

Assessing the impact of community gardening on modifiable risk factors for non-communicable diseases in urban populations

by

Sheila Flores Abacan

B.S., University of the Philippines Los Baños, 2007
M.S., University of the Philippines Los Baños, 2013

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

School of Health Sciences
College of Health and Human Sciences

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2026

Abstract

This dissertation examines community gardening as a potential preventive strategy for non-communicable diseases among free-living adults in urban areas of the United States, using three methodologically distinct studies.

The first study synthesizes existing research on urban community gardening in the United States. Across diverse study designs, the evidence shows that participation in community gardens is consistently associated with healthier dietary patterns, particularly increased vegetable intake, greater engagement in light to moderate physical activity, and improved psychosocial well-being. Gardening also serves as a restorative practice that reduces stress and strengthens social connections, although evidence for short-term changes in body weight remains mixed.

The second study assesses physical health behaviors, health status, and non-communicable disease prevalence among adult community gardeners in urban Kansas. The findings indicate that gardeners have higher physical activity levels, lower obesity prevalence, and fewer chronic conditions compared to national averages. While favorable health outcomes were strongly influenced by sociodemographic factors such as age and education, moderate participation in community gardening emerged as a uniquely protective factor against non-communicable diseases.

The third study explores the lived experiences of community gardeners in a small urban setting using a qualitative approach. Participants described how gardening evolved from a practical activity into a deeply meaningful lifestyle practice that supports healthy eating, routine physical movement, stress reduction, and social connection. Gardening was perceived not as formal exercise, but as functional movement integrated into daily life, particularly valued by older adults.

Together, these studies demonstrate that community gardening supports multiple modifiable risk factors for non-communicable diseases by integrating nutrition, physical activity, and psychosocial well-being within urban living.

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Approved by:

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Chapter 1 - Introduction

1.1 Non-communicable diseases (NCDs) and urbanization

Non-communicable diseases or chronic diseases refer to a group of conditions that are not mainly caused by an acute infection, resulting in long-term health consequences such as cancer, cardiovascular disease, diabetes, and chronic lung illnesses. Each year, 5.5 million people in the Americas die from NCDs, and 2.2 million of these people are between the ages of 30 and 69 years (Pan American Health Organization, n.d.). Globally, cardiovascular diseases account for most NCD deaths, or at least 19 million deaths in 2021, followed by cancers, chronic respiratory diseases, and diabetes, which recorded to be over 2 million, including kidney disease deaths caused by diabetes (World Health Organization, 2024). Moreover, as projected, ischemic heart diseases, stroke, and diabetes will be the top three leading causes of disease burden by 2050 (Institute for Health Metrics and Evaluation, 2024).

Ischemic heart disease is said to be influenced by the characteristics of the built environment in urban areas. According to Malambo et al. (2016), factors like residential density, traffic safety, the availability of recreational spaces, and street connectivity were regularly linked to physical activity levels and body mass index. Moreover, high-traffic areas and living near major roads (defined as proximity to busy, heavily trafficked streets) were found to increase the risk of developing coronary heart disease. In a socio-epidemiological perspective, Patil and others (2014) stated that urbanization led to shifts in dietary patterns and physical activity, raising the likelihood of obesity. Obesity has a profound impact on mortality rates. In 2016, excess body weight contributed to over

1,300 additional deaths daily, or nearly 500,000 deaths annually, and caused a reduction in life expectancy by about 2.4 years, surpassing the mortality rate attributed to smoking (Ward et al., 2022). Furthermore, obesity combined with a sedentary lifestyle is strongly associated with the rise of diabetes, especially in cities that lack adequate walking, cycling, and public transportation infrastructure. Urbanization has also been linked to higher levels of mental health disorders, such as depression and anxiety (World Health Organization, 2025).

Currently, the U.S. Census Bureau defines an urban area as a geographic area that encompasses at least 5,000 people or at least 2,000 housing units (U.S. Census Bureau, n.d.). Following the 2020 Census, the Bureau no longer distinguishes between different types of urban areas; however, cities are commonly categorized into large, midsize, and small based on population size and their designation as principal cities within urbanized areas. According to the National Center for Education Statistics (NCES), large cities are territories located within urbanized areas and designated as principal cities with populations of 250,000 or more. Midsize cities are principal cities within urbanized areas with populations ranging from 100,000 to 249,999, while small cities are principal cities within urbanized areas with populations below 100,000 (NCES, n.d.).

1.2 Importance of urban agriculture (UA) to public health

Urban agriculture has become an increasingly important tool for enhancing public health in cities. Urban agriculture broadly includes the production, processing, and distribution of food within urban, suburban, and peri-urban areas for a variety of

purposes, including commercial, educational, and non-profit goals (Papanek et al., 2023). Community gardens, as a central component of urban agriculture, serve as spaces where individuals in a neighborhood come together to grow food collectively. These gardens not only promote sustainable food practices but also offer a range of health benefits that impact individuals' nutrition, physical well-being, and social connections within urban environments.

One of the primary advantages of community gardening is its ability to improve food security and nutrition. Research has shown that participating in urban gardens leads to increased consumption of fruits and vegetables, which are key to maintaining a healthy diet and preventing chronic diseases (Audate et al., 2018). Some studies indicate that individuals who engage in community gardening tend to eat more fruits and vegetables than those who do not participate (Barnidge et al., 2013; Alaimo et al., 2008) while a more recent study reported that community gardening enhanced vegetable consumption by promoting the inclusion of more seasonal produce in the diet (Alaimo, 2023). This dietary improvement is especially important in urban areas, where access to fresh, nutritious food may be limited. Furthermore, urban gardens have been linked to better food security outcomes, particularly for urban farmers and families, as they increase access to fresh produce and contribute to more diverse diets (Audate et al., 2018).

Beyond improving nutrition, community gardening also contributes to physical health by encouraging active lifestyles. Gardening activities promote physical movement, such as digging, planting, and harvesting, which help prevent obesity and other non-communicable diseases (Kunpeuk et al., 2020). Regular involvement in gardening has been shown to reduce body mass index (BMI), a key measure of obesity, which is

associated with a variety of health problems. Additionally, gardening has psychological benefits, including stress reduction and improved mood, which are particularly valuable in urban settings where residents may face higher levels of stress and mental health challenges (Gregis et al., 2021). Thus, community gardens not only encourage healthier eating but also foster physical activity and support mental well-being.

Community gardens also play a significant role in strengthening social ties and building community resilience. By bringing together people from different backgrounds, these gardens facilitate intergenerational interactions and help reduce social isolation (Lawson, 2005). In urban areas, where residents may often feel disconnected, community gardens offer an opportunity to foster meaningful relationships and create a sense of belonging. In addition to their social benefits, these gardens help raise awareness about environmental sustainability and biodiversity, encouraging urban dwellers to connect with nature and adopt more sustainable practices (Lawson, 2005).

1.3 Community Garden

Community gardening is a key aspect of urban agriculture, where residents work together to cultivate shared plots for local food production. These gardens are defined as areas “collectively managed for the purpose of growing fruits, vegetables, and herbs for personal use” (Egli et al., 2016). Community gardens first emerged in the early 20th century and gained renewed importance during the World Wars as a response to food shortages. In recent years, they have expanded their role to support cultural traditions among immigrants, promote sustainability, and improve personal and family health. Additionally, they offer accessible sources of fresh produce for populations facing health

disparities, who often lack access to grocery stores or farmers' markets due to financial and transportation constraints. Located within neighborhoods and on public land, these gardens serve as inclusive spaces for underserved communities (The Trust for Public Land, 2001).

Community gardens in the United States are not a monolithic entity; rather, they are highly adaptable forms of social infrastructure that evolve to meet the specific spatial, socioeconomic, and public health needs of a given area (Firth et al., 2011). Historically, this movement shares roots with the allotment garden model, a typology widely used in Europe and parts of North America, where larger tracts of land are leased to individuals or families primarily for intensive staple food production (Kwartnik-Pruc & Droj, 2023). As this concept adapted to modern, space-constrained American cities, it evolved into what are now known as neighborhood gardens. These are typically located on vacant public or private lots and subdivided into smaller individual plots rented for a nominal fee, allowing residents to grow food for personal use. In highly dense urban areas, this model further adapts into residential gardens that are integrated directly into apartment complexes, assisted living facilities, or affordable housing units. A defining characteristic of these residential gardens is their exclusivity; whether they feature individual or communal plots, access is strictly reserved for the people who live in that specific building or complex to provide immediate, safe food-growing spaces right outside their doors (Bauermeister et al., 2013).

Beyond individual and household use, urban agriculture often extends to broader social and public health purposes. Institutional gardens, managed by hospitals, churches, or government agencies, are frequently incorporated into social service programs to support rehabilitation, employment training, and safe spaces for vulnerable populations.

School gardens rely on collaboration between faculty, parents, and community volunteers to turn schoolyards into hands-on learning environments focused on nutrition and natural sciences. Demonstration gardens, often developed through university extension networks or Master Gardener programs, function as living classrooms that offer workshops on sustainable horticulture and native plant care (Bauermeister et al., 2013)..

More recently, donation gardens, also known as giving gardens, have expanded this landscape. Unlike personal-use plots, these spaces are designed to connect directly with local emergency food systems. Guided by a food justice framework, they are collectively cultivated by volunteers to produce fresh, nutrient-dense food for distribution to food pantries, soup kitchens, and food banks, helping address gaps in emergency food supplies (Dankbar et al., 2017).

In practice, these classifications often overlap. Modern urban agriculture frequently involves hybrid models that combine multiple functions to increase community benefit (Bauermeister et al., 2013). For example, a neighborhood garden may dedicate part of its space to a communal donation plot, showing how these systems adapt to meet diverse and overlapping community needs (Guitart et al., 2012).

1.4 Research Objectives

The goal of this dissertation is to examine the role of community gardening in the prevention and reduction of risk for non-communicable diseases among urban adults by assessing its impact on physical health behaviors, health status, and psychosocial well-being. This goal is addressed through three component projects:

- Project 1 synthesizes existing literature to examine the evidence on how participation in community gardening influences modifiable risk factors for chronic disease, physical health outcomes, and psychosocial well-being among adults. This review draws primarily from studies conducted in urban settings across the United States.
- Project 2 evaluates physical health behaviors and health status among a sample of urban community gardeners in Kansas, providing empirical evidence on lifestyle-related health indicators within a regional context.
- Project 3 explores gardeners' perceptions of the health benefits of participating in a community garden in a small urban setting, as well as their motivations for participation, using a qualitative approach to capture lived experiences and meanings associated with gardening.

Together, these projects provide a comprehensive assessment of community gardening as a potential public health strategy by integrating existing evidence, localized quantitative health data, and qualitative perspectives within small city context.

1.5 Outline

This dissertation is organized into five chapters. Following this introduction, **Chapter 2** provides a narrative synthesis of the literature, investigating the impact of community gardening on modifiable chronic disease risk factors and psychosocial well-being among U.S. adults. **Chapter 3** transitions to primary empirical research, evaluating the health behaviors and status of community gardeners in cities of Kansas to situating national documented health benefits of this urban space within a Midwest state context. **Chapter 4** utilizes a qualitative methodology to interpret gardeners' motivations and perceived health benefits, centering the lived experiences of participants in a small urban environment. The dissertation concludes with **Chapter 5**, which synthesizes the overarching contributions to the body of knowledge and reflects on the practical and scholarly implications of the research.

Chapter 2 - Health Impacts of Community Garden Participation Among Free-Living Urban Adults in the United States: A Narrative Review

2.1 Introduction

2.1.1 Urbanization, Chronic Disease, and the Role of Urban Community Gardens

Non-communicable diseases (NCDs) such as cardiovascular disease, cancer, diabetes, and chronic respiratory illnesses are major contributors to global mortality and long-term disability. In the Americas, NCDs are responsible for an estimated 5.5 million deaths annually, including 2.2 million occurring prematurely among adults aged 30–69 (Pan American Health Organization, n.d.). Globally, cardiovascular diseases remain the leading cause of NCD mortality, accounting for over 19 million deaths in 2021, followed by cancers, chronic respiratory diseases, and diabetes-related conditions (World Health Organization, 2024). In the United States, federal surveillance shows that 41.9% of adults met criteria for obesity in 2017–March 2020, with over 100 million adults affected and severe obesity rising to 9.2% during the same period. Obesity contributes significantly to hypertension, diabetes, and cardiovascular disease, and imposes nearly \$173 billion in direct annual medical costs. Furthermore, national adult obesity prevalence maps show that, as of 2024, all U.S. states and territories reported obesity prevalence of 25% or higher, with Kansas reporting 37.6% which higher than U.S. median prevalence rate

Centers for Disease Control and Prevention (2024). These data underscore the growing burden of NCD risk factors among U.S. adults.

