builds social capital, growing urban agriculture networks and encouraging participation by residents, across ages, abilities, and backgrounds could contribute to strengthening a sense of community in the City.

## *Factors that support building social capital:*

- **Current, significant levels of social capital and civic engagement.** Cambridge collectively identifies as a connected community and values social cohesion, and conditions are in place for urban agriculture to facilitate deepening relationships between neighbors and across the City. Focus group participants spoke particularly to the value of relationships that urban agriculture activities could facilitate across ages, with immigrant residents, and with new neighbors.
- **Stakeholders support urban agriculture in the City.** Focus group members are actively engaged or interested in urban agriculture. They are interested in activities currently allowed (community, home and school gardening), as well as those that are allowed with the beekeeping policy and those that would be allowed with the passage of the henkeeping policy. Focus group participants felt that school-age children and older adults could benefit greatly from engaging in urban agriculture and that there would be great value to encouraging urban agriculture in schools, senior facilities,

public housing developments and through community gardens.

- **The region has several active urban agriculture organizations.** Passage of the policies could spur expansion and diversification of activities. A growing and diversifying urban agriculture network could foster exchange and partnerships within the network, and promote social capital across organizations and residents they engage.

#### *Factors that hinder building social capital.*

- **Gentrification and displacement.** The rising cost of living is making it difficult for many to afford living in Cambridge, having a destabilizing effect on the sense of community and level of social capital.
- **Barriers to engagement.** Immigrants, seniors, people of color, and low-income residents are more likely to encounter greater obstacles to civic participation and building social capital. These variably include systemic racism, lack of resources and time, health conditions, and language barriers, among others.

## **Recommendations**

1. Reduce and remove barriers to participation, actively promote urban agriculture and provide outreach and education
  - a. Develop a fund to encourage urban agriculture that could subsidize or cover cost of permitting and urban agriculture equipment that might otherwise be cost-prohibitive for individuals or organizations.
  - b. Maintain and publicly share information on urban agriculture organizations and schools that provide opportunities for public participation.
  - c. Prioritize urban agriculture initiatives that maximize opportunities for public access, participation, and enjoyment, whether these are ground-level, indoor, rooftop or other types of operations.
  - d. Prioritize urban agriculture initiatives on sites that are in neighborhoods with greater need and fewer resources.
  - e. Encourage urban agriculture initiatives to apply universal design standards, particularly where the initiative will be open to the public.
  - f. Support and encourage urban agriculture initiatives to plant culturally diverse crops. Engage with the immigrant community to understand what crops are in demand.

- g. Prioritize participation in urban agriculture by those most likely to experience social isolation, including new immigrants, older adults, and those with disabilities.
- h. Support renters in engaging in urban agriculture activities at their homes or at satellite locations (i.e. community gardens, city farms, school gardens). Accomplish this through workshops, community events, and urban agriculture education programs.
- i. Develop a guidance document that is comprehensive in scope and provides information on how to engage in urban agriculture activities that will be newly allowed via the passage of the Cambridge policies, and that also provide guidance on a range of related topics. Example topics to include are:
  - Beekeeping
  - Henkeeping
  - Commercial Farming
  - Community Gardening
  - Community Agriculture Organizations
  - School Gardening and STEAM Curriculum
  - Medical Healthy Food Prescription Programs
  - Composting
  - Food Retail
  - Food Donation

## Economic Impact

*Urban agriculture has been found to impact a variety of economic factors, though there is more evidence for some than others. The greatest opportunities for commercially viable enterprises and good jobs may be in high-tech food production.*

*Considering a variety of factors, we anticipate the Cambridge urban agriculture policy would likely both improve and impair economic conditions, and have both a positive and negative impact on health.*

### Economic Conditions Affect Health

The related socioeconomic factors of education level, employment, and income impact health. One's education level influences their job choices and in turn their income level. These factors together greatly influence the probability of a person's access to environments and resources supportive of health, as well as their mental and physical health.<sup>24</sup>

### Current Conditions

Information on several economic factors characterize the conditions and disparities in Cambridge. This section presents data that illuminates these issues.

#### Financial Security

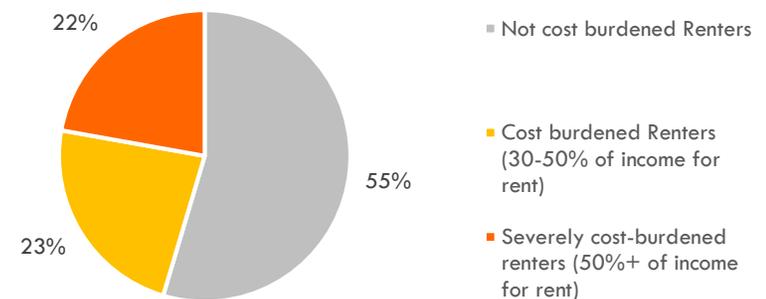
Financial security describes the degree to which residents are able to have financial independence and control. Income and cost of living affordability are two measures that provide insight into the level of financial security in Cambridge. In 2014, an estimated 40 percent, or 45,000 of Cambridge residents were financially insecure.<sup>25</sup>

Cambridge is a city with clear patterns of income inequality. With a median household income of \$83,122, the average

Cambridge household makes more money than the average Massachusetts household (median household income of \$70,954.<sup>26</sup> However, on the other extreme, Cambridge also has a greater proportion of residents in poverty (14 percent) than the state average (10.4 percent).

The cost of housing in Cambridge adds an additional burden on many residents. One out of five Cambridge rental households are severely cost burdened, meaning they pay 50 percent or more of their income on rent.<sup>27</sup> The high rent burden makes it harder to pay for other needs such as healthy food and health care.

Figure 7: Cost Burdened Rental Households (ACS, 2012-1016 5-year estimates)



Economic constraints show up unevenly across the city and among population groups. While only 9 percent of Cambridge residents receive public assistance income, these residents are spatially clustered in select neighborhoods in the City, namely North Cambridge, the Port, East Cambridge, and Wellington-Harrington.<sup>28</sup> And, across the population, children, particularly those living in household headed by a single female; Black or Latinx; and residents born outside of the U.S. are at a higher risk of financial insecurity.<sup>29</sup>

### **Employment**

Most Cambridge residents are employed (94.6 percent), but for many, securing jobs that pay a living wage is a significant challenge. Unemployment in Cambridge (5.4 percent) is comparable to the county (5.4 percent), and lower than the state (6.8 percent).<sup>30</sup> This translates into about 3,700 of Cambridge residents who are unemployed. Black and Latinx residents and those living in The Port, Wellington-Harrington, and MIT neighborhoods have higher rates of unemployment than the population on the whole and the City generally. Further, an estimated 34 percent of residents are underemployed, more than state and county estimates.<sup>31</sup>

Those with advanced degrees are more likely to gain access to high paying positions, including those in the City's leading industries: higher education, software development and technology, biotechnology, and healthcare. For those with more limited training, there are fewer opportunities for well-paying jobs. Participants of focus groups noted a need for more career pathways and training programs that match the jobs available.<sup>32</sup>

### **Education**

Nearly 80 percent of Cambridge residents have at least a bachelor's degree (ACS 2012-2016). However, educational attainment is unevenly distributed throughout the city; pockets of the Port, East Cambridge, Wellington-Harrington, Cambridgeport, and North Cambridge neighborhoods have a greater proportion of residents with less than a high school degree (8-21 percent) compared to other Cambridge neighborhoods.

### **Cambridge Urban Agriculture Policy: Economic Impacts**

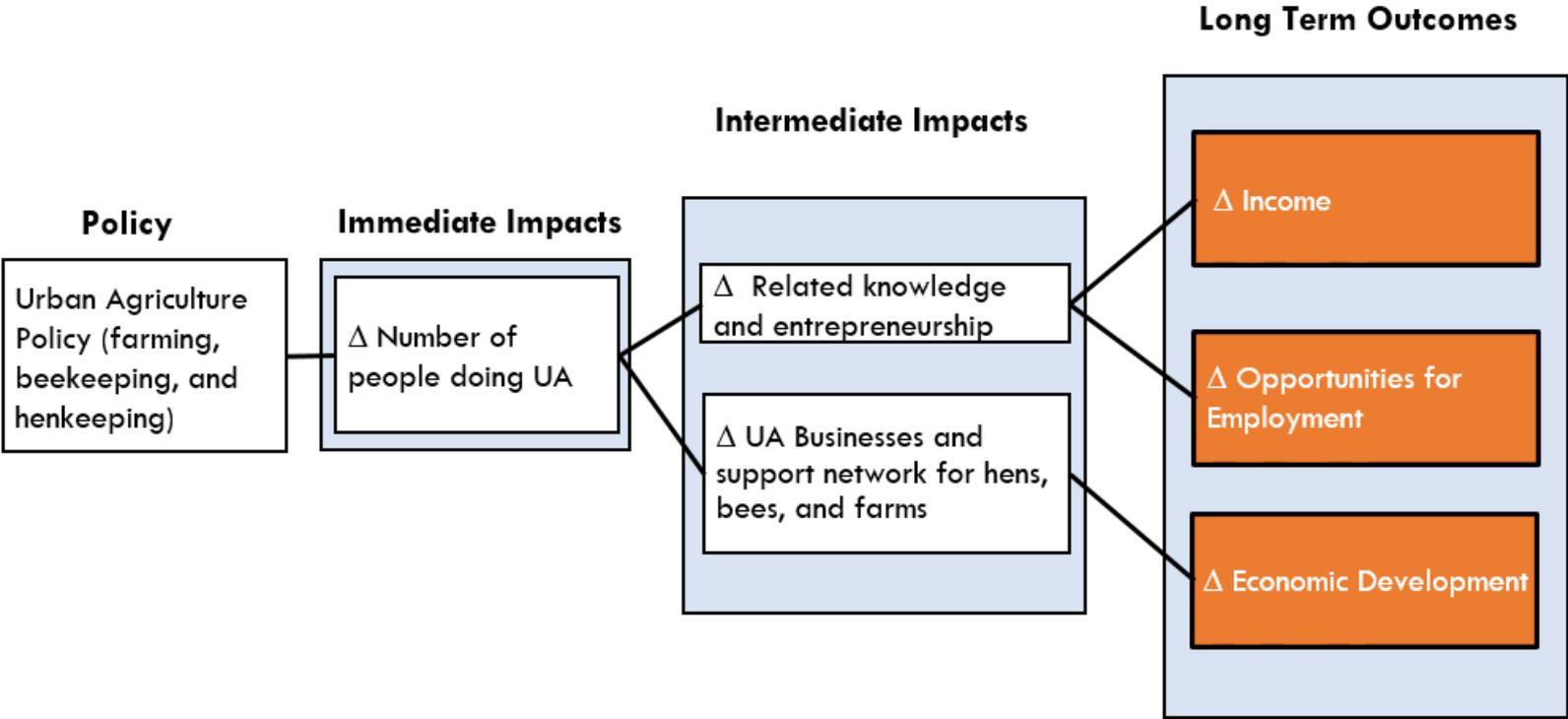
The following section assesses the potential and likely impacts of the proposed urban agriculture policies in Cambridge on economic factors that influence community health. Here we seek to answer:

#### ***How would implementation of Cambridge's urban agriculture policy affect and/or increase economic conditions and health?***

### **Impact Pathways**

Figure 8 presents a pathways diagram that charts the potential changes related to economic factors that may occur with the passage of the policies and the increase in urban agriculture activities. Based on the activities the policies would support, and based on evidence from literature, we expect that more people would engage in urban agriculture through a variety of means and gain a range of related skills and knowledge. For those that use this skillset to grow food for their own consumption, we expect that this would reduce their grocery bills and free up some of their income for other expenses. We would expect those employed in the field to gain income through their work. Where

Figure 8: Pathways Diagram of Potential Economic Impacts of Cambridge Urban Agriculture Policies



urban agriculture programs can support job-readiness and leadership development, we expect participants to build skills that could position them for more employment opportunities. The policies would also support the development of new urban agriculture enterprises and programs. We would expect their expansion, both in number and type, would support economic development through the direct and indirect impacts of business activity. There is also a possibility that the impacts of urban agriculture would exacerbate some of the dynamics of gentrification and displacement already taking place in

Cambridge, and that could negate the benefits of urban agriculture. Taken together, we anticipate the Cambridge urban agriculture policy would likely both improve and impair economic conditions, and have both a positive and negative impact on health.

**Urban Agriculture: Economic Impacts**

Urban agriculture has been found to impact a variety of economic factors, though there is more evidence for some than others,<sup>33,34,35</sup> discussed in the following sections.

### *Cost Savings and Earned Income*

Individuals may reduce their food costs when participating in urban agriculture activities, making more money available for other household expenditures. As examples, community gardening research has found that, not accounting for labor, the cost of growing food was comparably less than purchasing it in a grocery store.<sup>36</sup> The value of produce included in Community Supported Agriculture (CSA) programs have also been found to be higher than the value of equivalent produce at grocery stores – essentially that CSAs give a person more for their money.<sup>37</sup>

Cambridge's urban agriculture policies would expand opportunities for residents to produce food for their own consumption or sale, and as such their passage could deliver cost savings where residents produce food for their families, or increase income from sales of food produced. The extent to which these benefits would be delivered is hard to predict, however. Already, community and home gardening are allowed activities in Cambridge, and the passage of urban agriculture policies would not change residents' ability to save money by growing a garden.

Urban farms often also have social missions to promote food security and may contribute to the amount of food available for food pantries or community meal sites. For example, the Boston Medical Center gives low-income patients prescriptions for produce grown on their rooftop farm.<sup>38</sup> Where urban agriculture policies stimulate food donations or availability of reduced-cost food, this may reduce grocery costs for low-income households.

This project did not collect information about bee and hen equipment and management costs, and more information would be needed to estimate whether individuals would save money on eggs and honey if they produced their own. Further, HLA focus group participants were interested most in growing vegetables and fruits for their own consumption, and were not interested in entrepreneurship. If the focus group opinions are representative of broader interests, it is unlikely that many residents would seek to sell the food they produce.

### *Workforce Capacity*

Urban agriculture job training programs have been shown to build the capacity and skill of the workforce. In addition to food production and farming skills, programs can foster valuable transferable skills like marketing, customer service, accountability, and leadership – skills important for jobs in a range of sectors. Urban agriculture job training programs are often tailored to youth or formerly incarcerated individuals, and as such support skills development of an emergent or under-employable workforce.

Urban agriculture can create jobs, but researchers urge against overstating economic benefits related to jobs and profitability.<sup>39</sup> Urban agriculture can create local jobs, but historically, these jobs have rarely been well-paid. Where there are several examples of projects that project living wage job creation, there are actually few examples of projects that provide such jobs. Related, existing literature shows few examples of profitable urban agriculture enterprises. Several factors make the delivery of good urban agriculture jobs illusive; looking at sectoral trends, farm labor in the U.S. is one of the lowest paying industries. Most

urban agriculture projects are sustained not through sales of agricultural products, but grants, donations, and volunteer work. Costs of entry and operation can be significant, particularly where an urban farmer needs to secure urban land and resources or install high-yielding growing systems.<sup>40</sup> These and other factors make it challenging for urban agriculture to generate living wage jobs and support commercially-viable enterprises.

Passage of Cambridge's urban agriculture policies is likely to spur expansion of the urban agriculture network, and in turn increase opportunities and demand for a workforce. There are already enterprises operating locally that employ intensive and high-tech growing systems, with Freight Farms and Recover Green Roofs as examples. Further, academic institutions are engaging in research to advance food production systems. These features set Cambridge uniquely apart from many settings where urban agriculture is happening. With this as the context, it is possible that the job opportunities generated through expanded urban agriculture activities will be more technical and specialized, and possibly pay better than urban agriculture jobs traditionally do.

### **Economic Development**

Urban agriculture has been promoted as a tool for revitalization and business development. Proponents describe its impact: it can make use of and improve vacant lots and in turn increase property values, spur capital investment, and reduce municipal maintenance costs.<sup>41,42,43</sup> A Johns Hopkins report<sup>44</sup> synthesized research that documents positive economic impacts. Studies have found that homes near community gardens indeed have higher value which can in turn increase property tax revenue. Urban

agriculture can also spur enterprise development, but there is little historical evidence of their profitability. Among urban agriculture literature on the topic, a recent study of urban farms in Philadelphia found that one of the 14 farms studied was profitable. These included both for-profit (4) and non-profit farms (10).<sup>45</sup> **The greatest opportunities for commercially viable enterprises may be in high-tech food production, with market research pointing to the promise of the fast growing hydroponic and vertical growing segments of the food production sectors.**<sup>46</sup> **Despite the popularity of urban agriculture as a tool for economic development, economic outcomes are the least documented aspect of the field.**

Urban agriculture can also unwittingly have adverse economic impacts. Its positive impacts on neighborhood property values, can also contribute to the dynamics of gentrification and displacement. This effect is strongest in disinvested neighborhoods with low property values. To mitigate potential negative impacts and ensure positive revitalization impacts, advocates urge resident engagement, particularly by those at risk of displacement, to inform sustainable urban agriculture expansion efforts that prioritize their needs.<sup>47</sup>

The potential impact of Cambridge's urban agriculture policies on local and regional economic development are yet unknown, but they could be both positive and negative.

On one hand, the City is increasingly unaffordable for Cambridge residents. It's possible that urban agriculture could unintentionally exacerbate this issue if activities lead to higher property values.

On another hand, where literature on urban agriculture finds few examples of profitable enterprises, emergent market research of intensive growing systems shows that they can be profitable business models.<sup>h</sup> **The broader metropolitan Boston area is unique in that is home to several commercial operations<sup>i</sup> that provide design, installation and management services for indoor, rooftop, and other urban food production systems; and universities<sup>i</sup> that engage in food production technology research. Passage of Cambridge's urban agriculture policies, which would allow food production systems that employ hydroponic, aeroponic, aquaponic, and other techniques, would effectively open Cambridge to businesses using these techniques.** Conceivably, this could have the effect of spurring related research, business development, and expansion of the urban agriculture network broadly, but the degree to which this could happen is difficult to estimate.

Passage of the policies would also allow for beekeeping and henkeeping operations, with likely minor economic impacts. Where urban agriculture literature typically focuses on food cultivation, there is little research on these more ancillary urban agriculture activities. Cambridge urban agriculture practitioners and residents described these activities mostly as individual pursuits with limited income potential.

In response to questions about the potential economic impacts of urban agriculture, HLA Focus group participants described their values for an urban agriculture economy. Generally, they

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<sup>h</sup> Lufa Farms and Freight Farms both claim having profitable operations.

<sup>i</sup> Examples are GreenCity Growers, Recover Green Roofs, Freight Farms, GroveLabs, and Higher Ground Farm.

supported the development of cooperative businesses, the provision of living wages to employees, and an interest in supporting small-scale businesses and entrepreneurship. One participant expressed concern that expansion of large-scale operations could make it difficult for small-scale operations to compete in the market.

## Key Findings

### *Factors that support improving economic conditions.*

- **Cambridge would become open to high-tech, intensive food production.** Passage of Cambridge's urban agriculture policies would allow entry and operation by the commercial enterprises that employ hydroponic, aeroponic, and aquaponics growing methods. Already, the region is home to several such enterprises, and the policies could encourage more to establish.
- **The high-tech, intensive food production enterprises may support better jobs than urban agriculture conventionally does.** Where such enterprises require a workforce with a specialized skillset, passage of the urban agriculture policies may lead to creation of more technical and better-paying jobs.

<sup>j</sup> One example is MIT's Open Agriculture Initiative.

### *Factors that hinder improving economic conditions.*

- **Generally, and historically, food sector employment is low-wage.** The same has been true for urban agriculture, and few urban agriculture enterprises have been profitable. Those that do claim to be profitable include vertical farming and hydroponic operations that require significant capital investments, which may be prohibitive for many aspiring entrepreneurs.
- **Urban agriculture may exacerbate issues of gentrification and displacement.** Urban agriculture, in particular ground-level community gardens have been shown to increase area property values, which can impact the overall affordability of the neighborhood for its residents. Similar studies have not been done for indoor or rooftop urban agriculture initiatives. Cambridge already experiences significant income inequality and housing cost-burden. Residents in the North Cambridge, Port, East Cambridge, and Wellington-Harrington neighborhoods experience economic constraints the most.

### **Recommendations**

2. Mitigate potential negative economic impacts of urban agriculture.
  - a. Prioritize resident engagement and interests in neighborhood urban agriculture projects to mitigate negative impacts.
  - b. Minimize negative economic impacts to residents and in neighborhoods most at-risk. These include children, single mothers, Latinx, Black, and residents born outside the U.S, and the neighborhoods of North Cambridge, the Port, East Cambridge, and Wellington-Harrington.
3. Increase local workforce capacity and opportunities.
  - a. Encourage job training that prepare the local workforce with skills that match the needs of the sector. Prioritize workforce preparedness and training for those most at-risk.
  - b. Encourage creation of living wage jobs and career pathway opportunities.
  - c. Support high-tech, intensive food production toward fostering workforce development, food security, and innovation.

# Nutritional Impact

*Urban agriculture has been promoted for potential nutritional benefits that come from increased consumption of the food produced.*

*We anticipate that passage of the urban agriculture policies would likely improve the nutrition of Cambridge residents, and positively impact health.*

## Nutrition Influences Health

Diet is a health determinant and contributes to major health outcomes. A poor diet is linked to decreased school or workplace productivity, malnutrition, chronic conditions like obesity and hypertension, and mental health conditions like depression. Conversely, a healthy diet reduces the risk of chronic disease, and supports maintaining a healthy weight, brain function and leading an engaged, active, and productive life.