Urbanization exacerbates many of these chronic disease risks by shaping environmental exposures and everyday behaviors. Characteristics of the built environment, such as residential density, high traffic exposure, lack of recreational spaces, and poor street connectivity, are strongly associated with physical inactivity, higher BMI, and increased cardiometabolic risk (Malambo et al., 2016). These modern disparities stem directly from historical redlining, which refers to discriminatory 1930s housing policies that systematically denied investment to minority neighborhoods. Decades of this structural disinvestment have left historically redlined communities with worse infrastructure, disproportionate pollution exposure, and a severe lack of access to fresh, healthy food sources. This systemic creation of urban “food deserts” forces reliance on nutrient-poor, ultra-processed foods, which serves as a major driver of the high prevalence of non-communicable diseases (NCDs), including obesity, type 2 diabetes, and cardiovascular disease (Shaker et al., 2023). Together, these compounded environmental and nutritional barriers drive contemporary inequities in cardiometabolic health (Motairek et al., 2022). National initiatives such as the CDC’s Active People, Healthy Nation report that as of 2024, fewer than half of U.S. adults meet aerobic physical activity guidelines, and over one-quarter of adults are reported inactive (Centers for Disease Control and Prevention, 2024). Healthy People 2030 identifies neighborhood conditions, such as access to safe parks, greenspace, and active transportation routes, as key determinants of physical and mental well-being. It also notes that many U.S. communities face heightened exposure to environmental and safety risks (Office of

Disease Prevention and Health Promotion, n.d.). These structural environments contribute to rising rates of obesity, diabetes, and mental health disorders, particularly in dense urban areas (Patil et al., 2014; WHO, 2025).

Urban classification in the United States provides additional context for community health planning. The U.S. Census Bureau currently defines an urban area as containing “at least 5,000 people or 2,000 housing units” (U.S. Census Bureau, n.d.). City size is often described using National Center for Education Statistics (NCES) categories, which classify large cities as principal cities with populations of 250,000 or greater, midsize cities as those with 100,000–249,999 residents, and small cities as those below 100,000.

In response to the health challenges associated with urbanization, urban agriculture (UA) has emerged as a promising strategy for improving diet, reducing chronic disease risk, and strengthening community resilience. The USDA’s Office of Urban Agriculture and Innovative Production (OUAIP), which was created through the 2018 Farm Bill, supports the growth of community gardens, rooftop farms, indoor and vertical farming systems, and other innovative methods of food production. According to the USDA, urban agriculture contributes to local access to nutritious foods, expands greenspace, supports economic development, and strengthens community connection and resilience (U.S. Department of Agriculture, 2022).

Community gardens represent one of the most accessible and widely adopted forms of UA. These shared spaces provide opportunities for residents to grow food collectively while supporting a range of health-promoting outcomes. Participation in

community gardening has consistently been linked to increased fruit and vegetable consumption, improved dietary diversity, and enhanced food security, particularly in neighborhoods with limited access to fresh produce (Audate et al., 2018; Barnidge et al., 2013; Alaimo et al., 2008).

Beyond dietary benefits, community gardening fosters regular physical activity through tasks such as digging, planting, and harvesting, which support healthier body weight and reduce the risk of NCDs (Kunpeuk et al., 2020). Gardening activities also contribute to improved psychological well-being by reducing stress, enhancing mood, and providing restorative contact with natural environments, which is an increasingly important function in dense urban settings where mental health burdens are elevated (Gregis et al., 2021). Community gardens additionally strengthen social connectedness by facilitating relationship-building, intergenerational interactions, and a sense of belonging among diverse participants (Lawson, 2005). Combining the said benefits of improving nutrition, greater physical activity, mental health, and social cohesion, community gardens represent a multifaceted urban-health asset capable of promoting well-being in urban populations.

2.1.2 Statement and Significance of the Research Problem

Several studies have documented a range of potential health benefits associated with community gardening across physical, social, and mental health domains. However, existing reviews often merge studies from varied contexts, including international settings, mixed rural-urban areas, and mixed-age samples, which makes it difficult to isolate the unique impacts of community garden participation among urban, free-living

adults in the United States. This gap is particularly important because urban areas possess distinct characteristics such as high land values, dense development patterns, limited access to greenspace, and competing demands for available land. These factors shape both the availability and functionality of community gardens. Moreover, adults are the primary users of community gardens, underscoring the importance of understanding how participation influences their health and well-being within these resource-constrained urban environments. This need is further amplified by the rising prevalence of obesity and major NCDs among adults, driven by sedentary lifestyles, limited access to fresh produce, psychosocial stressors, and environmental barriers that are especially pronounced in urban settings. As a result, there is a growing call for effective, community-based health promotion programs tailored to adults, who bear a substantial share of the NCD burden. Community gardens may serve as accessible, low-cost health-promoting environments that align well with the needs of adults living in urban areas. Their potential benefits include increasing physical activity, improving dietary quality, reducing stress, and strengthening social networks.

Addressing this gap is significant for advancing research, practice, and policy. By synthesizing evidence specific to U.S. urban adults, this narrative review will clarify the extent and nature of the health benefits associated with community garden participation in settings where land scarcity and urban pressures shape gardening experiences. Such context-specific insight can guide urban planning strategies, inform public health and community-based interventions, and support initiatives aiming to utilize community gardens as tools for improving overall well-being and reducing chronic disease risk in U.S. cities.

2.1.3 Review Objective

The purpose of this review was to document the current scientific evidence on the health impacts of community garden participation among urban, free-living adults in the United States, with the goal of understanding its potential role as a community-based health promotion strategy for addressing the growing burden of noncommunicable diseases in this population.

This review sought to answer the following questions:

1. Does participation in community gardening in U.S. cities lead to increased fruit and vegetable intake and higher levels of physical activity?
2. Does participation in community gardening in U.S. cities lead to improved health and health-related outcomes?

2.2 Methodology

2.2.1 Literature search

A broad literature search was conducted from November 2025 to January 2026. The goal was to identify original articles that examined health and physical health behaviors in relation to urban community gardening, published between January 2000 and December 2025. Searches were performed in PubMed/MEDLINE (<https://www.ncbi.nlm.nih.gov/pubmed/>) and Web of Science

(<https://www.webofscience.com/wos/woscc/basic-search>), and additional articles were identified by reviewing the reference lists of relevant publications. Search terms were used in various combinations and included: community garden, urban garden, United States, fruit intake, vegetable intake, diet, physical activity, health, wellbeing, nutrition, obesity, and adult. In addition to database search, a snowball sampling strategy was used to identify additional relevant studies cited in earlier reviews. Only original English-language peer-reviewed research articles were included; review papers, reports, and student dissertations were excluded.

2.2.2 Eligibility criteria

Titles and abstracts were screened to determine relevance, and full texts of potentially eligible studies were retrieved. Studies were included if they:

1. Population: Involved individual, non-institutionalized adults (≥ 18 years old) participating in community garden in an urban area of the United States.
2. Setting: Were conducted in urban areas, either explicitly described as urban in the published article or classifiable as urban based on U.S. Census Bureau criteria.
3. Time Frame: Were published between January 2000 and December 2025.
4. Exposure:
 - a. Examined participation in community gardens, defined as any piece of land cultivated collectively through individual or shared plots on public or private urban land.

- b. Hospital- or health-affiliated community gardens were included if they functioned as community-accessible garden spaces.
- 5. Outcomes: Qualitatively or quantitatively assessed nutrition or health-related outcomes, such as fruit and vegetable intake, physical activity, obesity or anthropometric measures, or indicators of physical or mental health.

Studies were excluded if they:

- 1. Population: Focused on
 - a. institutionalized adults (e.g., veterans in treatment programs, older adults in senior housing, hospitalized patients in gardening programs; university students in an experimental community garden group),
 - b. adults with specific diagnosed health conditions as the target sample (e.g., developmental disabilities, diabetes, American Indian/Alaska Native adults receiving mental health treatment)
 - c. garden program coordinator provided the data and not the gardeners themselves; or
 - d. household-level data where outcomes could not be attributed to the individual gardener.
- 2. Setting:
 - a. Were conducted in non-urban areas or outside the United States, or
 - b. Provided insufficient geographic specificity (e.g., “southwestern Alabama,” “eastern North Carolina”).
- 3. Time Frame: Were published before January 2000 or after December 2025.

4. Exposure Setting: Examined gardening in non-community garden contexts, meaning settings that provide exclusive, restricted, or non-collective access rather than shared, community-accessible spaces. These include demonstration gardens, school gardens, or institutional gardens (e.g., prisons, hospitals) that do not operate as open community garden spaces.
5. Intervention Type: Focused on home gardening, therapeutic gardening, or multicomponent interventions in which the effects of community gardening could not be isolated.

2.2.3 Article search and selection process

Figure 2.1 presents the flow of study identification, screening, and selection based on the predefined inclusion and exclusion criteria. The database search yielded 430 records, including 290 from PubMed and 140 from Web of Science. Following title and abstract screening, 43 articles were retained for full-text review, and 7 duplicate records were removed. Of the 37 full-text articles assessed for eligibility, 7 met the inclusion criteria. An additional 7 studies were identified through manual hand-searching, resulting in a total of 14 studies included in this review.

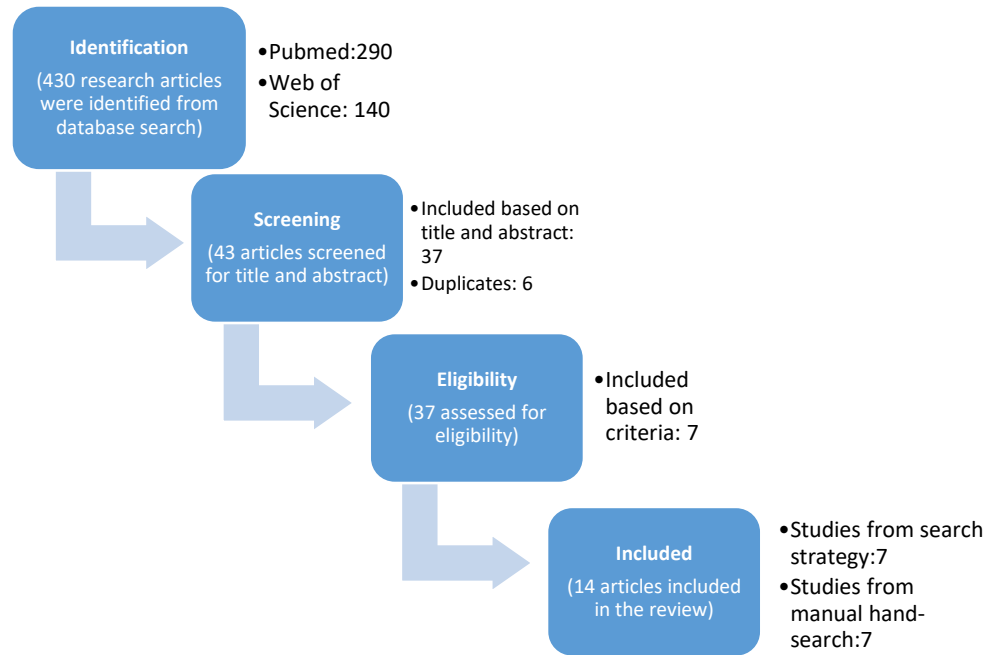


Figure 2.1. Flowchart of records identified, screened, assessed for eligibility, and included

2.3 Results

2.3.1 Description and summary of included studies

A total of 14 studies were included in this review (Table 2.1). Across these 14 studies from U.S. cities published from 2000–2025, researchers used qualitative, mixed-method, cross-sectional, quasi-experimental, and randomized controlled trial designs to examine the effects of community gardening to health and health-related outcomes such as social and psychological benefits, fruit and vegetable intake, physical health outcomes like BMI and general health. Samples ranged from small qualitative groups to trials with over 200 participants, and participants typically skewed female, middle-aged, and White. Regionally, studies conducted in urban areas were concentrated in the Western United States, particularly in Denver and Aurora. Additional studies were conducted in Washington, Utah, California, Missouri, Illinois, New York City, Philadelphia, and in a multi-city national sample. Taken together, these studies show growing methodological rigor and increasing attention to equity-focused program design.

2.3.1.1 Study designs

The reviewed studies employed a diverse range of methodological approaches, reflecting the evolving sophistication of community-garden research over 25 years. Qualitative designs were prominent in early and mid-period studies, including interviews (Teig et al., 2009; Alaimo et al., 2024), observational work (Althaus Ottman et al., 2010), and longitudinal qualitative tracking (Sonti & Svendsen, 2018). Cross-sectional surveys were also common (Johnson & Smith, 2006; Litt et al., 2011; Wong et al., 2018), often used to examine associations between gardening and nutrition or environmental concerns.