## Current Conditions

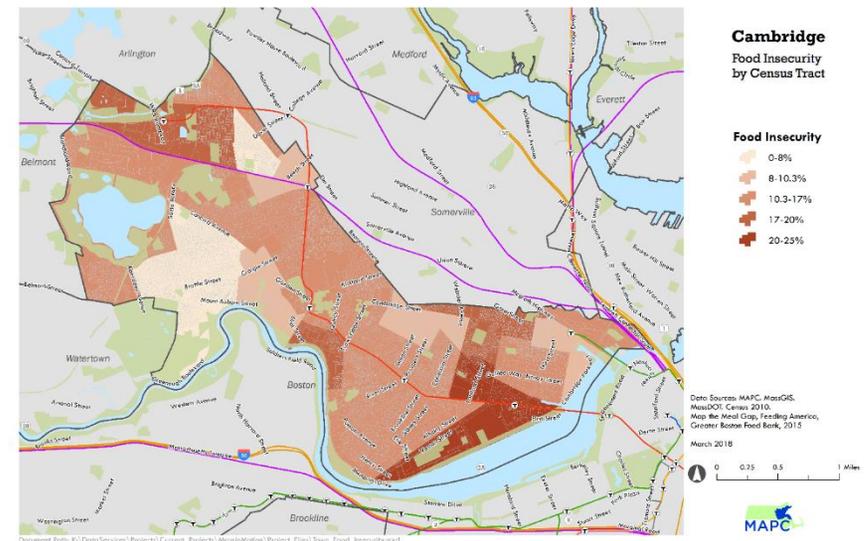
Information on several nutritional health factors characterize the conditions and disparities in Cambridge. This section presents data that illuminates these issues.

### Food Insecurity

Food insecurity refers to the state of having inadequate access to nutritious food to live a healthy and active life. In Cambridge, households experience hunger to a greater extent than the average household in Massachusetts. An estimated 12.9 percent of residents are food insecure,<sup>48</sup> whereas the Massachusetts rate is 10.3 percent.<sup>49</sup> A 2015 survey of 400 Cambridge residents had similar findings, with 14 percent of respondents reporting that they worried their food would run out before they had money to get more.<sup>50</sup>

Estimated food insecurity rates vary across the City. The Port and MIT neighborhoods<sup>51</sup> include census tracts with the highest rates of food insecurity, (21 and 25 percent respectively). Portions of

Figure 9: Cambridge Food Insecurity by Census Tract



the Wellington-Harrington, East Cambridge, Riverside, and North Cambridge neighborhoods also have high food insecurity rates between 18 and 20 percent. In the United States, poverty and food insecurity disproportionately impact people of color,

particularly Black communities.<sup>52</sup> This is true in Cambridge, where the census tracts with the highest food insecurity rates generally experience comparatively higher poverty levels and have a greater percentage of residents of color, particularly Black residents.

Poverty and food insecurity are closely linked and associated with poorer health outcomes. Those experiencing poverty are likely to concurrently have limited financial resources, competing priorities, stress, and other resource-related hardships, that make it difficult to maintain good nutrition and health and address existing health conditions. Further, poorer neighborhoods also tend to have fewer health promoting resources, such as full-service grocery stores. These compounding factors result in a range of health issues, among them, obesity, diabetes, and high blood pressure, among others.

### Diet Related Chronic Disease

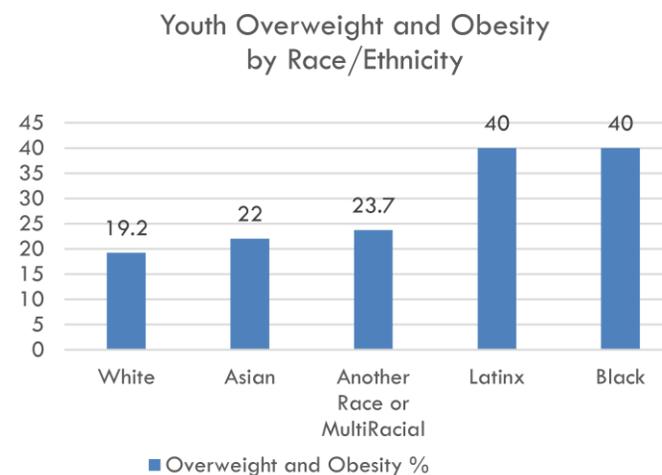
Cambridge residents have a sense that it is a healthy city and has a wide variety of healthy eating options and opportunities to be physically active.<sup>53</sup> Data on diet-related chronic disease place Cambridge as healthier on the whole, compared with the rest of the state. Data show that 12.5 percent of adults are obese, 13.9 percent have high blood pressure, and 4 percent have diabetes. Across these chronic diseases, these rates are nearly half of the comparative Massachusetts rates (respectively 21.5, 25.7, and 7.2 percent).<sup>54</sup>

Though Cambridge has low average rates of diet-related chronic disease, residents of color and low-income residents are disproportionately impacted. There is limited data on adult diet-

related disease by income and race in Cambridge, but data on childhood obesity provides a window into income- and race-based disparities.<sup>55</sup>

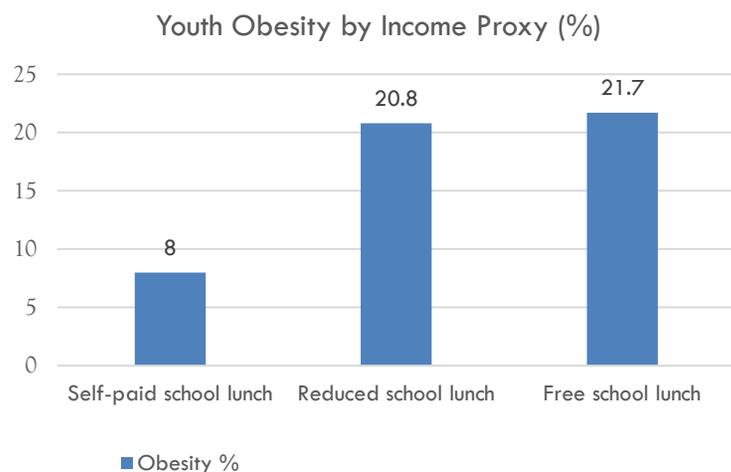
Generally, overweight and obesity prevalence among K-8 Cambridge Public School students has declined in recent years, from 39.1 percent in the 2004 to 27.5 percent in 2017. Still, a snapshot of 2017 (Figure 10) shows that non-White students had higher rates of overweight and obesity, with the highest rates among Black and Latinx students, at 40 and 39.9 percent, respectively.

Figure 10: Overweight and Obese Youth (K-8) by Race/Ethnicity, Cambridge Public Schools (2017)



Further, where free- and reduced- lunch eligibility is determined by income, 2014-2015 data (Figure 11) show that low-income students have higher rates of obesity, significantly greater than higher income students and, again, equivalent to Massachusetts averages.<sup>56</sup>

Figure 11: Obese Youth (K-8) by Income Proxy, Cambridge Public Schools (2014-15)



### Cambridge Urban Agriculture Policy: Nutritional Impacts

The following section assesses the potential and likely impacts of the proposed urban agriculture policies in Cambridge on nutritional and related factors that influence community health. Here we seek to answer: How would implementation of Cambridge’s urban agriculture policy affect and/or increase nutritional health?

### Impact Pathways

Figure 12 presents a pathways diagram that charts the potential changes related to nutritional health that would occur with the passage of the policies and the increase in urban agriculture activities and food production. Based on anticipated changes and evidence from the literature, we anticipate that passage of the urban agriculture policies would likely improve the nutrition of Cambridge residents, and positively impact health.

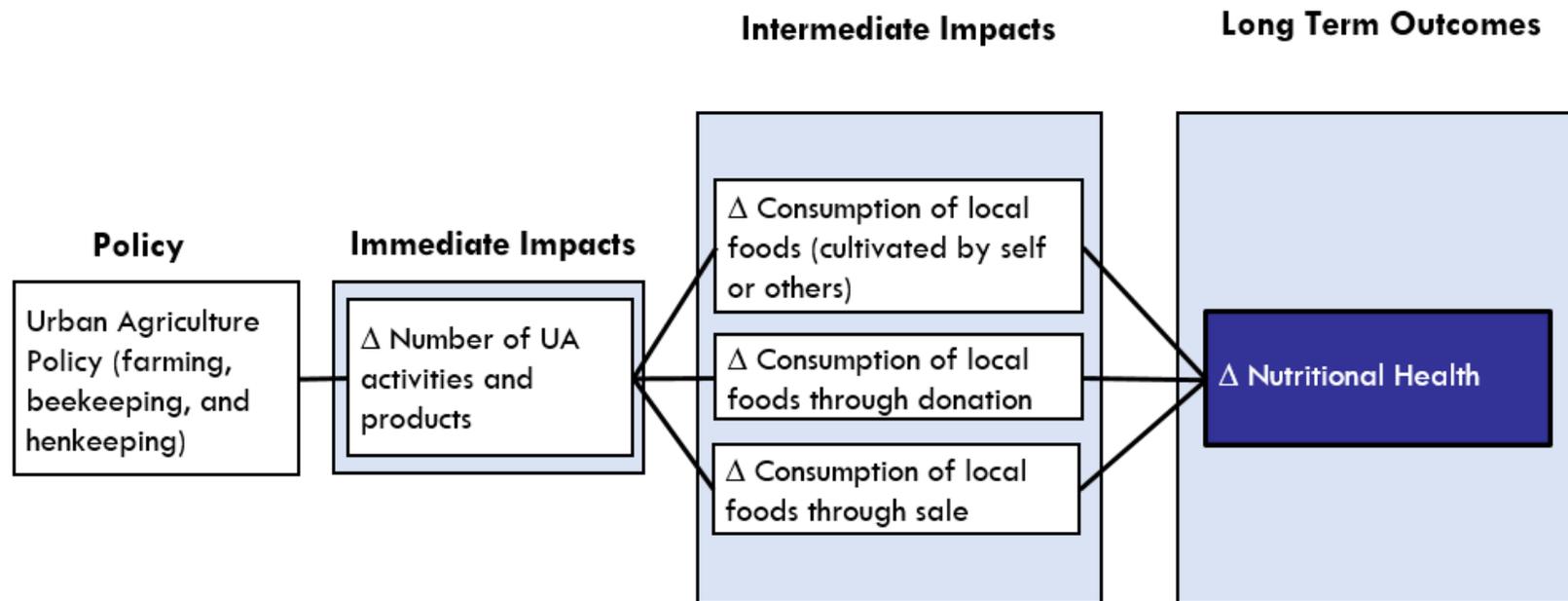
#### Urban Agriculture: Nutritional Health

Urban agriculture has been promoted for a number of potential health benefits. Among these are nutritional benefits that come from increased consumption of the food produced through urban agriculture activities.<sup>57,58,59</sup> UA is discussed as a mechanism for improving health and food security on a variety of scales - from the individual that gardens or farms, to those that benefit from increased food access through community-sharing, purchasing, or donation channels, to the municipal level.<sup>60</sup> Evidence is strongest for the benefits to individuals that engage in urban agriculture activities, and several studies have found that gardening households consume more fruits and vegetables.<sup>61</sup>

#### Consumption of local foods

The proposed urban agriculture policies aim to increase local production of food through a variety of mechanisms. Policies would enable commercial and non-commercial cultivation of vegetables and fruit; eggs; honey; and fish. And, they would allow distribution of these foods through sales and donation, and anticipate food will also be produced for self-consumption.

Figure 12: Pathways Diagram of Potential Nutritional Impacts of Cambridge Urban Agriculture Policies



HLA focus group participants agreed that the urban agriculture policies would enable consumption of locally-produced, nutritious foods, naming in particular eggs, fruits, and vegetables.<sup>k</sup> The expansion of urban agriculture activities would likely increase the amount of locally produced foods available via home production, food assistance donation programs, farmers markets and other retail, restaurants, schools, after school programs, assisted living facilities, and possibly other venues. If residents

are able to produce their own food, and if locally produced food is also affordable, the passage of the policies may positively impact food security and community health.