Mixed-method designs combining surveys and interviews appeared in several studies (Hannah & Oh, 2000; Algert et al., 2016; Delshad, 2022). In 2013, one quasi-experimental post-test comparison (Zick et al., 2013) analyzed BMI outcomes among gardeners versus multiple matched controls. More rigorous experimental design emerged after 2020, with one major randomized controlled trial (Alaimo et al., 2023; Litt et al., 2023) testing the causal impact of gardening on diet, activity, and health. Additionally, the most recent feasibility study (Canton et al., 2025) evaluated a culturally tailored gardening program for Black women as how would it affect physical activity, fruit and vegetable intake, and some measures of psychological health.

2.3.1.2 Study locations

The studies on urban community garden and its health impacts collectively span all major U.S. regions, but representation is uneven. The West is the most heavily represented, with multiple studies in Colorado (Denver, Aurora) across qualitative, cross-sectional, mixed-method, and RCT designs, as well as studies in California (San Jose), Washington (Moses Lake), and Utah (Salt Lake City). The Midwest includes work from Illinois (Champaign) and Missouri (St. Louis), reflecting growing interest in culturally tailored and environmental-justice topics. The Northeast is represented primarily through a couple of New York City studies (Althaus Ottman et al., 2010; Sonti & Svendsen, 2018), focusing on community well-being and long-term motivations. The Mid-Atlantic includes one early study from Philadelphia. Delshad (2022) provided the broadest urban national context, with interview participants from 10 U.S. cities such as Philadelphia, PA; Detroit, MI; Chicago, IL; St. Louis, MO; Atlanta, GA; Dallas, TX; Denver, CO; Salt Lake City, UT; Portland, OR; and Los Angeles, CA. Overall, regional

trends suggest that Western urban centers, especially Denver, have become major spot for rigorous garden-based health research, while newer work in the Midwest reflects increasing investment in equity-focused interventions.

2.3.1.3 Study aims

Although all included studies examined health impacts as a major or minor aim, their specific research aims can be clustered into four major themes. Many studies sought to understand the social, psychological, and community-level benefits of gardening (Hannah & Oh, 2000; Teig et al., 2009; Althaus Ottman et al., 2010; Sonti & Svendsen, 2018; Alaimo et al., 2024). Others focused on nutrition-related outcomes, such as fruit and vegetable intake, dietary behaviors, or evaluations of nutrition programs (Johnson & Smith, 2006; Litt et al., 2011; Algert et al., 2016; Alaimo et al., 2023). A third group examined physical health and environmental concerns, including BMI (Zick et al., 2013), soil contamination (Wong et al., 2018), and broader health-risk reduction (Litt et al., 2023). More recent work added policy- and equity-oriented aims, evaluating the wider social, political, and environmental contributions of community gardens (Delshad, 2022) and testing culturally tailored gardening interventions for African American women (Canton et al., 2025).

2.3.1.4 Interventions

For the experimental studies included, interventions varied in intensity, structure, and intentionality. The RCT reported in Alaimo et al. (2023) and Litt et al. (2023) implemented a comprehensive gardening intervention that provided participants with access to a community garden plot, plants and seeds, and in some cases a formal

gardening class, alongside random assignment to immediate gardening versus a waitlist control. In contrast, Zick et al. (2013) used a quasi-experimental design in which naturally occurring participation in community gardening served as the exposure, without delivering any structured program. The feasibility study by Canton et al. (2025) offered tailored and intensive programming, delivering an 8-week culturally specific gardening and nutrition education curriculum with 15 guided sessions for African American women. Collectively, these studies illustrate a spectrum of gardening interventions, ranging from naturally occurring participation to structured, multisession programs designed to support skill-building and health behavior change.

2.3.1.5 Sample size and characteristics

Sample sizes and demographic compositions varied widely. Smaller qualitative studies typically included 20–90 participants, often without full demographic profiles (e.g., Althaus Ottman et al., 2010). Cross-sectional surveys ranged from 41 to 436 participants, frequently majority female and White, with mean ages in the mid-40s to early-50s (Litt et al., 2011; Wong et al., 2018). Mixed-method studies often included diverse adult samples but still skewed toward higher education and income levels (Algert et al., 2016; Delshad, 2022). Experimental studies enrolled 243–291 participants, predominantly female (80–82%), with only about one-third identifying as Hispanic and approximately two-thirds holding a college degree. One study (Canton et al., 2025) deliberately targeted a specific demographic which are the midlife African American women with high BMI, highlighting emerging attention to equity in intervention research.

Table 2.1. Summary of study designs, locations, and sample characteristics

First Author, Year	Study Location	Study Design	Study Aims	Intervention	Sample Size & Key Characteristics
1. Hannah & Oh, 2000	West Philadelphia	Case study (mixed-method)	Examine benefits of gardening for inner-city communities	–	n=69 (survey); n=44 (interviews)
2. Johnson & Smith, 2006	Moses Lake, Washington	Cross-sectional survey	Evaluate Washington State Nutrition & Physical Activity Plan using gardening	–	n=41 across two years (29 in year 1; 12 in year 2)
3. Teig et al., 2009	Denver, Colorado	Qualitative interviews (group + individual)	Explore social processes linking gardens, participation, and health	–	n=67; those reporting demographics (n=47): mean age 46.8; 64% female; mostly White (78%)
4. Althaus Ottman et al., 2010	New York City, New York	Qualitative, observational study	Examine urban agriculture and productive landscaping as alternative approaches to	–	n=32 gardeners; no demographic description provided for the gardeners

First Author, Year	Study Location	Study Design	Study Aims	Intervention	Sample Size & Key Characteristics
			urban challenges and to understand gardeners' perceptions of quality-of-life improvements		
5. Litt et al., 2011	Denver, Colorado	Cross-sectional survey	Relationship between gardening, F&V intake, and social/psychological processes	–	Total n=436; community gardeners n=41 (9%); mean age=46; majority White (57%) and female (68%)
6. Zick et al., 2013	Salt Lake City, Utah	Quasi-experimental post-test comparison	Examine association between gardening and BMI; compare gardeners to neighbors, siblings, and spouses	Community gardening participants were compared to multiple control groups	198 gardeners; comparison groups: 12,552 neighbors, 316 siblings, 67 spouses; community gardeners

First Author, Year	Study Location	Study Design	Study Aims	Intervention	Sample Size & Key Characteristics
					typically mid-40s except married male gardeners and their wives were in their early 50s; Female gardeners average BMI = 24; male gardeners average BMI = 25
7. Algert et al., 2016	San Jose, California	Mixed-method (open-ended interviews + survey)	Compare community vs. home gardeners on whether gardening increases vegetable intake	–	Total n=135; community gardeners n=85; mean age 49 ± 13; 84% female; majority White; community gardeners had higher

First Author, Year	Study Location	Study Design	Study Aims	Intervention	Sample Size & Key Characteristics
					education and income
8. Sonti & Svendsen, 2018	New York City, New York	Longitudinal qualitative analysis	Explore the deeper motivations of NYC community gardeners and how these spaces contribute to individual and community well-being.	–	n=86 (in 2011) but only 27 has data from 2003 and 2011
9. Wong et al., 2018	St. Louis, Missouri	Cross-sectional verbal survey	Explore perceived benefits and concerns around soil contamination	–	n=93; 60% female; 64.5% White; 33% Black; mean age 50; 40.9% postgraduate education
10. Delshad, 2022	10 U.S. cities (urban gardens)	Mixed-method (survey + interviews)	Examine social, health, economic, environmental, and political	–	n=63; 64% White; 63% income ≥\$60K; 86% ≥31 years

First Author, Year	Study Location	Study Design	Study Aims	Intervention	Sample Size & Key Characteristics
			benefits of community gardens		old; 52% $\geq$ associate degree
11. Alaimo et al., 2023	Denver & Aurora, CO	Mixed-methods RCT	Examine changes in F&V intake and mediators linking gardening to intake	Community garden plot + plants/seeds + gardening class	RCT n=243; qualitative n=34; mean age ~41; 82% female; 34% Hispanic; 65% college graduates; ~50% <1 year gardening experience
12. Litt et al., 2023	Denver & Aurora, CO	Observer-blind RCT	Test whether gardening reduces health risks (diet, PA, BMI, etc.)	Randomized to immediate gardening in community garden vs. waiting-list control	Total n=291; intervention n=145; mean age 42; 80% female; 33% Hispanic; 67% non-Hispanic; 68% college degree; 60% <1 year

First Author, Year	Study Location	Study Design	Study Aims	Intervention	Sample Size & Key Characteristics
					gardening experience
13. Alaimo et al., 2024	Denver, Colorado	Qualitative interviews	Identify which gardening experiences support engagement and well-being over time	–	n=34; 71% female; ages 20–70; 21% Hispanic; 59% college grads; 26% food insecure; 49% <1 year gardening experience
14. Canton et al., 2025	Champaign, Illinois	Single-group pre–post feasibility study	Test feasibility of an 8-week culturally tailored gardening program for African American women	8-week gardening + educational workshops, 15 sessions	n=11 African American women, ages 45–64; mean age 50.8; mean BMI 35.9; highly educated sample (45.5% bachelor's); 63.6% employed full-time

2.3.2 Fruit and Vegetable Intake

Across the reviewed studies, participation in community gardening consistently appeared to facilitate higher fruit and vegetable consumption, although the strength and precision of evidence differed across study designs (Table 2.2). Mixed-method studies, such as Hannah and Oh (2000), Algert et al. (2016), and Wong et al., 2018, highlighted community gardens as important sources of fresh produce and as places where participants regularly grew, consumed, shared, and cooked with home-grown fruits and vegetables. Survey findings from Moses Lake in Washington (Johnson and Smith, 2006) further supported this pattern by showing that more than half of gardeners reported eating more fruits and vegetables during the gardening season and that many relied on the garden to stretch their food dollars. A cross-sectional study from Denver (Litt et al., 2011) demonstrated that community gardeners consumed fruits and vegetables much more frequently than home gardeners and nongardeners, with 5.7 daily intake occasions compared with 4.6 and 3.9 respectively. More than half of community gardeners met daily intake recommendations, and even after adjusting for socioeconomic, health, and psychosocial factors, community gardeners still consumed nearly one full serving more per day. Qualitative findings from the same study suggested that the sensory experience of gardening, including the way gardens “awakened the senses,” helped support healthier eating patterns. In San Jose, Algert et al. (2016) reported that while baseline vegetable intake was similar for home and community gardeners, consumption increased to four cups per day when gardeners were actively eating produce from their gardens. Longitudinal qualitative study from New York City

(Sonti and Svendsen, 2018) highlighted the abundance, taste, and enjoyment associated with cooking with garden produce. Interview data from ten U.S. cities (Delshad, 2022) showed that most participants identified improved access to fresh and affordable produce as a major benefit of community gardens, particularly in neighborhoods with limited food options.

Experimental studies provided additional insights. In the Colorado RCT, the gardening arm increased total vegetable intake by ≈ 0.63 servings/day and garden-grown vegetables by ≈ 0.67 servings/day from spring to harvest; fruit and combined F&V did not change (Alaimo et al., 2023). The companion trial analysis by Litt et al. (2023) showed no statistically significant intervention effects for total fruit and vegetable intake, but gardeners did report a small increase of 0.46 servings per day suggesting a small positive change that did not reach statistical significance. Finally, the culturally tailored feasibility study in Champaign, Illinois (Canton et al., 2025) found substantial increases in fruit and vegetable intake among African American women over an eight-week gardening and education program.

Table 2.2. Summary of studies showing the impact of community gardening on fruit and vegetable intake

Author, Year	Outcome Related to Fruit and Vegetable Intake
Hannah & Oh, 2000	Community gardens provided fresh produce for consumption, donation, or sale; participants described reliable access to home-grown fruits and vegetables.
Johnson & Smith, 2006	Over half of gardeners reported eating more fruits and vegetables during participation; many used the garden to stretch their food budgets.
Litt et al., 2011	Community gardeners consumed fruits and vegetables 5.7 times/day, significantly more than home gardeners (4.6/day) and nongardeners (3.9/day). Greater proportion

Author, Year	Outcome Related to Fruit and Vegetable Intake
	of community gardeners met recommended intake (56% vs. 37% of home gardeners and 25% of nongardeners). After adjusting for socioeconomic, health, and psychosocial factors, community gardeners still consumed nearly one full serving more per day than both comparison groups. Gardening was significantly associated with higher F&V intake, and qualitative data suggested that sensory and aesthetic experiences in the garden fostered healthier eating.
Algert et al., 2016	Baseline vegetable intake similar between home and community gardeners (1.9–2.0 cups/day), but intake doubled (4 cups/day) when participants were actively eating from their gardens; gardens viewed as source of fresh, organic, nutritious food.
Sonti & Svendsen, 2018	Food-related motivations increased over time (5% → 20%); gardeners emphasized abundance, flavor, and enjoyment of cooking with fresh produce.
Wong et al., 2018	Access to healthy, fresh food was one of the most cited benefits (35.5%).
Delshad, 2022	Most interviewees (84%) identified improved access to fresh produce as a key health benefit; gardens seen as vital sources of affordable fresh vegetables, especially in food deserts.
Alaimo et al., 2023	Gardeners significantly increased vegetable intake (+0.63 servings/day) and garden grown vegetable intake (+0.67 servings/day); Seasonal eating increased, partially mediated the increase in intake. No changes in fruit intake or total combined F&V intake.
Litt et al., 2023	No significant intervention effects for total F&V, but intervention group showed a small increase of +0.46 servings/day though not significant
Canton et al., 2025	Fruit and vegetable intake increased substantially (median 140 → 222 units). Small increase in leafy green intake; no changes in other vegetable categories.

2.3.3 Physical activity and community gardening

Community gardening participation has been shown to increase physical activity among adults through both structured and routine movement (Table 2.3). Early qualitative study indicated that garden spaces function as areas for active recreation (Althaus Ottman et al., 2010). Mixed-method evidence from San Jose, California supports this pattern, with community gardeners frequently identifying exercise as one of the primary benefits of their involvement (Algert et al., 2016). Among older and retired gardeners, participation helped maintain daily activity by providing structure and purposeful movement that kept them physically engaged (Sonti and Svendsen, 2018). Experimental research also demonstrated meaningful gains in physical activity. In the Denver/Aurora RCT, community gardening participants showed a significant increase in their moderate-to-vigorous physical activity (~6 extra minutes/day of MVPA compared with the control group), while sedentary time remained unchanged (Litt et al., 2023). Similarly, an eight-week gardening program for African American women produced measurable increases in daily step counts, rising from 4,938 steps at baseline to 5,819 steps after the intervention, along with indications of increased light-intensity activity (Canton et al., 2025).

Table 2.3. Summary of physical activity outcomes reported in community gardening studies

Author, Year	Physical Activity Outcome
Althaus Ottman et al., 2010	Gardening provided a space for active recreation, giving gardeners regular opportunities for physical movement.
Algert et al., 2016	Community gardeners identified exercise as one of the top benefits of their gardening participation.

Author, Year	Physical Activity Outcome
Sonti & Svendsen, 2018	Older and retired gardeners reported that gardening kept them physically occupied and provided purposeful daily activity.
Litt et al., 2023	Gardening led to a significant increase in moderate-to-vigorous physical activity, averaging 5.8 more minutes per day compared with controls. No change in sedentary time.
Canton et al., 2025	Daily step counts increased from 4,938 at baseline to 5,819 post-intervention. There's an increase in light physical activity and overall daily activity, but moderate-to-vigorous activity showed a small decline. Self-reported leisure activity rose slightly, while total self-reported physical activity decreased slightly.

2.3.4 Health and Social Benefits Reported Across Community Gardening Studies

Throughout the included studies, community gardening was frequently associated with healthier physical outcomes (Table 2.4). One of the strongest pieces of evidence came from Zick et al. (2013), who compared 198 community gardeners with more than twelve thousand neighbors, as well as siblings and spouses. Gardeners had lower BMIs than non-gardeners, equivalent to about 11 fewer pounds for women and 16 fewer pounds for men, and they were 34 to 62 percent less likely to be overweight or obese. These findings held even when women gardeners were compared to their own sisters, which indicates that the effect was not simply due to neighborhood or family-level differences. Algert et al. (2016) also reported lower BMI among community gardeners compared with home gardeners, with average BMIs of 26.3 among community gardeners and 28.5 among home gardeners. Although the randomized trial conducted by Litt et al. (2023) found no significant change in BMI or waist circumference over time, participants still viewed

gardening as part of a healthier lifestyle, which aligns with earlier survey findings from Johnson and Smith (2006), where all respondents in the second year believed gardening helped them live healthier lives.

Mental and emotional well-being emerged as among the most consistent benefits across studies. In the randomized controlled trial by Litt et al. (2023), gardening significantly reduced perceived stress and anxiety relative to a waiting list control, with especially strong effects among individuals who began with elevated psychological distress. Qualitative studies reinforced these findings. For example, Sonti and Svendsen (2018) reported that gardeners described the garden as a peaceful and restorative environment that offered relief from depression, anxiety, and daily stress. Many participants described gardening as relaxing, therapeutic, and emotionally restorative. Alaimo et al. (2024) also noted that gardeners experienced emotional relief and improved mood through caretaking, accomplishment, and time in nature. Even in a small feasibility study, Canton et al. (2025) observed modest reductions in perceived stress and increases in a sense of meaning and purpose among African American women following an eight-week gardening program.

Gardening also supported deeper emotional and existential benefits. Gardeners in the longitudinal analysis by Sonti and Svendsen (2018) described gardens as spiritually and emotionally nourishing places where they could escape from urban stressors and reconnect with a sense of calm and purpose. Alaimo et al. (2024) similarly found that gardeners experienced a sense of accomplishment and personal growth as they cared for plants across a season. Participants commonly reported that gardening brought joy, satisfaction, pride, and a renewed sense of meaning. These findings paralleled earlier qualitative work

in New York City by Althaus Ottman et al. (2010), where gardeners said they participated to improve family health, enhance neighborhood beauty, and strengthen family closeness.

Several studies described gardening as an important coping strategy that helped participants manage daily stress and emotional challenges. Gardeners in New York reported that the garden served as a healthy space in contrast to the surrounding city environment and provided an outlet for stress reduction (Sonti and Svendsen, 2018). Alaimo et al. (2024) noted that gardening helped participants in Denver manage symptoms of depression or anxiety and improved emotional balance by offering a calm, reflective space. Teig et al. (2009), in an earlier study in Denver, similarly documented a case where gardening promoted emotional healing, using an example of a socially isolated individual with a history of addiction who reconnected with others and experienced meaningful emotional improvement through participation. The randomized trial by Litt et al. (2023) in Colorado, reinforced this pattern by showing measurable reductions in stress and anxiety among gardeners.

Social benefits were central in nearly every study. Community gardeners in Philadelphia (Hannah and Oh, 2000) expressed strong concern for their community and described close ties with other gardeners. Teig et al. (2009) found that Denver gardeners valued the gardens as places to build friendships, connect across different cultural backgrounds, and strengthen neighborhood belonging. They also reported strong norms of reciprocity, including sharing produce, advice, and personal assistance. Johnson and Smith (2006) observed that gardeners viewed the garden as a place to build community and provide access for those without gardening space. Wong et al. (2018) similarly found that more than two thirds of participants in Missouri emphasized community building as the

primary benefit of community gardens. Even though some gardeners in Denver were disappointed with the amount of social interaction in their garden, many still reported forming or strengthening relationships with family members or fellow gardeners (Alaimo et al., 2024).

Table 2.4. Summary of health and social outcomes reported across community gardening studies

Author, Year	Health Outcomes	Social Outcome
Hannah & Oh, 2000	—	All gardeners reported strong ties with others in the garden and deep concern for community well-being.
Johnson & Smith, 2006	Participants believed gardening helped them lead healthier lifestyles.	Reported a “sense of community” and improved access to garden space for those lacking suitable land.
Teig et al., 2009	Participation in the community garden helped a socially isolated individual with a history of addiction reconnect with others and experience meaningful emotional improvement.	Strong social interaction, cultural bridging, friendship formation, civic engagement, and neighborhood belonging.
Althaus Ottman et al., 2010	Participants sought gardening for family health benefits.	Motivations included staying close to family and beautifying the neighborhood.
Litt et al., 2011	Higher fruit and vegetable intake associated with greater social involvement; no direct link to BMI after covariate adjustment.	Social involvement strongly predicted fruit and vegetable intake, highlighting social pathways to healthier behaviors.
Zick et al., 2013	Gardeners had significantly lower BMIs and lower odds of overweight/obesity; household members showed similar BMI profiles.	—
Algert et al., 2016	Community gardeners had lower BMIs than home gardeners and	Social connection, learning from others, and a strong sense of community and sharing.

Author, Year	Health Outcomes	Social Outcome
	reported exercise as a major benefit.	
Sonti & Svendsen, 2018	Reported emotional, spiritual, and mental health benefits including relaxation, pleasure, and feeling better.	About 20% noted social motivations; gardens fostered socialization and cross-cultural interaction.
Wong et al., 2018	15.4% highlighted physical health improvements.	68.8% emphasized community building; 18.3% cited learning and education.
Delshad, 2022	92% reported improved mental well-being, reduced stress, and increased purpose.	Gardens fostered new friendships and bridged racial, ethnic, linguistic, and socioeconomic divides.
Litt et al., 2023	Gardening reduced perceived stress and anxiety; no significant BMI or waist changes.	Not primary focus, but shared garden participation may facilitate social interaction.
Alaimo et al., 2024	Improved emotional well-being, purpose, and stress relief supported by caretaking, accomplishment, and nature connection.	Many strengthened relationships; fewer formed new friendships, but still reported meaningful social experiences.
Canton et al., 2025	Small reductions in stress and increases in meaning and purpose; minimal change in depression or anxiety.	Social aspects not emphasized; program included shared workshop participation.

2.4 Discussion

The reviewed studies collectively suggest that community gardening can influence several health-related behaviors and outcomes for adults living in U.S. cities, particularly in the areas of diet, physical activity, and overall health. Findings consistently show that participation in community gardens is associated with improved access to fresh produce, increased vegetable intake but not combined fruit and vegetable intake, routine engagement in gardening-related physical activity, and various self-reported physical health and psychosocial well-being. At the same time, the evidence base includes mixed results from randomized trials and cross-sectional studies, highlighting the need to interpret outcomes within the context of study design. Despite these differences, the available studies consistently describe how community gardening participation corresponds with observable differences in dietary behaviors, physical activity patterns, and health indicators among adult community gardeners in U.S. urban settings.

2.4.1 Impact of community gardening involvement in fruit and vegetable consumption and physical activity

Overall, the evidence indicates that community gardening often supports higher fruit and vegetable consumption by increasing access to fresh produce (Hannah & Oh, 2000; Johnson & Smith, 2006; Algert et al., 2016; Delshad, 2022; Alaimo et al., 2023; Canton et al., 2025). This pattern is consistent with earlier findings from Upstate New York, where Armstrong (2000) documented that many adults joined community gardens specifically to meet basic needs, including gaining reliable access to fresh and affordable

fruits and vegetables. Similarly, in an urban area in Canada, Wakefield et al. (2007) found that gardeners incorporated more fresh produce into daily meals due to improved access and affordability. Comparing gardeners with non-gardeners, Litt et al. (2011) demonstrated that adults who garden consumed significantly more fruits and vegetables, even after adjusting for neighborhood characteristics, social involvement, and aesthetic perceptions. National-level evidence also supports this relationship: in a large sample of U.S. adults aged 65 and older, Veldheer et al. (2023) found that gardeners had higher odds of consuming ≥ 5 servings of fruits and vegetables per day compared to non-gardeners.

In some of the included studies (Algert et al., 2016; Delshad, 2022; Alaimo et al., 2024), adult community gardeners frequently describe enhanced sensory and emotional appeal, including better taste, pride in growing food, and a connection to “real” produce, as motivating higher intake. This aligns with Hale et al. (2011), who reported that adult gardeners in Denver developed stronger sensory, emotional, and aesthetic connections to food, which encouraged greater vegetable consumption. Community gardens also create routine opportunities for cooking, experimenting with new foods, and eating seasonally (Sonti & Svendsen, 2018; Alaimo et al., 2023).

However, effects are more consistent for vegetable intake than for fruit intake or combined fruit and vegetable intake, and results from randomized controlled trials (Alaimo et al., 2023; Litt et al. 2023) are more mixed than cross-sectional, qualitative, and the culturally-tailored, female-focused feasibility studies (Johnson & Smith, 2006; Litt et al., 2011; Canton et al., 2025). Despite this, the collective findings point to

community gardening as an accessible and meaningful pathway for improving dietary quality in U.S. cities.

Among the studies that examined physical activity, the evidence indicates that participation in community gardening is associated with increases in overall physical activity. Reported benefits include higher levels of light-intensity activity and greater daily step counts among adult women, and more frequent purposeful daily movement. Findings regarding its influence on moderate-to-vigorous physical activity (MVPA) remain mixed; however, when greater weight is placed on the more methodologically rigorous study which considered both sexes, community gardening appears to contribute to increases in MVPA. For adults, gardening can contribute to meeting recommended activity levels (Litt et al., 2023). This is also evident in the analysis of a sample of 152,424 participants aged 65 and above, where most (75%) of older adult gardeners have met the aerobic PA recommendations through gardening alone (Veldheer, et al., 2023). On the other hand, community garden involvement did not make any difference in sedentary time which could mean that gardeners may be more active during part of the day but not necessarily less sedentary overall. Together, these results show that community gardening is an accessible way for adults, including older adults and those with limited exercise opportunities, to incorporate regular physical activity into their lives.