**Healthy eating habits**

Urban agriculture can be a vehicle for learning about nutrition, gaining an appreciation for fresh foods, and establishing healthy eating habits.<sup>62</sup> HLA Focus group participants remarked on the

<sup>k</sup> Notably, none mentioned honey’s health benefits, nor the fish that could be raised with the passage of the policies.

long-term impacts urban agriculture could have on establishing healthy eating habits. This can happen through individual engagement in food cultivation, or through more formal programming. As the leading example, CitySprouts, a Cambridge-based school gardening education organization partners with Cambridge public schools and provides elementary and middle school children opportunities to learn and lead through gardening. CitySprouts garden educators work with teachers and schools to tailor curricula to include garden-based extensions, and garden coordinators maintain schoolyard gardens throughout the growing season. Through hands-on gardening activities students become more engaged learners, increase their understanding of where food comes from, and sets them on a path toward life-long healthy food choices.<sup>63</sup> HLA Focus group participants also expressed that their children learn responsibility through care of a CitySprouts garden, and that they would like to reinforce this opportunity at home through also gardening there. Conceivably, the passage of urban agriculture policies could enable expansion of the types of programming CitySprouts and other programs like it offer.

## Key Findings

### *Factors that support improving nutrition.*

- **Gardening households consume more vegetables.** Cambridge residents can already garden at their homes or at one of the City's community gardens. Passage of the urban agriculture policies may increase the number of residents that produce food. Compared with other methods of getting produce, gardeners are more likely to consume more vegetables and gain related health benefits.<sup>64</sup>
- **Educational programming in Cambridge can reinforce healthy eating habits.** Urban agriculture can promote healthy eating habits over one's lifetime. CitySprouts currently engages Cambridge public school students in school gardening programs that support making healthy food choices. Passage of the urban agriculture policies could stimulate expansion of CitySprouts and similar programs.

### *Factors the hinder improving nutrition.*

- **Food insecurity is a reality for some residents more than others.** Cambridge has higher food insecurity rates (12.9 percent) than the state (10.3 percent), and it disparately impacts residents of color and low-income residents. The Port, MIT, Wellington-Harrington, East Cambridge, Riverside and North Cambridge neighborhoods have the highest food insecurity rates (18 percent and higher).

## **Recommendations**

4. Ensure food insecure residents benefit from urban agriculture.
  - a. Provide outreach and educate residents about opportunities to grow and produce food. Ensure avenues for engagement are easy and affordable.
  - b. Ensure locally-grown or -raised food is affordable and accessible through mechanisms such as municipal institutional procurement efforts; local food incentive programs, such as SNAP-matching; backpack programs; and strengthening donation channels.

## Ecosystem Impact

*Urban green spaces, inclusive of urban agriculture, can promote mental and physical health, and support positive health outcomes.*

*We anticipate the Cambridge urban agriculture policy will likely improve ecosystem health and positively impact public health.*

### **Ecosystem Conditions Impact Health**

Urban green spaces, inclusive of urban agriculture, can promote mental and physical health, and support positive health outcomes. They provide a range of positive benefits, called ecosystem services, which describe the ways humans benefit from the presence and processes of natural features. Ecosystem services are usually grouped into four categories and include regulating services (i.e. climate regulation, air and water purification); provisioning services (i.e. food and lumber); cultural services (i.e. recreation and relaxation opportunities); and supporting services which are necessary for the production of all other ecosystem services (i.e. soil formation, photosynthesis and nutrient cycling).<sup>65</sup>

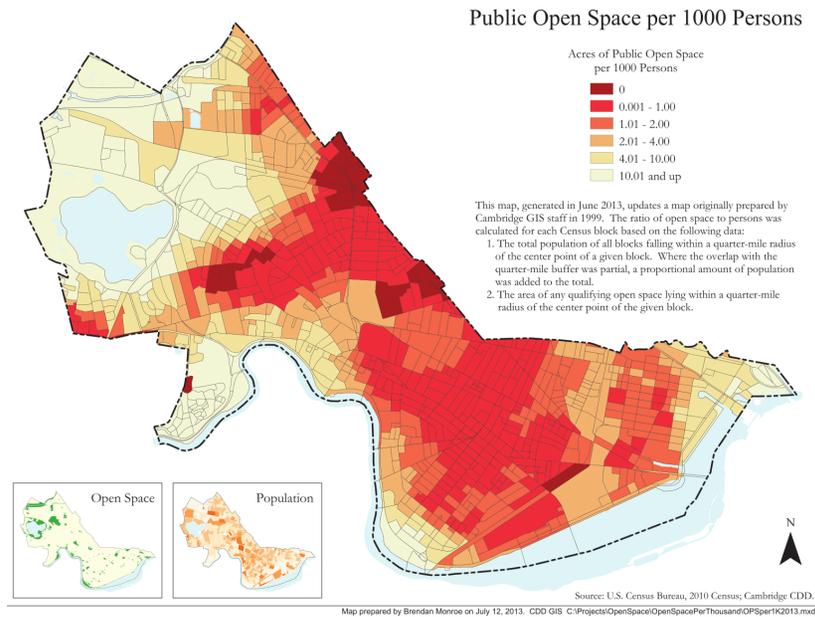
The activities of farming and gardening, and the environments they take place in can increase physical activity, promote relaxation, alleviate stress, and improve immune function. Discussed in a separate section, these activities also foster relationships and building social capital (see Social Impact section). Urban green spaces can also reduce exposure to environmental hazards, air pollution, and excessive heat. Together, urban green spaces can have a variety of positive health effects, including improved mental health, reduced depression, better cardiovascular health, reduced obesity and diabetes rates, among others.<sup>66,67</sup>

### **Current Conditions**

About 11 percent of Cambridge's land area is classified as protected public open space. The public open space system is comprised of public parks, playgrounds, reservations and other recreational sites. Additionally, a significant amount of private open space is held by large non-profits, namely private universities that own about 10 percent of the land area in the City. With some exceptions, this private open space is accessible to the public and is an additional important asset. As part of the public open space system, Cambridge manages 14 community gardens with nearly 500 plots. The City is actively expanding the community gardens to respond to expressed interest. The most recent 2010-2016 Open Space & Recreation Plan described a waiting list of 80 families.<sup>68</sup>

Cambridge residents place high value on open spaces for opportunities for leisure activities, enjoyment of the natural environment, sports and exercise, and for gardening; and they actively use these assets. When surveyed, over 85 percent of residents said they or someone in their household had visited a park at least 3 times within the year; 59 percent visited 13 or more times.<sup>69</sup> Figure 13 describes open space availability by Cambridge residents across the city. The City uses this and other demographic information to guide open space expansion and improvements where they are needed most.<sup>70</sup>

Figure 13: Open Space Availability by 1000 persons in 2010, (Source: Cambridge Community Development Department<sup>71</sup>)



Cambridge’s Climate Change Vulnerability Assessment identifies increasing heat; flooding from increased precipitation; and reduced air quality as top environmental issues in the City. These issues are expected to have significant public health, safety, and economic impacts over time. And, the impacts are expected to be greater on those with lower incomes, people with preexisting chronic health concerns, and those isolated due to age, disability, language or other factors.<sup>72</sup> The assessment notes that tree canopy coverage and pervious surface, integral to the system of green spaces, are valuable to cooling, improving air quality, and capturing stormwater runoff, among other benefits.<sup>73</sup> Where climate change is likely to increase

heat-related health issues and decrease air quality, the systems of open green space can play a part in lessening negative health impacts related to climate change.

### Cambridge Urban Agriculture Policy: Environmental Impacts

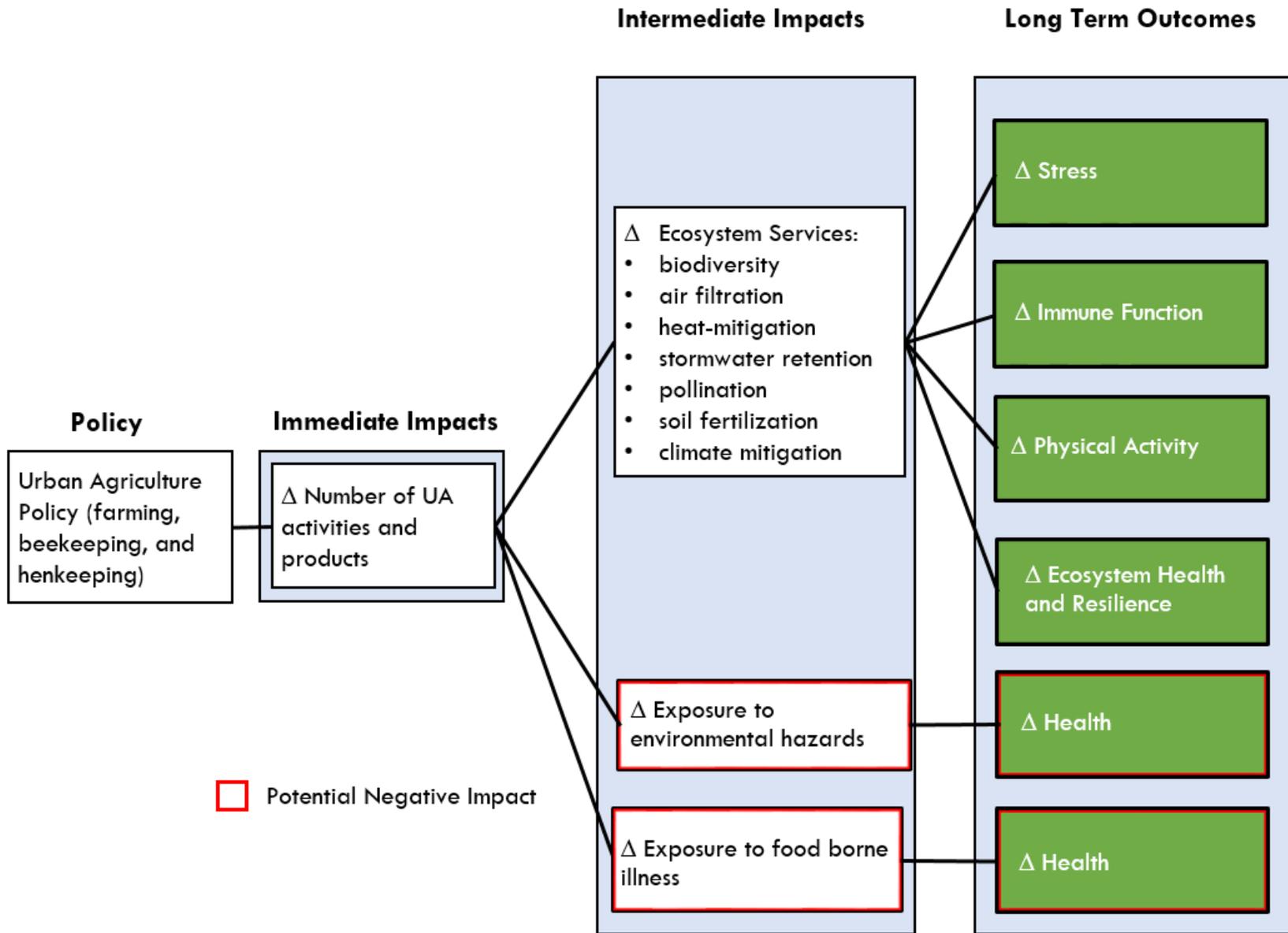
The following assesses the potential and likely impacts of the proposed urban agriculture policies in Cambridge on environmental health factors that influence community health. Here we seek to answer:

*How would implementation of Cambridge’s urban agriculture policy affect and/or increase environmental health?*

### Impact Pathways

Figure 14 presents a pathways diagram that charts the potential health changes related to ecosystem conditions that would occur with the passage of the policies and the increase in urban agriculture activities and food production. Based on anticipated changes and evidence from the literature, we estimate that passage of the urban agriculture policies would lead to an increase in the urban agriculture activities in Cambridge, and that residents would derive physical and mental health benefits from engaging in farming and gardening activities. Further, we expect the ecosystem services provided by urban agriculture would contribute to overall ecosystem health, which would also in turn positively impact public health. This pathway also anticipates that increased urban agriculture activity could, in theory, lead to increased exposure to hazards and illness, but where the policies anticipate and mitigate these negative health impacts, we expect these to be minimal and controlled. Together, we anticipate the

Figure 14: Pathways Diagram of Potential Environmental Impacts of Cambridge Urban Agriculture Policies



urban agriculture policy will have likely improve ecosystem health and positively impact public health.