2.4.2 Impact of participation in community garden to health

2.4.2.1 Health-promoting behaviors and dietary quality

Across these studies (Johnson & Smith, 2006; Litt et al., 2011; Algert et al., 2016; Canton et al., 2025), community gardening is consistently linked with improvements in everyday health-related behaviors, particularly fruit and vegetable intake. A couple of studies reported that gardeners believed their participation helped them lead healthier lifestyles, and social involvement within gardens was shown to predict higher fruit and vegetable consumption. Quantitative findings indicated that community gardeners often consumed more fruits and vegetables than non-gardeners, and many described exercise as a major perceived benefit of gardening. Access to garden space for individuals or families without suitable land also supported engagement with fresh produce and gardening activities, which may help reinforce these nutrition-related behaviors.

Some studies noted that gardening was pursued specifically for family health, suggesting that the practice fosters healthier routines at the household level. Workshops and shared activities within garden programs provided additional opportunities for learning, exposure to new foods, and the reinforcement of nutrition practices through social participation.

2.4.2.2 Psychosocial well-being

Mental and emotional health benefits consistently emerged as some of the strongest findings across both qualitative and quantitative research on community gardening. These outcomes can be collectively understood under the broader construct of psychosocial well-being, which encompasses “emotional or psychological well-being as well as social and collective well-being”. The concept aligns closely with “quality of life,” which similarly includes emotional, social, and physical dimensions (Larson, 1996; Ryff & Martikainen, 2002, as cited in Eiroa-Orosa, 2020).

Gardeners repeatedly described community gardens as calming, restorative spaces that offered relief from stress, anxiety, and symptoms of depression (Sonti & Svendsen, 2018; Alaimo et al., 2024). Experimental evidence complements these findings: participation was associated with reductions in perceived stress and anxiety, with the largest effects observed among adults who began with higher levels of distress (Litt et al., 2023). Participants also reported feelings of purpose, relaxation, accomplishment, and emotional resilience, often describing the garden as a therapeutic refuge from daily pressures and the surrounding urban environment. Culturally tailored gardening programs have produced modest improvements in stress, meaning, and purpose (Canton et al., 2025), and participation encouraged even a socially isolated individual to spend time outdoors and engage with others, facilitating behavioral and emotional improvement (Teig et al., 2009). These patterns suggest that psychological benefits can emerge through community garden participation. Collectively, the studies highlight the strong psychological and therapeutic value of community gardening. Across this body of work,

gardening was described as more than a hobby; it was viewed as a structured and meaningful activity that contributed to emotional well-being and personal fulfillment.

2.4.2.3 Social capital, family connection, and neighborhood cohesion

Positive social outcomes were a defining feature in some studies and appear integral to how gardening supports overall health and well-being. Specifically, social capital, family connection, and neighborhood cohesion consistently emerged as central themes in selected studies of community gardening. Gardeners frequently described community gardens as places where friendships could be formed, community ties strengthened, and a sense of belonging cultivated, often through shared concern for community welfare (Hannah and Oh, 2000; Teig et al., 2009). Community gardens facilitated rich interpersonal interactions across racial, ethnic, linguistic, cultural, and socioeconomic backgrounds, creating opportunities for cultural bridging, reciprocity, and mutual support (Wong et al., 2018; Delshad, 2022). Even in settings where fewer new friendships developed, gardeners still experienced strengthened relationships and meaningful social support through shared activities in the garden (Alaimo et al., 2024).

Family-related motivations and benefits were also evident. Some gardeners participated to promote family health, spend time together, or contribute to neighborhood beautification, reflecting the garden's role in supporting family connection and intergenerational engagement (Althaus Ottmann et al., 2010). Community gardens additionally provided growing space for households lacking suitable land, allowing more families to cultivate food and engage in outdoor activities together (Johnson and Smith, 2006).

At the community level, gardening activities fostered neighborhood pride and collective identity. Shared workshops, public events, and collaborative maintenance strengthened civic engagement and reinforced the social fabric of neighborhoods (Canton et al., 2025). In some studies, higher levels of social involvement within the garden were also linked to healthier dietary behaviors, indicating that social cohesion may support improved fruit and vegetable intake (Litt et al., 2011). These findings highlight community gardens as socially rich environments that build social capital, strengthen family and neighborhood connections, and support overall well-being through enhanced community cohesion.

2.4.2.4 Physical health and activity

Across diverse study designs, community gardening in U.S. cities has been associated with meaningful physical health benefits for adult participants. Cross-sectional studies consistently report lower body mass index (BMI) and reduced odds of overweight or obesity among community gardeners compared with non-gardeners, including comparisons with matched neighbors and even siblings living in the same household (Zick et al., 2013). Community gardeners have also been found to have lower BMIs than home gardeners (Algert et al., 2016) and frequently identify increased physical activity as one of the primary benefits of participation (Johnson & Smith, 2006). Participants commonly explain these benefits as the combined result of regular access to fresh produce and routine, low-intensity movement embedded in gardening tasks (Johnson & Smith, 2006; Wong et al., 2018) such as planting, weeding, and harvesting.

On the other hand, experimental evidence indicates that community gardening can increase light intensity and total physical activity among female midlife adults, and may also contribute to increases in moderate-to-vigorous physical activity (MVPA), although reductions in sedentary time are not consistently observed (Canton et al., 2023; Litt et al., 2023). Overall, findings on MVPA remain mixed; however, when greater weight is given to the more methodologically rigorous trial that included both sexes, community gardening appears to have a positive influence on MVPA. Notably, the short-term intervention did not produce significant changes in BMI or waist circumference, even though participants experienced meaningful reductions in perceived stress (Litt et al., 2023). Taken together, these results suggest that while community gardening supports healthier movement patterns and psychosocial benefits, observable changes in adiposity may require longer intervention durations or broader lifestyle modifications.

Emerging evidence from a large national sample points to potential long-term health implications. Among U.S. adults aged 65 and older, gardeners had significantly lower odds of reporting cardiovascular disease, stroke, myocardial infarction, high cholesterol, hypertension, diabetes, a BMI of 25 or higher, and poor physical or mental health compared with individuals who did not engage in exercise-related activities (Veldheer et al., 2023). These patterns indicate that gardening may play a role in healthier weight trajectories, improved cardiometabolic profiles, and sustained daily physical activity across the lifespan, even if short-term experimental studies do not always capture immediate anthropometric change (Zick et al., 2013; Litt et al., 2023).

2.5 Conclusion

In summary, several plausible mechanisms help explain the health impacts associated with participation in community gardens in U.S. cities. First, gardens increase access to fresh and healthful produce and encourage its consumption through improved taste, pride in growing food, and exposure to seasonal ingredients. These factors can improve diet quality by increasing vegetable intake and promoting more home cooking. Second, although evidence regarding changes in moderate-to-vigorous physical activity is mixed in experimental studies, the routine light-intensity activities involved in gardening may still accumulate over time and support healthier weight trajectories. Third, community gardens appear to support psychosocial well-being through both the restorative qualities of nature and the social relationships cultivated in these spaces. Participants frequently describe gardens as calming and therapeutic environments that provide relief from stress, anxiety, and emotional strain, while also fostering feelings of purpose, accomplishment, and resilience. At the same time, gardens promote social and collective well-being by creating opportunities for friendship, belonging, reciprocity, and cross-cultural connection. Together, these psychological and social benefits may enhance overall quality of life and encourage sustained engagement in healthy behaviors.

However, certain key limitations should be considered when interpreting the results of this review. The majority of the included studies are cross-sectional and qualitative which rely on self-selection into gardening, which can inflate associations if gardeners differ systematically from non-gardeners. Self-reported outcomes (diet, physical activity, anthropometric measures, perceived health and well-being) are vulnerable to recall and social

desirability biases. Seasonal variability in gardening and produce availability, as well as generalizability beyond predominantly urban U.S. contexts or specific demographic groups, also warrant caution.

To advance the research evaluating the impact of community gardening on health and health-related outcomes, future research should select rigorous longitudinal and experimental designs, greater geographic and demographic diversity, culturally tailored interventions, and objective measures of diet, physical activity, and psychosocial well-being. In addition, future research should prioritize long-term studies that investigate how to make gardening programs more accessible and equitable for diverse U.S. adult populations, including those facing structural barriers to participation.

In conclusion, converging evidence indicates that community gardening in urban U.S. settings is consistently associated with healthier dietary patterns and increased engagement in physical activity. Across diverse studies, gardeners show higher vegetable intake, greater access to fresh produce, and more frequent cooking with garden-grown foods. Participation also supports increased light daily activity and provides opportunities for purposeful movement embedded in routine tasks. Beyond behavioral changes, community gardening contributes to a wide range of health-related benefits. Gardeners commonly report reduced stress and anxiety, improved mood, enhanced emotional resilience, and a stronger sense of purpose. These spaces also foster supportive social environments—strengthening friendships, neighborhood belonging, and cross-cultural connection—that reinforce both mental and physical well-being. Collectively, this review highlights community gardens as low-cost, broad-reach public health strategy capable of contributing to healthier diets, more active lifestyles, and improved psychosocial health among adults living in U.S. cities.

Chapter 3 – Health Behaviors, Perceived Health, Obesity, and Non-communicable Diseases among Adult Participants of Urban Community Gardens in Kansas

3.1 Introduction

Urbanization is accelerating globally, reshaping demographic patterns and influencing public health outcomes. By 2050, an estimated 68% of the world’s population will reside in urban areas, and in the United States this figure is projected to reach 89% (Center for Sustainable Systems, 2024). While urban environments offer economic and social opportunities, they also present significant public health challenges. These include the rising prevalence of noncommunicable diseases, persistent risks of infectious disease outbreaks, and increased exposure to violence and injuries (World Health Organization, 2025). Recent research has established a causal link between urbanization and health, underscoring the need to address the unique health risks associated with urban living (Zhang et al., 2023).

Noncommunicable diseases such as cardiovascular disease, cancer, diabetes, and chronic respiratory illnesses are among the leading causes of mortality worldwide. In the Americas alone, NCDs claim 5.5 million lives annually, with 2.2 million deaths occurring among adults aged 30 to 69 years (Pan American Health Organization, n.d.). Globally, cardiovascular diseases account for the majority of NCD-related deaths, totaling approximately 19 million in 2021, followed by cancers, chronic respiratory diseases, and diabetes (World Health Organization, 2024). Projections indicate that ischemic heart disease, stroke, and diabetes will remain the top contributors to disease

burden by 2050 (Institute for Health Metrics and Evaluation, 2024). Urban environments exacerbate these risks through factors such as high residential density, limited access to recreational spaces, and increased traffic exposure, which influence physical activity and body weight (Malambo et al., 2016). Additionally, urbanization often leads to dietary shifts and sedentary lifestyles, contributing to obesity. Obesity is linked to over 500,000 deaths annually and a reduction in life expectancy by approximately 2.4 years, surpassing the mortality impact of smoking (Ward et al., 2022). These trends highlight the urgent need for strategies that promote healthier behaviors in urban settings.

Community gardens have emerged as a promising intervention to address urban health challenges by promoting nutrition, physical activity, and social well-being. As a key component of urban agriculture, these gardens provide spaces where individuals collectively grow food, promoting sustainable practices and improving access to fresh produce. Participation in community gardening has been linked to increased fruit and vegetable consumption, improved food security, and more diverse diets (Audate et al., 2018; Alaimo, 2023). In addition to nutritional benefits, gardening activities encourage physical movement, which helps reduce body mass index and mitigate obesity-related health risks (Kunpeuk et al., 2020). Community gardens also offer psychosocial advantages, including stress reduction, improved mood, and stronger social connections. These benefits are particularly valuable in urban environments where isolation and mental health challenges are common (Gregis et al., 2021; Lawson, 2005). By integrating nutritional, physical, and social dimensions of health, community gardens represent a holistic approach to reducing the burden of noncommunicable diseases and improving overall well-being among urban populations.

Despite these potential benefits, research on the physical health impacts of community gardening remains inconsistent. While many observational studies report improvements in fruit and vegetable intake among gardeners, recent randomized controlled trial has shown no significant differences in fruit and vegetable consumption, sedentary time, or body mass index. Furthermore, most earlier studies did not account for variations in participation frequency or adequate control for demographic factors, limiting the generalizability of findings. Results may also vary by geographic location and urban characteristics. Unfortunately, most studies which assessed the relationship between community garden participation and physical health behaviors and outcomes were done in big cities and metropolitan areas outside Kansas. These gaps highlight the need for research that explores patterns of health behaviors and outcomes among community gardeners, considering participation frequency and demographic factors, among adults in cities in Kansas.