### *Ecosystem Services and Resilience*

Within densely built cities, urban farms and community gardens are valuable features, and can provide a range of ecosystem services. In addition to producing food, perhaps one of the most obvious of ecosystem services, these urban green spaces provide several regulating, cultural and support services. They can increase local biodiversity, where they include diverse vegetation, create habitat, and encourage pollination. Open green spaces can be encouraged for stormwater infiltration and purification; this is particularly valuable in urban areas with surrounding impervious ground. Vegetation also improves air quality, both through producing oxygen and filtering pollutants. Plants and trees moderate temperatures, and can lessen the 'heat island effect'. Through the production of compost, gardens and farms can also increase soil fertility. Several of the same ecosystem benefits may be provided by vegetative systems that are integrated into buildings, whether on rooftops or indoors.<sup>74</sup>

Where urban agriculture can localize the food supply chain, some also claim this reduces fossil fuel use when compared with the global food supply chain, and that this can help mitigate climate change.<sup>75</sup> Though the evidence for this is limited, one study estimates that where urban agriculture systems employ low-carbon methods and practices that encourage carbon sequestration, urban agriculture can result in net reduced greenhouse gas emissions.<sup>76</sup> Another study suggests that the impact could be even greater if urban agriculture encourages

members and customers to walk or bike, both low-emissions transportation methods.<sup>77</sup>

Climate change stands to have broad impacts on a variety of systems and people in Cambridge. The City has been proactive in understanding local vulnerabilities and taking action in lessening impacts and preparing for changes. Where urban agriculture is credited with delivering a range of ecosystem services, the passage of Cambridge's policies could increase local resilience. As an example, expansion of green roofs or urban farms could increase assets for reducing and filtering stormwater runoff, and mitigating the heat island effect. Commenting on the declining bee population globally, one advocate also emphasized the importance of allowing beekeeping in Cambridge as part of efforts to bolster population health and because of the important role bees play in supporting biodiversity.

### *Physical and Mental Health*

Green spaces are important neighborhood assets that support recreation and leisure. Farming and gardening can encourage physical activity as well as encourage relaxation, promoting health. Important to emphasize, low-income neighborhoods often have fewer green spaces. The impact of this is often compounded by a lack of other services and resources. Research finds that such neighborhoods tend to benefit the most from improved availability and access to these kinds of environmental features.<sup>78</sup>

The passage of urban agriculture policies has the potential to increase opportunities for physical activity and improve mental

health. Mentioned previously, Cambridge residents describe these as benefits that they derive from the substantial open space features in the City. Particularly where urban agriculture activities take place in publicly accessible areas, whether part of a park system or at a school, the passage of the policies will likely increase the number of opportunities for people to engage in it, and as such increase opportunities for the mental and physical health benefits that come with it. Focus group members agreed that urban agriculture, including henkeeping, beekeeping and gardening provide opportunity for physical activity. They also mentioned the individual and community mental health benefits of engaging in urban agriculture, describing psychological and therapeutic benefits of tending to plants and animals, and the similar mental health benefits of feeling engaged in community activities.

### **Risk and Disease**

Along with its many benefits, urban agriculture can also increase exposure to hazards if preventative measures are not taken. Soil contaminated with heavy metals or toxic materials can pose risks in gardening as well as animal keeping. Air pollution can have negative health impacts, and problems can be worse where gardens or farms are close to busy transportation routes or other pollution sources. Further, producing and consuming food can increase the risk of food borne illnesses.<sup>79</sup> Many of these risks can be avoided where individuals take care in how food is produced, by following public health guidance, and where enforcement of public health regulations and thoughtful planning and siting help avoid these risks.

The primary purpose of Cambridge public health regulations and guidance is to prevent disease and promote public health. As such, the implementation of proposed urban agriculture policies will aim to mitigate possible negative health impacts. The finalized beekeeping public health regulations include measures to prevent human disease and injury. These regulations serve as an example of how the henkeeping and soil regulations will likely also be developed. The beekeeping regulations prescribe the siting and maintenance of bee operations, as well as the safe processing and sale of honey and honey products. In doing so, it seeks to mitigate perceived and real risk of bee stings and attracting nuisance, disease-carrying rodents or insects. Similarly, soil guidance is anticipated to emphasize using tested and imported soil to prevent soil-borne disease or poisoning; and the henkeeping regulations are expected to require practices that will prevent salmonella. Beyond the passage of the local urban agriculture policies, Massachusetts food safety; animal welfare; aquaculture and other regulations already in place will further prevent disease.

Focus group members were mostly enthusiastic about the positive benefits urban agriculture can deliver, still some noted the possibility of negative impacts. These concerns had mostly to do with the risks of increased exposure to soil that in a developed city such as Cambridge, can carry heavy metals and other toxic materials. This risk was mentioned as it relates to growing food, as well as keeping hens that scratch the soil. One participant also commented on potential exposure to pesticides or fertilizers. Throughout the process of developing the urban agriculture policy, residents have also discussed concerns about bee stings, urban agriculture activities attracting rodents, and associated

smells. In response, Cambridge staff and advocates have provided information to address misconceptions and described how best management practices and the passage of policies would avoid potential negative impacts.

## Key Findings

### *Factors that support improving environmental conditions.*

- **Urban agriculture can provide a range of ecosystem services that may increase local resilience to climate change.** Urban agriculture can encourage stormwater infiltration, improve air quality, and improve soil fertility, among other ecosystem services. These can deliver health benefits and increase resilience both in the short and long term. Cambridge's urban agriculture policies could support expansion of urban agriculture activities and in turn the ecosystem benefits they deliver.
- **Urban agriculture could support greater physical and mental health.** The passage of urban agriculture policies could provide residents with more opportunities to engage in urban agriculture and derive the physical and mental health benefits they deliver.
- **Urban agriculture policies mitigate negative health risks.** The proposed public health regulations and guidance of the urban agriculture policy seek to prevent disease and promote health. These, along with state regulations seek to proactively minimize health risks and promote health benefits associated with urban agriculture.

### *Factors that hinder improving environmental conditions.*

- **Some residents may face greater hurdles to benefiting from urban agriculture.** A majority of Cambridge residents rent their homes; because they are not the property owners there may be limitations or hurdles to engaging in urban agriculture at home. For many Cambridge residents, there is simply limited space to produce their own food at home. The City's system of community gardens is actively used, and the community gardening policies prioritize membership by those who otherwise don't have opportunities to garden.<sup>80</sup> Still the demand for community garden plots is greater than what is available.
- **Some residents will be impacted more by climate change.** Lower income residents, those with pre-existing health conditions, those isolated due to age, disability, language and other factors will be disparately impacted by climate change and related health conditions. Urban agriculture could have a role in decreasing vulnerabilities where it provides opportunities for residents to engage in physical activity and build relationship with neighbors, impacting health and social resilience.

## Recommendations

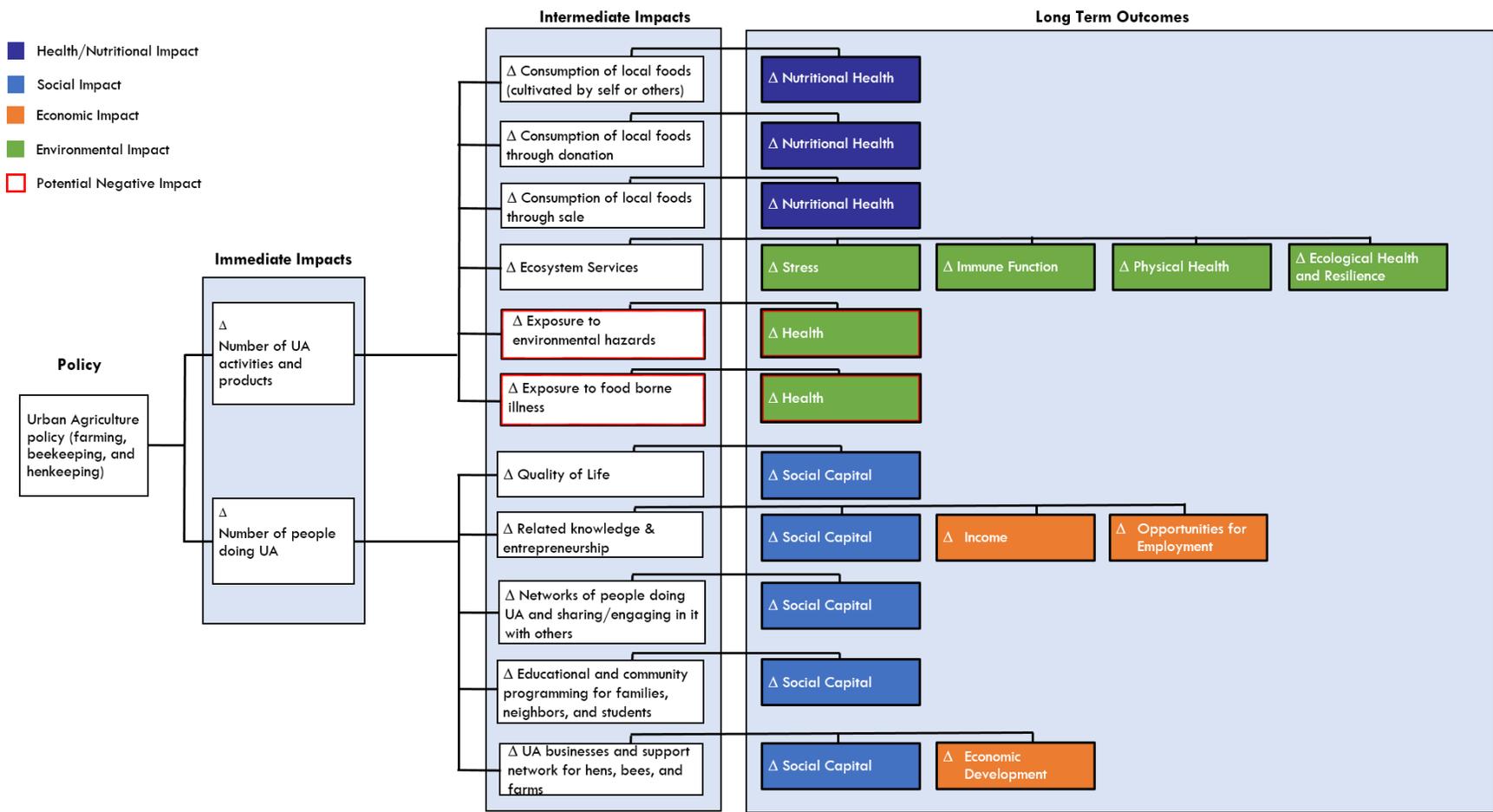
5. Mitigate potential negative environmental impacts of urban agriculture.
  - a. Reduce exposure to air pollution by allowing urban agriculture away from highways and other major air pollution sources.
  - b. Provide residents with guidance for safe gardening, beekeeping, and henkeeping.
6. Prioritize participation in urban agriculture by those with limited opportunities to do so.
  - a. Conduct an urban agriculture site suitability analysis to identify public and private land and rooftops that could be conducive to urban agriculture activities, and make the results publicly available. Use the results of this analysis to guide public investments in urban agriculture.
  - b. Coordinate with universities and other large property owners and explore opportunities for urban agriculture initiatives on their land, particularly those that allow for public access and participation.
  - c. Where possible, expand opportunities to engage in urban agriculture on public land. HLA Focus group members suggested this could be accomplished through public community farms.

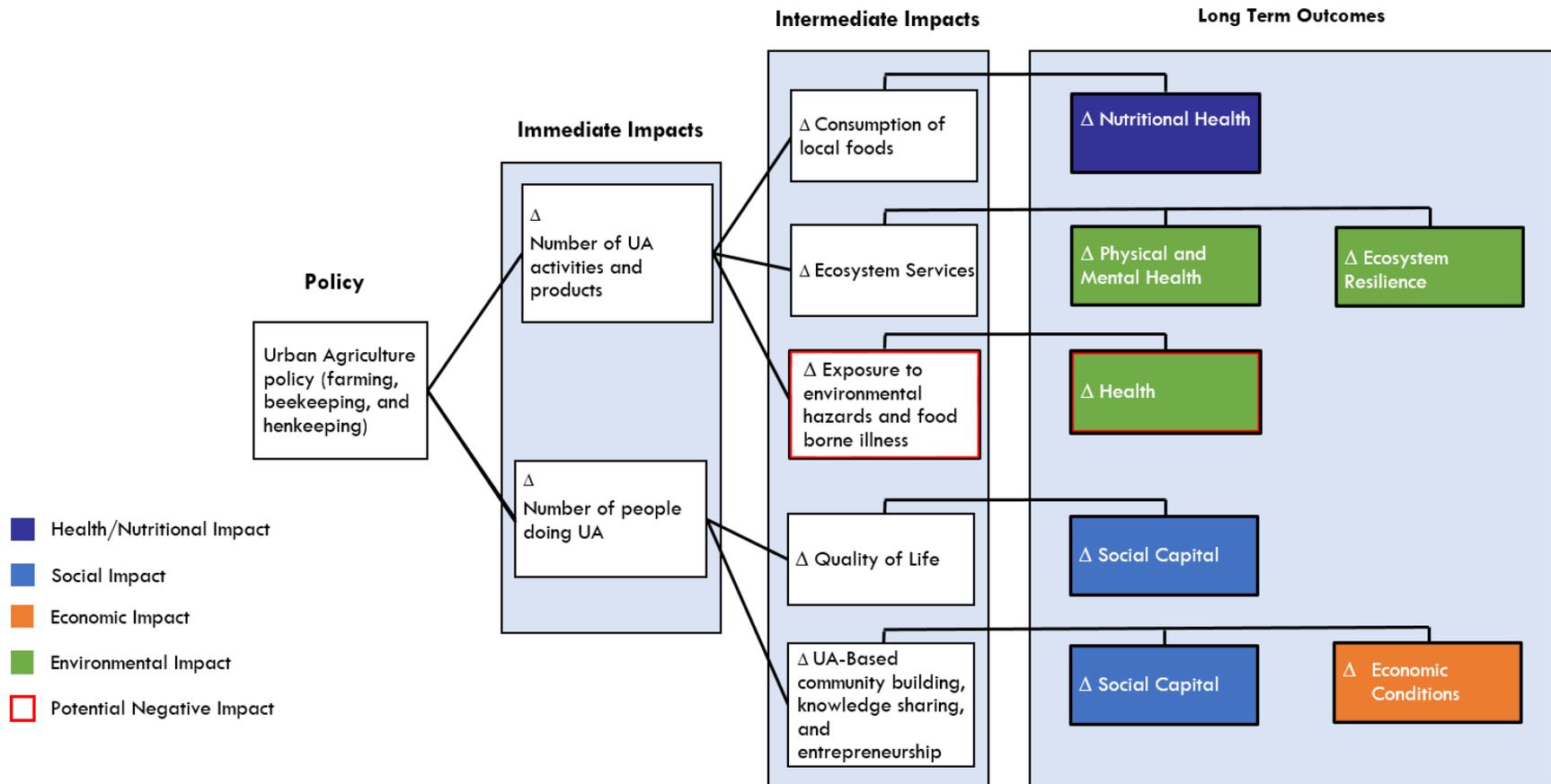
# Appendices

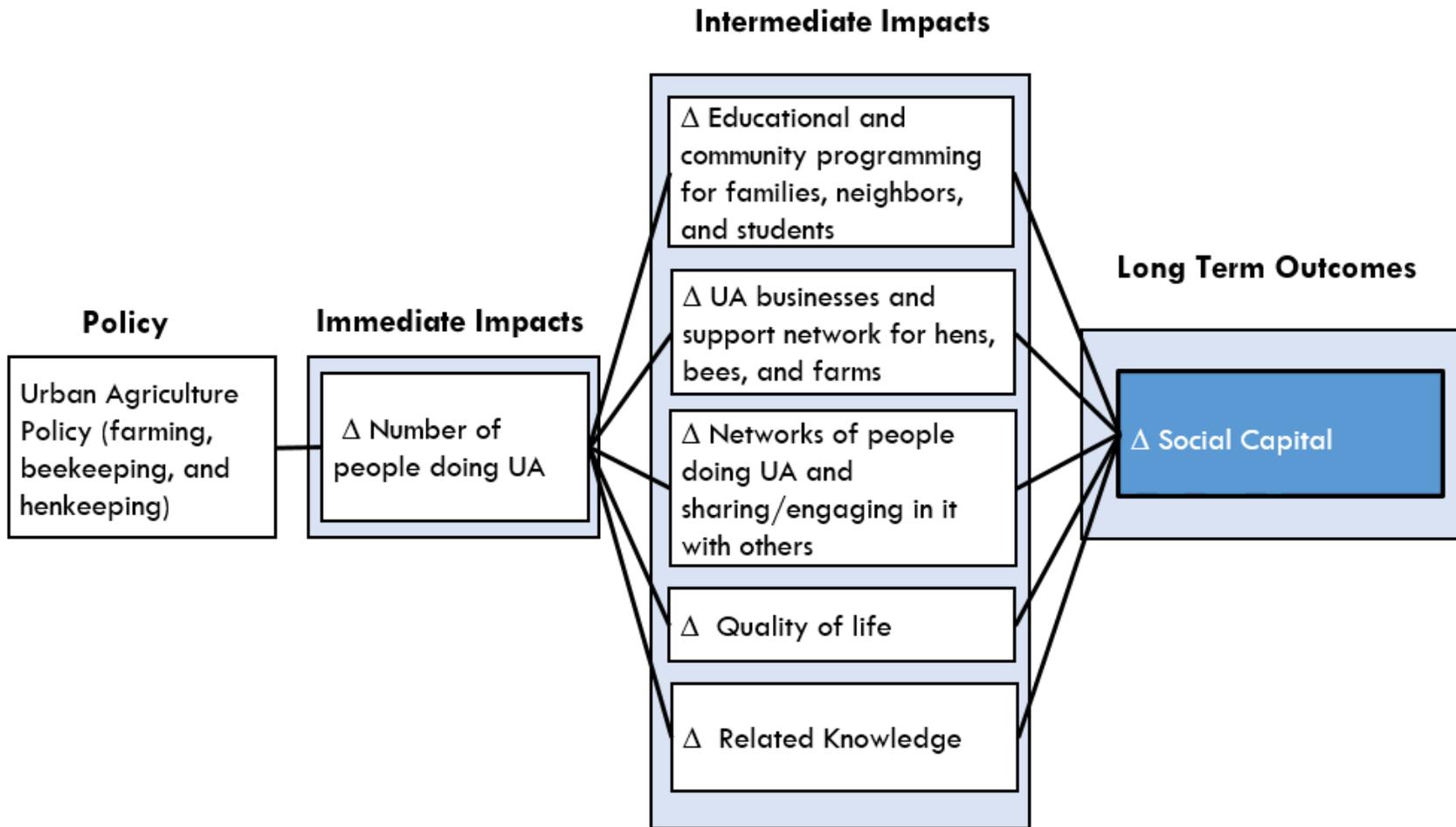
The appendices include larger versions of the pathways diagrams. The pathways diagrams files can be viewed or downloaded via this link. <https://mapc.sharefile.com/d-s2f36f4400c54af08>