This study is significant because it addresses these gaps by examining multiple physical health behaviors and outcomes among urban community gardeners while controlling sociodemographic characteristics and participation frequency. By assessing the health profile of community gardeners, this research will provide evidence on how participation in community gardens relates to physical health among adults in Kansas cities. Additionally, by exploring how participation frequency correlates with health indicators, this study will offer practical insights that can inform urban health policies. The findings will provide support for the establishment and maintenance of community gardens in Kansas and therefore protect them from conversion and encroachment pressures caused by urban development.

3.1.3 Research objectives

The general aim of this study is to assess the impact of participation in community gardens on physical health behaviors, perceived health, obesity, and other noncommunicable diseases among adult participants of urban community gardens in Kansas.

Specific objectives:

- A. To characterize participants of urban community gardens in terms of sociodemographic factors (age, gender, race or ethnicity, level of education, income), frequency of involvement in community agriculture, physical access to fruits and vegetables, access to green space, access to community garden, food preparation confidence, frequency and skills, weight status, multimorbidity, and perceived general health;
- B. To examine differences in fruit and vegetable intake, physical activity, sleep duration, weight status, perceived general health, and self-reported non-communicable diseases across age groups, gender, frequency of community garden involvement, and income levels among participants; and
- C. To assess the relationship between the frequency of participation in community garden and various physical health behaviors and outcomes while adjusting for sociodemographic variables.

3.2 Related literature

3.2.1 Community gardens

Community gardening is an important component of urban agriculture in which residents collectively cultivate shared plots to grow fruits, vegetables, and herbs for personal use (Egli et al., 2016). Community gardens first emerged in the United States in the early twentieth century and gained prominence during the World Wars as a response to food shortages. In recent decades, their role has expanded to include supporting cultural traditions, promoting sustainability, and improving personal and family health. Community gardens also increase access to fresh produce for populations facing health disparities, particularly those with limited access to grocery stores or farmers' markets due to financial or transportation constraints. Often located within neighborhoods and on public land, these gardens function as accessible and inclusive spaces for underserved communities (The Trust for Public Land, 2001).

Community gardens in the United States take a variety of forms designed to meet different community needs. Neighborhood gardens typically consist of individual plots within a shared area, while residential gardens serve residents of apartment complexes, assisted-living facilities, or affordable housing developments. Institutional gardens are affiliated with organizations such as churches, hospitals, or government agencies and often support educational, rehabilitative, or skill-building programs. Demonstration gardens focus on education and outreach through workshops and hands-on learning experiences, and school gardens engage students, families, and community members in gardening and environmental education. Many community gardens combine elements of multiple models, creating hybrid spaces that serve diverse populations and goals (Bauermeister et al., 2013).

3.2.2 Fruit and vegetable intake among gardeners

Several studies have examined how community gardening influences dietary behaviors, particularly fruit and vegetable (FV) consumption. Many observational studies demonstrate strong positive associations between gardening participation and increased FV intake. For example, adults in households with a community garden participant consumed fruits and vegetables 1.4 times more per day and were 3.5 times more likely to meet the recommendation of five daily servings compared with nonparticipants (Alaimo et al., 2008). Similarly, community gardeners reported eating fruits and vegetables 5.7 times daily, significantly higher than home gardeners (4.6 times) and nongardeners (3.9 times), with over half of community gardeners meeting national dietary recommendations (Litt et al., 2011). Vegetable intake also increases when gardeners regularly consume their produce, as seen in a study where intake rose to four cups per day among those who most often ate from their gardens (Algert et al., 2016). Moreover, Litt et al. (2011), evidence suggests gardening exerts a direct influence on FV intake, although with a small effect size, indicating modest behavioral impacts.

Studies that quantify consumption of garden-grown produce reinforce these findings. Spliethoff et al. (2016) found that nearly all adult household members and 89% of gardeners and children consumed vegetables from their community gardens. Total vegetable intake averaged 1308 mg/kg per day across categories of fruits, leafy vegetables, root vegetables, and herbs. Although this was lower than nationally representative estimates of home-produced vegetable consumption, it demonstrated substantial incorporation of garden-grown foods into daily diets. Consistent with these behavioral findings, gardeners frequently report that one of the primary benefits of

participation is access to fresh, healthy food, which was reported by more than a third of gardeners in Missouri (Wong et al., 2018).

Qualitative studies provide insight into why gardening may encourage healthier diets. Gardeners often describe increased consumption due to the convenience, accessibility, and superior taste and quality of produce grown in the garden. Motivations extend beyond availability and include emotional attachment to plants, feelings of pride and accomplishment, self-reliance, opportunities to try new foods, cooking and sharing food with others, and embracing seasonal eating patterns (Alaimo et al., 2023).

Participants in a North Carolina study similarly noted eating “more vegetables, more fruit” and in some cases “less meat” due to increased access to fresh produce and its ease of consumption. In an interview-based study across ten U.S. cities, more than 61% of gardeners reported that community garden involvement increased the amount of produce in their diets, and 63.6% identified access to fresh produce as a key motivation for participation (Delshad, 2022). These findings highlight psychosocial, sensory, and cultural mechanisms through which gardening promotes dietary improvements.

Seasonality emerges as an important factor shaping the dietary impact of community gardening. Evidence from randomized controlled trials indicates that increases in vegetable intake are concentrated during the growing season. In one RCT, participation in community gardening increased vegetable intake by 0.63 servings per day and garden vegetable intake by 0.67 servings per day, yet produced no increase in fruit intake or combined FV consumption (Alaimo et al., 2023). Follow-up data showed no differences from baseline to winter, suggesting that dietary effects are strongly tied to seasonal availability. Additional analysis from the same study found that community

gardeners were more likely to engage in seasonal eating, which mediated increases in vegetable intake (Alaimo et al., 2023).

Despite these positive findings, several studies report mixed or null effects. Some note that community gardens may have minimal impact on food access due to limitations such as seasonal production or low yields (Smith et al., 2013). Booth et al. (2017) found increased vegetable intake only among occasional gardeners compared with nonparticipants, indicating that simple access to the garden environment may be sufficient, whereas more regular participation does not necessarily amplify effects. More recent controlled studies similarly report no significant differences in FV intake across gardener and nongardener groups (Litt et al., 2023; Heilmayr and Friedman, 2020). Brown et al. (2022), in a pre–post intervention feasibility study, also found no changes in FV stages of change or motivation. These findings demonstrate that community gardening’s effects on diet do not apply in all cases and may be sensitive to location and intensity of participation among gardeners.

The mixed evidence indicates that while community gardening can be a promising strategy for improving dietary behaviors, its impact varies depending on contextual, environmental, and behavioral factors that shape the extent to which participants incorporate garden produce into their diets.

3.2.3 Physical activity and sedentary behavior

Research which include examining the relationship between community gardening and physical activity suggests that gardening may promote increased outdoor time and movement, yet the evidence remains inconsistent across methodologies and

geographic settings. Several cross-sectional and mixed-method studies indicate that gardeners commonly perceive increases in their physical activity as a result of their participation. For example, most community gardeners in one cross-sectional study reported being more physically active because of their involvement in gardening activities (Mangadu et al., 2017). Similarly, mixed-method findings show strong agreement among gardeners that gardening increases time spent outdoors (80.5%) and boosts physical activity levels (69%) (D'Abundo and Carden, 2008; Delshad, 2022). Qualitative research reinforces these perceptions, with participants describing improvements in their overall health and well-being linked to spending more time outside, getting exercise, and engaging in regular movement through garden tasks (Chauvenet et al., 2022).

Intervention studies offer partial support for these self-reported benefits. Brown et al. (2022) found consistently positive changes in physical activity scores among individuals participating in a structured group gardening program compared with a comparison group, suggesting that intentional program design may help amplify physical activity outcomes. A randomized controlled trial conducted in Denver also found a significant time-by-intervention effect for moderate-to-vigorous physical activity, with gardeners engaging in an average of 5.80 more minutes per day of moderate-to-vigorous activity than the nongardening group. However, this same trial found no effect on sedentary time (Litt et al., 2023).

Despite these promising trends, not all studies have found measurable increases in physical activity. An earlier RCT reported no significant changes in physical activity over time and no significant interaction between group and time (Heilmayr and Friedman,

2018). These conflicting findings highlight a key limitation in the existing literature: although many gardeners report being more physically active, objective evidence is mixed, and effects may vary by program structure, population, climate, and regional context. Collectively, these studies illustrate that while community gardening may support increased physical activity, the extent of this effect remains unclear, particularly across diverse states and community settings. All of the existing research is conducted in specific metropolitan regions outside of Kansas which have different climates, cultural contexts, and gardening infrastructures.

3.2.4 Physical health outcomes

Previous studies suggest that community gardens can support healthier lifestyles, yet the magnitude and nature of these benefits vary widely across studies and geographic contexts. Although many scholars report positive associations between community gardening and indicators of physical health, evidence remains far from uniform. This inconsistency highlights the importance of evaluating health impacts within specific regional and cultural settings rather than assuming that findings from one location automatically apply to another.

Qualitative work offers valuable insight into how participants themselves perceive health changes connected to gardening. For example, a study in North Carolina found that community gardeners often described broad improvements in their health after joining a garden, even when these changes could not be traced exclusively to gardening activities (Chauvenet et al., 2022). Participants frequently linked community gardening to better management of chronic conditions, including high blood pressure, diabetes, and

cholesterol, and expressed that the garden created an environment that supported overall well-being. Two clear themes emerged: community gardens as an informal intervention space for chronic disease, and perceived improvements in physical and emotional health following garden involvement (Chauvenet et al., 2022). These findings highlights the role of gardens as supportive, health-promoting spaces that extend beyond food production.

Observational studies add further context, though their results often differ by location. In San Jose, California, community gardeners reported fairly strong levels of self-rated health, with roughly one-third describing their health as excellent or very good, and only 17% reporting fair or poor health (Algert et al., 2016). The study also found that community gardeners had a lower average BMI compared to home gardeners, suggesting a potential connection between gardening in shared spaces and healthier body weight. Meanwhile, work conducted in Salt Lake City documented even more pronounced differences. Zick and colleagues found that the average BMI of women community gardeners was 1.48 units lower than that of their non-gardening neighbors, and that women gardeners were significantly less likely to be overweight or obese (Zick et al., 2013). Similar results were observed for men, who showed an even greater BMI difference relative to neighbors. These findings translated into meaningful body-weight gaps, approximately 11 pounds for women and 16 pounds for men, reinforcing the potential for gardening to influence physical health outcomes.

Related literature review analyses echo this pattern. Dyg et al. (2020) reported that gardeners perceived improvements such as lower body weight, reduced hypertension, greater physical activity, and increased food-related knowledge. On the other hand, a meta-analysis pooling BMI data found that community gardening has a significant

positive effect on reducing BMI (Kunpeuk et al., 2020). Taken together, these findings suggest the possibility that community gardening supports healthier behaviors and obesity outcomes and may help with chronic disease management.

However, the picture becomes more complicated when examining controlled experimental studies. A randomized controlled trial conducted in Wisconsin found no significant differences in changes to BMI, blood pressure, or hemoglobin A1C between gardeners and control participants (Brown et al., 2022). Similarly, an RCT in California reported that while participants' self-reported health improved over time, these improvements did not differ across study groups (Heilmayr & Friedman, 2018). Post-test measures of sleepiness, physical activity, and self-rated health showed no clear pattern attributable to gardening participation. More recently, Litt et al. (2023) reported no significant intervention effects on BMI or waist circumference, further complicating assumptions about the influence of community gardening on measurable physical health outcomes.

Overall, the research shows a mixed picture because some studies find health benefits from community gardening while others do not. While qualitative accounts and regional observational data often show promising health benefits, experimental studies frequently detect no significant physiological changes directly linked to gardening. Differences in community garden design, neighborhood environments, participant demographics, and cultural practices may all contribute to this variability. Because health outcomes associated with community gardening differ across settings, localized and context-specific assessment is essential. Research from North Carolina, San Jose,

California, Salt Lake City, and Wisconsin each reveal unique patterns that cannot be assumed to apply to other regions here in the United States.

3.2.5 Gaps in existing literature

While many studies highlight the potential of community gardening to improve dietary intake and support healthier behaviors, several gaps limit the ability to understand how these benefits apply across different regions and populations. Existing research is concentrated in specific cities with distinct climates, social environments, and garden structures, making it difficult to generalize findings to other contexts. The evidence on fruit and vegetable intake varies considerably, with strong improvements documented in some communities and little or no change in others. Seasonal availability also plays a large role in determining dietary outcomes, since increases in vegetable consumption tend to occur only during active growing periods. Motivational, cultural, and experiential factors such as taste, convenience, emotional connection to plants, and seasonal food habits appear to shape outcomes, but these influences differ across communities. Additionally, Kunpeuk and colleagues (2020) note that most studies do not examine how the intensity of gardening participation affects health, leaving an important gap in understanding how engagement levels relate to dietary improvement and overall health.

Similar inconsistencies appear in research on physical activity and physical health outcomes. Gardeners often report increased outdoor time, higher activity levels, and better overall well-being, yet objective indicators of physical health do not consistently reflect these perceived benefits. Some areas report lower BMI and better self-rated health among gardeners, while others show no clear differences in weight, blood pressure, or

physical activity levels. These mixed findings may be shaped by factors that vary across locations, including demographic characteristics, neighborhood conditions, types of gardens, and cultural practices surrounding gardening and food. As in the dietary literature, little is known about how the amount of time spent gardening influences physical health outcomes, reinforcing the observation by Kunpeuk et al. (2020) that level of community gardening engagement is understudied. Since the available evidence comes from diverse regions within the United States such as San Jose, California, New York City, Denver, Colorado, rural areas in North Carolina, Salt Lake City, Utah, and Wisconsin, it cannot be assumed to represent cities in Kansas, where climate, population characteristics, and gardening infrastructures differ. This shows the need for region-specific research to understand how community gardening relates to health within Kansas communities.

3.3 Materials and Methods

A cross-sectional survey was conducted to assess how participation in CGs influences adults' health behaviors and physical health. This design was selected because it provides a practical way to capture a snapshot of health-related outcomes and behaviors associated with engagement in urban agriculture, particularly among community garden participants, at a single point in time.

3.3.1 Participants

This research is part of a larger urban agriculture impact study, “Transdisciplinary Assessment of Contributions from Urban and Peri-Urban Agriculture Sites,” which aims to examine the role of urban agriculture in economic development, community food resiliency, environmental sustainability, and community health. The respondents in this study represented four urban CG sites in Kansas. All gardens included were open to the public and were not restricted to members of a particular institution or organization. Eligible participants were adults aged 18 years or older who are regular participants of the four community garden sites.

3.3.2 Recruitment and data collection

Data were collected as part of the multi-component survey for the impact study “Transdisciplinary Assessment of Contributions from Urban and Peri-Urban Agriculture Sites” between July and November 2025 using Qualtrics™, a secure online survey platform. A purposive sampling strategy was employed to recruit participants through community garden coordinators or president of board of garden volunteers, who distributed study information and the survey link via email and other internal communication channels.

Before participation, respondents reviewed an electronic consent form detailing the study's purpose, procedures, confidentiality measures, and voluntary nature of participation. Individuals who met the eligibility criteria and provided informed consent answered the online questionnaire.

After the data collection period, a total of 8,775 responses were submitted to the main urban agriculture survey across participating sites. The present study draws on data from a specific component of this survey focusing on community garden participants. However, the main dataset was substantially affected by automated or fraudulent entries. Several patterns consistent with bot activity were identified, such as repeated response patterns, inconsistent or implausible demographic information, and illogical health-related data. As a result, a rigorous multi-step screening process was implemented to ensure that only high-quality and credible responses were retained for analysis (Figure 3.1). In addition, only individuals who were actual participants in community garden activities were included, while those who only received produce donations and did not participate in gardening were excluded.

After this screening process, only 398 responses, representing approximately 4% of the total online submissions, met all validation criteria and were considered reliable. The remaining 96% were excluded due to clear indicators of low data quality. From the validated dataset, only 132 responses from confirmed community garden participants were used in the analysis for this study. Although this reduction in sample size was substantial, it was necessary to maintain the integrity of the study's findings and to ensure that the final dataset accurately reflected genuine community garden participants.

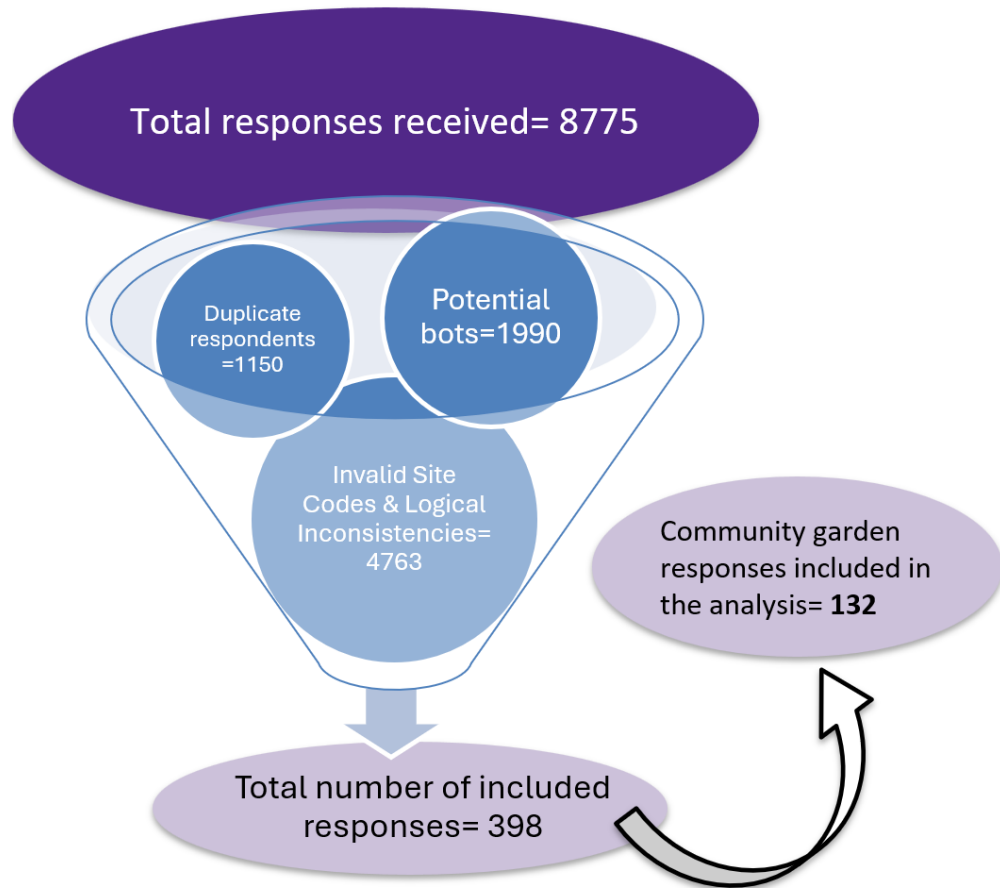


Figure 3.1. Survey data cleaning and filtering

3.3.3 Survey instrument

The questionnaire was developed using a combination of validated instruments and original items tailored to the study objectives. It included sections on:

3.3.3.1 Demographics and CG engagement

This section was designed to collect essential background information about the respondents to ensure a comprehensive understanding of the sample population. This section included variables such as age, gender, race or ethnicity, education level, and income range, which provide insights into the socio-economic characteristics of participants. In addition, the frequency of involvement in community agriculture, such as community gardening, was included.

3.3.3.2 Health behaviors

A. Fruit and vegetable intake

To estimate the amount of fruit and vegetable intake, we developed four questions based on two items from the Expanded Food and Nutrition Education Program (EFNEP) Adult Evaluation Survey (National Institute of Food and Agriculture, 2020). The modifications in the questions were made to capture estimated average daily intake over an entire year, thereby reducing seasonal variation. Respondents were asked about the frequency of fruit and vegetable intake using the following categories: 1–3 times per month, 1–2 times per week, 3–4 times per week, 5–6 times per week, once per day, twice per day, three times per day, four times per day, or five or more times per day. Fruit intake included fresh, frozen, dried, or canned fruit and 100% fruit juice, while vegetable

intake included fresh, canned, and frozen vegetables. To estimate quantity, participants reported their typical daily amount. For fruit, options included: less than one medium fruit, one medium fruit, two medium fruits, more than two medium fruits, less than ½ cup, about ½ cup, about 1 cup, or more than 1 cup. For vegetables, options included: less than ½ cup, about ½ cup, about 1 cup, about 2 cups, or more than 2 cups. Reported amounts were converted to cup-equivalents using standard serving definitions, where 1 cup-equivalent was defined as one medium fruit or approximately one cup of fruit (American Heart Association, n.d.). For vegetables, one cup-equivalent was defined as one cup of vegetables, consistent with cup-equivalent definitions for most vegetables, excluding raw leafy vegetables.

Adequacy of fruit and vegetable intake was assessed based on the U.S. Department of Agriculture's MyPlate guidelines (U.S. Department of Agriculture, n.d.). According to these recommendations, adult men should consume at least 3 cups of vegetables and 2 cups of fruit daily, while adult women should aim for at least 2.5 cups of vegetables and 1.5 cups of fruit each day.

B. Physical activity

Physical activity was assessed subjectively using a modified short form of the International Physical Activity Questionnaire (IPAQ), modified to estimate activity levels over a one-year period to reduce seasonal variation. The IPAQ captures physical activity across multiple domains, including leisure time, household and gardening tasks, work-related activities, and transportation (International Physical Activity Questionnaire, 2019). Participants were asked whether they walked or engaged in moderate- or

vigorous-intensity activities for at least 10 minutes on any day and to report the time spent on each activity. Additional questions assessed time spent sitting during a typical weekday and weekend day. Analyzed IPAQ variables included time spent in moderate-to-vigorous physical activity (MVPA) and total physical activity (minutes per week). The total duration for each physical activity component was converted to Metabolic Equivalent Minutes per Week (MET-min/week). Physical activity levels were categorized as inactive (<600 MET-min/week), minimally active ($600\text{--}<3000$ MET-min/week), or highly active (≥ 3000 MET-min/week) (Lee et al., 2011).

Adequacy of physical activity was determined based on U.S. guidelines by calculating total weekly MVPA. Participants were classified as meeting recommendations if they reported at least 150 minutes of moderate-intensity activity per week, consistent with the Physical Activity Guidelines for Americans (U.S. Department of Health and Human Services, 2018).

C. Sleep

Respondents were asked to report the average number of hours they sleep each night. Their sleep duration was then compared to the expert recommendation of 7-9 hours per night (National Heart, Lung, and Blood Institute, 2022).

3.3.3.3 Health status

A. Presence of NCD and multimorbidity

Presence of NCD or chronic disease was defined in this study as responding yes to having ever been told by a doctor or other health professional that the respondent had

any of the following: obesity, high blood pressure/hypertension; arthritis; depressive disorder (depression); diabetes (excluding during pregnancy only); heart attack, angina, or coronary heart disease (heart disease); high cholesterol; chronic kidney disease (CKD); or stroke, cancer, excluding skin cancer (cancer); chronic obstructive pulmonary disease (COPD), asthma. This classification of chronic conditions was adopted on the list of conditions used by Watson et al. (2025) which was based on the list developed by the US Department of Health and Human Services (HHS) and reported by BRFSS. Moreover, the presence of multimorbidity which is defined as co-occurrence of two or more chronic non-communicable health conditions in the same individual (Academy of Medical Sciences, 2018), was analyzed in this study.

B. Weight status

Respondents were asked to self-report their height and weight. From these measures, the Body Mass Index (BMI) was computed. Body mass index is the most common method to estimate body fat, and it is computed using the formula below:

$$\text{BMI} = \text{weight}(\text{kg}) \div [\text{height}(\text{m})]^2$$

Weight status was determined according to Adult BMI classification (Centers for Disease Control and Prevention [CDC], 2024):

- Underweight (Less than 18.5)
- Normal Weight (18.5 to less than 25)
- Overweight (25 to less than 30)
- Obesity (30 or greater)

C. Perceived general health

General health was measured using five items adapted from the SF-36 General Health domain (RAND Corporation, n.d.). The items measured the respondent's level of agreement to each statement using the 5-point Likert scale in which 1 = “Definitely true” and 5 = “Definitely false”. Response options for each item were converted to a 0–100 scale and aligned so that higher values consistently reflected better health. The resulting General Health score ranges from 0 to 100, with higher scores indicating more favorable perceived health. Prior to administration, the survey questionnaire was pretested with a small group (n=15) from Kansas State University Olathe Horticulture Research and Extension Center to confirm clarity and relevance and assessed the internal consistency of general health scale. Internal consistency was assessed using Cronbach’s alpha coefficient for each set of multi-item measures included in the questionnaire. The scales adapted from the SF-36 Health Survey demonstrated strong reliability as the General Health measure showed a Cronbach’s α of 0.89.