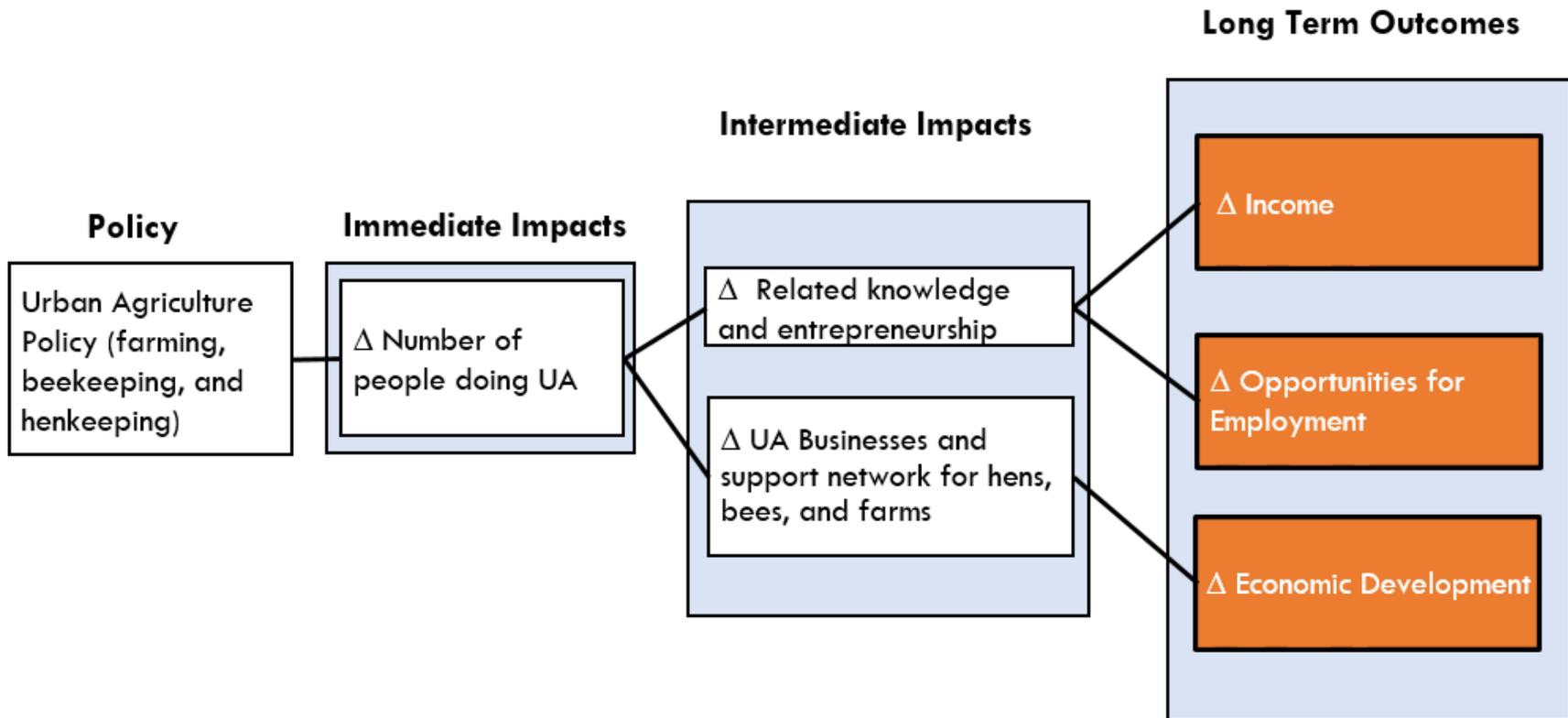
## Appendices

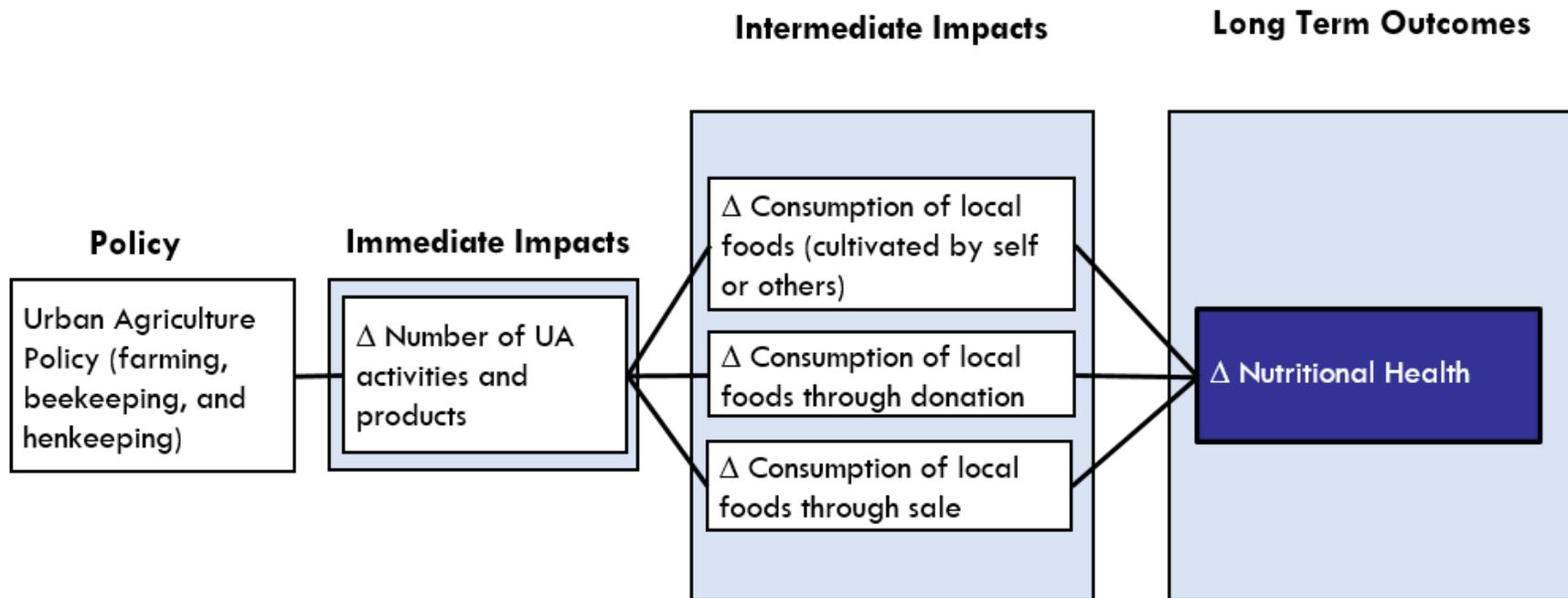
- A. Comprehensive Pathways Diagram
- B. Simplified, Comprehensive Pathways Diagram
- C. Social Impact Pathways Diagram
- D. Economic Impact Pathways Diagram
- E. Nutritional Impact Pathways Diagram
- F. Ecological Impact Pathways Diagram

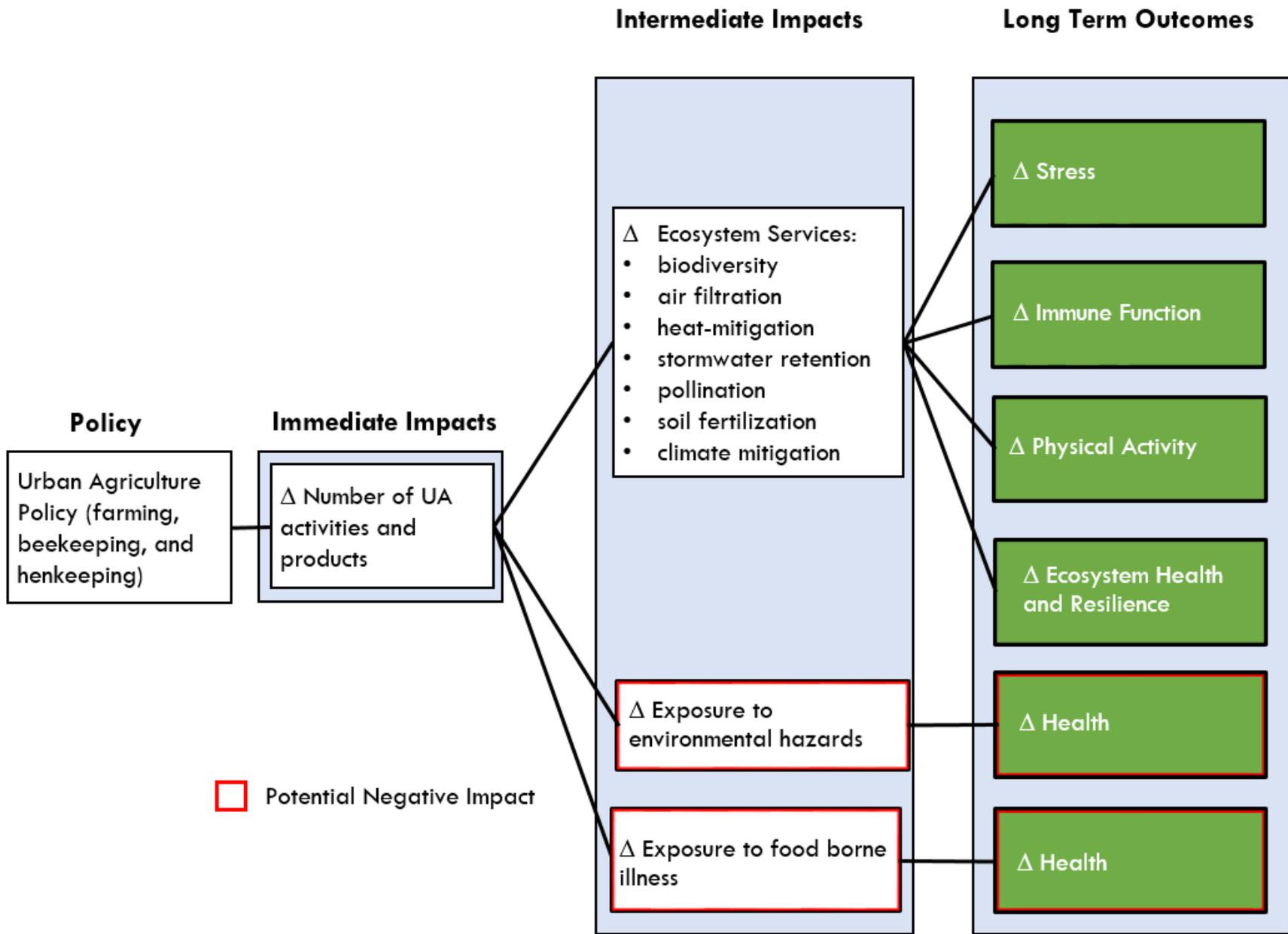












## References

- 1 City of Cambridge. 2015. "Community Garden Program Policy for City-Owned Property." Accessed January 6, 2019 from [https://www.cambridgema.gov/~media/Files/publicworksdepartment/conservationcommission/garden\\_policy2015.pdf](https://www.cambridgema.gov/~media/Files/publicworksdepartment/conservationcommission/garden_policy2015.pdf).
- 2 Cambridge Public Health Department. "Healthy Markets Program." Accessed January 6, 2019 from <http://www.cambridgepublichealth.org/lifestyle/Cambridge%20in%20Motion/healthy-market-program.php>.
- 3 Balonon-Rosen, Peter. 2015. "Behind the Scenes of Cambridge's School Lunch." Access from Learning Lab on January 6, 2019 from <http://learninglab.legacy.wbur.org/2015/03/16/behind-the-scenes-of-cambridges-school-lunch/>.
- 4 Cambridge Public Schools. "CitySprouts Gardens." Accessed January 6, 2019 from <https://www.cpsd.us/cms/one.aspx?pagelId=4797565>.
- 5 City of Cambridge. "Cambridge Zoning Ordinance, Article 4.30, Table of Use Regulations." Accessed January 6, 2019 from [https://www.cambridgema.gov/~media/Files/CDD/ZoningDevel/Ordinance/zo\\_article4\\_1397.ashx](https://www.cambridgema.gov/~media/Files/CDD/ZoningDevel/Ordinance/zo_article4_1397.ashx).
- 6 Government of South Australia. "Health Lens Analysis Projects." Accessed on January 6, 2019 from <https://www.sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/about+us/about+sa+health/health+in+all+policies/health+lens+analysis+projects/health+lens+analysis+projects>.
- 7 World Health Organization. "Constitution of WHO: Principles," definition of health. Accessed January 6, 2019 from <https://www.who.int/about/mission/en/>.
- 8 Robert Wood Johnson Foundation. "What Drives Health." Accessed January 6, 2019 from <http://www.commissiononhealth.org/WhatDrivesHealth.aspx>.
- 9 U.S. Census Bureau. American Community Survey, CS 2012-2016 5-Year estimates.
- 10 U.S. Census Bureau. 2010.
- 11 U.S. Census Bureau. American Community Survey, 2012-2016 5-Year estimates.
- 12 U.S. Census Bureau. American Community Survey, 2012-2016 5-Year estimates.
- 13 Chuang, et. al. 2013. "Social Cohesion Matters in Health." <https://doi.org/10.1186/1475-9276-12-87>.
- 14 Errickson, Malin. 2011. "Social Capital and Health – Implications for Health Promotion," *Global Health Action* 2011, 4: 5611 - DOI: 10.3402/gha.v4i0.5611.
- 15 TDC and the City of Cambridge. January 2017. "Cambridge Needs Assessment." Accessed on January 6, 2019 from <https://www.cambridgema.gov/CDD/Projects/Planning/~media/D6E35EF2822B411986DC72B6FEC9CD6B.ashx>.
- 16 TDC and the City of Cambridge. January 2017.
- 17 TDC and the City of Cambridge. January 2017.
- 18 TDC and the City of Cambridge. January 2017.
- 19 TDC and the City of Cambridge. January 2017.
- 20 Johns Hopkins Center for a Livable Future. May 2016. "Vacant Lots to Vibrant Plots: A review of the benefits and limitations of urban agriculture." Accessed on January 6, 2019 from [https://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-a-livable-future/\\_pdf/research/clf\\_reports/urban-ag-literature-review.pdf](https://www.jhsph.edu/research/centers-and-institutes/johns-hopkins-center-for-a-livable-future/_pdf/research/clf_reports/urban-ag-literature-review.pdf).
- 21 Golden, Shiela. 2013. "Urban Agriculture Impacts: Social, Health, and Economic: A Literature Review." [https://assets.jhsph.edu/clf/mod\\_clfResource/doc/UA%20Lit%20Review-%20Golden%20Reduced%2011-15.pdf](https://assets.jhsph.edu/clf/mod_clfResource/doc/UA%20Lit%20Review-%20Golden%20Reduced%2011-15.pdf).
- 22 Policy Link. 2012. "Growing Urban Agriculture: Equitable Strategies and Policies for Improving Access to Healthy Food and Revitalizing Communities." [https://assets.jhsph.edu/clf/mod\\_clfResource/doc/GrowingUrbanAg.pdf](https://assets.jhsph.edu/clf/mod_clfResource/doc/GrowingUrbanAg.pdf).
- 23 Johns Hopkins Center for a Livable Future. May 2016.

- 
- 24 Swain, Geoffrey. 2017. "How does economic and social disadvantage affect health?" Accessed on January 6, 2019 from University of Wisconsin-Madison website <https://www.irp.wisc.edu/publications/focus/pdfs/foc331a.pdf>.
  - 25 TDC and the City of Cambridge. January 2017.
  - 26 Census. American Community Survey, CS 2012-2016 5-Year estimates.
  - 27 U.S. Census Bureau. American Community Survey, CS 2012-2016 5-Year estimates.
  - 28 U.S. Census Bureau. American Community Survey, CS 2012-2016 5-Year estimates. Households receiving public assistance.
  - 29 TDC and the City of Cambridge. January 2017.
  - 30 U.S. Census Bureau, American Community Survey 5-Year Estimates, 2012-2016.
  - 31 TDC and the City of Cambridge. January 2017.
  - 32 TDC and the City of Cambridge. January 2017.
  - 33 Hodgson, K., Canton Campbell, M., & Bailkey, M. 2011. "Urban Agriculture: Growing healthy, sustainable places." Chicago, IL: American Planning Association Planning Advisory Service.
  - 34 Golden, Shiela. 2013. "Urban Agriculture Impacts: Social, Health, and Economic: A Literature Review." [https://assets.jhsph.edu/clf/mod\\_clfResource/doc/UA%20Lit%20Review-%20Golden%20Reduced%2011-15.pdf](https://assets.jhsph.edu/clf/mod_clfResource/doc/UA%20Lit%20Review-%20Golden%20Reduced%2011-15.pdf).
  - 35 Policy Link. 2012.
  - 36 Golden, Shiela. 2013.
  - 37 Golden, Shiela. 2013.
  - 38 Boston Medical Center. "Food Pantry Feeds One Million." Accessed on January 6, 2019 from <https://development.bmc.org/our-impact/stories/food-pantry-feeds-one-million/>
  - 39 Johns Hopkins Center for a Livable Future. May 2016.
  - 40 Johns Hopkins Center for a Livable Future. May 2016.
  - 41 Hodgson, K., Canton Campbell, M., & Bailkey, M. 2011.
  - 42 Golden, Shiela. 2013.
  - 43 Policy Link. 2012.
  - 44 Johns Hopkins Center for a Livable Future. May 2016.
  - 45 <https://www.foodsystemsjournal.org/index.php/fsj/article/download/509/483/>
  - 46 Johns Hopkins Center for a Livable Future, May 2016.
  - 47 Johns Hopkins Center for a Livable Future, May 2016.
  - 48 Feeding America and Greater Boston Food Bank. 2015. "Food Insecurity Estimates." MAPC received the data directly from Greater Boston Food Bank.
  - 49 Feeding America, 2015.
  - 50 Cambridge City Council. 2015. "Report of the Mayor's Blue Ribbon Commission on Income Insecurity in Cambridge. Accessed on January 6, 2019 from [http://www2.cambridgema.gov/CityOfCambridge\\_Content/documents/Income%20Insecurity%20Report%209.24.2015.pdf](http://www2.cambridgema.gov/CityOfCambridge_Content/documents/Income%20Insecurity%20Report%209.24.2015.pdf).
  - 51 Cambridge Community Development Department. 2016. "Cambridge Neighborhoods." Accessed on January 6, 2019 from [http://www.cambridgema.gov/~media/Files/CDD/Maps/Neighborhood/cddmap\\_neigh\\_index.pdf?la=en](http://www.cambridgema.gov/~media/Files/CDD/Maps/Neighborhood/cddmap_neigh_index.pdf?la=en).
  - 52 Feeding America. "Hunger Hits African American Communities Harder." Accessed on January 6, 2019 from <http://www.feedingamerica.org/assets/pdfs/fact-sheets/african-american-hunger-fact-sheet.pdf>.
  - 53 Health Resources in Action and Cambridge Public Health Department. 2014. "Cambridge Health Assessment." Accessed on January 6, 2019 from [http://www.cambridgepublichealth.org/publications/FinalCambridgeCHAreport\(2\).pdf](http://www.cambridgepublichealth.org/publications/FinalCambridgeCHAreport(2).pdf).
  - 54 Cambridge Public Health Department. 2013. "Cambridge Health Indicators." Accessed on January 6, 2019 from <https://www.cambridgepublichealth.org/publications/Cambridge-Health-Indicators-2013.pdf>.
  - 55 Health Resources in Action and Cambridge Public Health Department. 2014. "Cambridge Health Assessment." Accessed on January 6, 2019 from [http://www.cambridgepublichealth.org/publications/FinalCambridgeCHAreport\(2\).pdf](http://www.cambridgepublichealth.org/publications/FinalCambridgeCHAreport(2).pdf).

- 
- 56 Cambridge Public Health Department. 2009 – 2015. “Cambridge Youth Weight Surveillance, Grades K-8, 2009-2015.” Note: Students were classified based on BMI percentiles, with obese defined as BMI  $\geq$ 95th percentile.
- 57 Johns Hopkins Center for a Livable Future, May 2016.
- 58 Golden, Shiela. 2013.
- 59 Policy Link. 2012.
- 60 Johns Hopkins Center for a Livable Future, May 2016.
- 61 Johns Hopkins Center for a Livable Future, May 2016.
- 62 Hodgson, K., Canton Campbell, M., & Bailkey, M. 2011.
- 63 CitySprouts website. Accessed on January 6, 2019 from <http://citysprouts.org>
- 64 Johns Hopkins Center for a Livable Future, May 2016.
- 65 Millennium Ecosystem Assessment. 2005. “Ecosystem and Human Well-being Synthesis.” Island Press. Washington, D.C. Accessed on January 6, 2019 from <https://www.millenniumassessment.org/documents/document.356.aspx.pdf>.
- 66 Braubach M., Egorov A., Mudu P., Wolf T., Ward Thompson C., Martuzzi M. 2017. Effects of Urban Green Space on Environmental Health, Equity and Resilience. In: Kabisch N., Korn H., Stadler J., Bonn A. (eds) Nature-Based Solutions to Climate Change Adaptation in Urban Areas. Theory and Practice of Urban Sustainability Transitions. Springer, Cham [https://doi.org/10.1007/978-3-319-56091-5\\_11](https://doi.org/10.1007/978-3-319-56091-5_11).
- 67 Doherty, Kathleen. 2015. “Urban Agriculture and Ecosystem Services: A Typology and Toolkit for Planners.” Accessed on January 6, 2019 from [https://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1259&context=masters\\_theses\\_2](https://scholarworks.umass.edu/cgi/viewcontent.cgi?article=1259&context=masters_theses_2).
- 68 City of Cambridge. 2011. “Open Space and Recreation Plan 2009-2016.” Accessed on January 6, 2019 from [http://www.cambridgema.gov/~media/Files/CDD/ParksandOpenSpace/OSPlanning/OpenSpacePlan/osplan\\_2010\\_complete.pdf?la=en](http://www.cambridgema.gov/~media/Files/CDD/ParksandOpenSpace/OSPlanning/OpenSpacePlan/osplan_2010_complete.pdf?la=en).
- 69 TDC and the City of Cambridge. January 2017.
- 70 Cambridge Community Development Department. 2000. “Report of the Green Ribbon Open Space Committee.” Accessed on January 6, 2019 from [http://www.cambridgema.gov/~media/Files/CDD/ParksandOpenSpace/OSPlanning/GreenRibbon/grrib\\_complete.pdf?la=en](http://www.cambridgema.gov/~media/Files/CDD/ParksandOpenSpace/OSPlanning/GreenRibbon/grrib_complete.pdf?la=en).
- 71 Cambridge Community Development Department. 2010. “Public Open Space per 1000 Persons.” Accessed on January 6, 2019 from [http://www.cambridgema.gov/~media/Files/CDD/Maps/openspace/cddmap\\_open\\_space\\_per1000\\_2010.pdf?la=en](http://www.cambridgema.gov/~media/Files/CDD/Maps/openspace/cddmap_open_space_per1000_2010.pdf?la=en).
- 72 Kleinfelder and the City of Cambridge. 2015. “Climate Change Vulnerability Assessment: Public Health Assessment.” Accessed on January 6, 2019 from <http://www.cambridgema.gov/CDD/Projects/Climate/~media/190871A066004CEBA2198F83EDAF737E.ashx>.
- 73 Kleinfelder and the City of Cambridge. November 2015. “Cambridge Climate Vulnerability Assessment: Critical Assets and Community Resources.” Accessed on January 6, 2019 from <https://www.cambridgema.gov/CDD/Projects/Climate/~media/13E112045F904992B0953849E9846011.ashx>.
- 74 Johns Hopkins Center for a Livable Future, May 2016.
- 75 Johns Hopkins Center for a Livable Future, May 2016.
- 76 Conservation Law Foundation and CLF Ventures. 2012. “Growing Green: Measuring Benefits, Overcoming Barriers, and Nurturing Opportunities for Urban Agriculture in Boston. Accessed on January 6, 2019 from <https://www.clf.org/wp-content/uploads/2016/04/GrowingGreen.Report.July2012.pdf>.
- 77 Doherty, Kathleen. 2015.
- 78 Braubach M., Egorov A., Mudu P., Wolf T., Ward Thompson C., Martuzzi M. 2017.
- 79 Johns Hopkins Center for a Livable Future, May 2016.
- 80 City of Cambridge. 2015.