3.3.3.4 Ethical Considerations

This study, as part of the project "Development of Resilient Urban Food Systems That Ensure Food Security in the Face of Climate Change", was reviewed and approved by the Institutional Review Board (IRB) at Kansas State University (IRB Protocol #:11771). All participants provided informed consent electronically prior to beginning the survey. Participation was voluntary, and all responses were anonymized to protect confidentiality. Additionally, modest compensation was given to the participants for their time.

3.3.4 Data analysis

3.3.4.1 Data preparation

Health behaviors, health status, and demographic characteristics were summarized using descriptive statistics. Categorical variables were presented as frequencies and percentages.

For the group comparisons of health behaviors and outcomes, sociodemographic variables and gardening- and diet-related factors were regrouped into meaningful categories considering the limited cell sizes observed in the result of descriptive analyses (Table 3.1). Community garden involvement was assessed using a self-reported 5-point frequency scale indicating how often participants engaged in community agriculture activities such as community gardening: once a month or less, 2–3 times a month, once a week, 2–3 times a week, and daily. This was recategorized into three meaningful levels reflecting increasing frequency of participation: low involvement (once a month or less; 2–3 times a month), moderate involvement (once a week), and high involvement (2–3 times a week or daily). The three-level categorization distinguishes occasional participation from regular and intensive engagement, which has been shown to be relevant when examining associations between gardening and dietary behaviors, physical activity, and psychosocial health outcomes (Alaimo et al., 2008; Litt et al., 2011). Access to a community garden was dichotomized into good access (walking distance, ≤ 20 minutes; response categories 4–5) and limited access (requiring motorized transport; response categories 1–3), consistent with WHO recommendations emphasizing walkable

proximity (e.g., within 300 m) for public health benefits (WHO Regional Office for Europe, 2016).

Participants self-rated their general health using a five-point Likert scale from the RAND Health Survey. Responses were converted to a General Health score ranging from 0 to 100 and subsequently recoded into a standard five-category measure: excellent, very good, good, fair, or poor. For analytical purposes, this variable was dichotomized in accordance with established public health research conventions into good health (excellent, very good, or good) and poor health (fair or poor). This approach is consistent with the methodology used in the 2014 Behavioral Risk Factor Surveillance System (BRFSS), as described by Zhao et al. (2018), in which self-rated health was similarly dichotomized into poor/fair versus good/very good/excellent.

Demographic variables and frequency of community garden involvement were collapsed into smaller categories to reduce categories with very small cell counts and facilitate inclusion in multiple linear regression. Income was collapsed into three groups based on the current median household income in Kansas (\$75,514): (1) Low income (categories 1–4, <\$75,000, below the median), (2) Middle income (category 5, \$75,000–\$99,999, on or slightly above the median), and (3) High income (category 6, ≥\$100,000, comfortably above the median). Responses indicating “Prefer not to say” (category 7) were coded as missing. Age was grouped into three categories: young adults (18–34), midlife adults (35–64), and older adults (65 and above). Education level was collapsed into three categories: no degree (less than high school, high school, some college), college degree (bachelor’s or vocational degree), and advanced degree (postgraduate degree). For race/ethnicity, given that most respondents were White followed by

Black/African American, and fewer than 10% identified as Hispanic, Asian, or mixed race, three dummy variables were created: White, Black/African American, and other. Finally, frequency of community agriculture involvement was categorized into three levels: low (once a month or 2–3 times a month), moderate (once a week), and high (2–3 times a week or daily).

3.3.4.2 Statistical Analysis

Survey responses were exported from Qualtrics and analyzed using IBM SPSS Statistics (Version 30; IBM Corp., Armonk, NY, USA). Descriptive statistics, including frequencies and percentages, were calculated to provide a comprehensive summary of participants' demographic characteristics, health behaviors, and health outcomes. Categorical variables were summarized as frequencies and percentages to illustrate distribution patterns, whereas continuous variables were presented as median and interquartile range (IQR), with their minimum and maximum values to describe central tendency and variability.

Normality was assessed using the Shapiro–Wilk test (Shapiro & Wilk, 1965) as well as skewness and kurtosis values within ± 1 and ± 2 , respectively were considered acceptable. Unfortunately, no single variable passed the normality assumption hence, Kruskal–Wallis and Mann–Whitney *U* tests with Dunn's post hoc comparisons (Bonferroni-adjusted) were used. Analyses examined differences in health behaviors and outcomes across age groups, gender, frequency of community gardening involvement, and income categories.

All regression analyses were conducted in R. Two-block hierarchical multiple linear regression was used to evaluate the crude and adjusted association of community

gardening involvement with continuous health outcomes (general health score and BMI). Model 1 assessed the unadjusted bivariable relationship, while Model 2 adjusted for sociodemographic covariates, including age, gender, educational level, and household income, the same as the control variables considered in the previous research (Gulyas et al., 2024). Model fit was evaluated using R^2 and Adjusted R^2 . Regression assumptions were verified using the Durbin-Watson statistic for independent errors and the Variance Inflation Factor ($VIF < 3.0$) for multicollinearity. Finally, the assumption of normally distributed residuals was evaluated through the Shapiro-Wilk test and visual inspection of Q-Q plots, while homoscedasticity was verified via plots of residuals versus fitted values. Diagnostic tests were conducted to evaluate the assumptions of the multiple linear regression models. For the BMI model, the Shapiro-Wilk test indicated that the residuals deviated from a normal distribution ($p < .001$). However, given the adequate sample size of the study, ordinary least squares regression is highly robust to violations of the normality assumption due to the Central Limit Theorem. Therefore, to preserve the clinical interpretability of the coefficients (kg/m^2), the data were not transformed.

To account for count data, the number of NCDs was analyzed using a hierarchical Poisson regression with the same two-block structure. Poisson results are reported as Incidence Rate Ratios (IRRs) with 95% Confidence Intervals (CIs), and improvements in model fit were evaluated via Analysis of Deviance (χ^2). Across all analyses, statistical significance was set at $p < .05$.

3.4 Results

3.4.1 Characteristics of community garden participants

Participants in this study (N= 132) had a median age of 39 years (IQR: 32–61.5; range: 20–83), with most in midlife (41.7%) or young adulthood (37.9%), and fewer in older adulthood (20.5%) (Table 3.1). Gender distribution was nearly equal, with males (52%) and females (48%). Most participants identified as White (74.2%), followed by Black or African American (18.9%). Educational attainment was high, with participants holding postgraduate (34.8%) or undergraduate degrees (29.5%). Household income varied, with nearly one-third reporting annual earnings of \$100,000 or more (31.8%).

Table 3.1. Sociodemographic characteristics of participants (N = 132)

Characteristics	n (%)	Median (IQR)	Min–Max
Age (years)	—	39 (32-61.5)	20-83
18-34 (young adults)	50 (37.9%)	—	—
35-64 (midlife adults)	55 (41.7%)	—	—
65 and above (older adults)	27 (20.5%)	—	—
Gender			
Male	69 (52.3%)	—	—
Female	63 (47.7%)	—	—
Race/Ethnicity			
Asian	3 (2.3%)	—	—
Black or African American	25 (18.9%)	—	—
White	98 (74.2%)	—	—
Hispanic or Latino	2 (1.5%)	—	—
Middle Eastern or North African	1 (0.8%)	—	—
Two or more races	3 (2.3%)	—	—
Education level			
High school diploma/GED	2 (1.5%)	—	—
Some college	20 (15.2%)	—	—
Undergraduate degree	39 (29.5%)	—	—
Vocational/technical degree	12 (9.1%)	—	—
Some post-graduate studies	13 (9.8%)	—	—

Characteristics	n (%)	Median (IQR)	Min–Max
Post-graduate degree	46 (34.8%)	—	—
Household income			
Less than \$20,000	6 (4.5%)	—	—
\$20,000 - \$34,999	6 (4.5%)	—	—
\$35,000 - \$49,999	10 (7.6%)	—	—
\$50,000 - \$74,999	24 (18.2%)	—	—
\$75,000 - \$99,999	31 (23.5%)	—	—
\$100,000 or more	42 (31.8%)	—	—
Prefer not to say	13 (9.8%)	—	—

In Table 3.2 most participants reported high confidence and strong skills in preparing fruits and vegetables (88.7% and 75.0%, respectively). Participants also reported cooking at home frequently and generally perceived fruits and vegetables as affordable. Access to community gardens was high, with 96.2% of participants reporting reasonable access within a 20-minute walk or transit ride, and more than half reported regular engagement in community agriculture, including weekly participation (24.2%) or participation two or more times per week or daily (30.3%). Regular engagement in community agriculture was common among more than half of the participants, with participants reporting weekly involvement (24.2%) or two or more times per week and daily (30.3%). Most participants reported moderate access to community gardens (54.5%) and limited access to fruits and vegetables (62.9%); however, fruits and vegetables were perceived as definitely or somewhat affordable by most participants (69.7%).

Table 3.2. Food environment and preparation skills and practices of participants (N= 132)

Characteristics	n (%)
Frequency of CG involvement	
Once a month or less	23 (17.4%)

Characteristics	n (%)
2-3 times a month	37 (28.0%)
Once a week	32 (24.2%)
2-3 times a week	28 (21.2%)
Daily	12 (9.1%)
Access to CG	
Not much (More than 60 minutes using a vehicle)	1 (0.8%)
A little (about 30-40 minutes driving or by bus)	4 (3.0%)
Moderate (about 10-20 minutes driving or by bus)	72 (54.5%)
Quite a bit (walking distance, between 10-20 minutes)	28 (21.2%)
A lot (walking distance, less than 10 minutes)	27 (20.5%)
Access to fruits and vegetables	
Good ($\leq \frac{1}{2}$ mile; response categories 1–2)	49 (37.1%)
Limited ($> \frac{1}{2}$ mile; response categories 3–5)	83 (62.9%)
Perceived affordability of fruits and vegetables	
Definitely affordable	40 (30.3%)
Somewhat affordable	52 (39.4%)
Neutral	32 (24.2%)
Somewhat unaffordable	5 (3.8%)
Definitely unaffordable	3 (2.3%)
Frequency of home-cooked meals	
Very rare	3 (2.3%)
1 day a week	2 (1.5%)
2 days a week	20 (15.2%)
3 days a week	21 (15.9%)
4 days a week	28 (21.2%)
5 days a week	28 (21.2%)
6-7 days a week	30 (22.7%)
Confidence in preparing FV	
Not confident at all	1 (0.8%)
Slightly confident	7 (5.3%)
Somewhat confident	25 (18.9%)
Fairly confident	23 (17.4%)
Very confident	76 (57.6%)
Level of skill in preparing fruit and vegetables	
Poor	1 (0.8%)
Average	14 (10.6%)
Good	60 (45.5%)
Excellent	57 (43.2%)

Health behaviors indicated generally favorable patterns, except for vegetable intake (Table 3.3). Median daily fruit and vegetable intake was 1.25 and 1.0 cup-equivalents, respectively, with participants meeting fruit intake (42.4%) and vegetable intake recommendations (17.4%). Physical activity levels were high, with participants classified as highly active (63.6%) and meeting aerobic activity guidelines (68.9%). Median sitting time was 4.5 hours per day, and optimal sleep duration was reported by most participants (68.9%). The median BMI was 25.14 kg/m², placing the average participant just above the threshold for overweight status, with participants classified as normal weight (45.5%), overweight (36.4%), or obese (18.2%). The prevalence of non-communicable diseases (NCDs) among participants was generally low. The median number of NCDs per participant was 0 (range: 0–1), with individual disease conditions reported as follows: hypertension and arthritis were the most common, affecting 12.1% of participants each, followed by obesity (9.1%), other NCDs (6.8%), diabetes (4.5%), mental illness (3.8%), and heart disease (2.3%). Moreover, multimorbidity was low (12.1% had ≥ 2 non-communicable diseases), with hypertension and arthritis being most common (12.1% each). Perceived general health was favorable (median score = 75), with over half rating their health as very good or excellent.

Table 3.3. Health behaviors and outcomes among community gardeners (N=132)

Characteristics	n (%) ^a	Median (IQR)	Min–Max
Health behaviors			
Fruit intake (cup-equivalent/day)	—	1.25 (0.5–2.0)	0.2–10
Meeting the daily recommended fruit intake	56 (42.4%)	—	—
Vegetable intake (cup-equivalent/day)	—	1 (0.5–2.0)	0.3–11.25

Characteristics	n (%)^a	Median (IQR)	Min–Max
Meeting the daily recommended vegetable intake	23 (17.4%)	—	—
Physical activity (Total Met-min/week) ^a		4489 (2620-7896)	720-19212
Physical activity level ^b			
Minimally active	36 (30 %)	—	—
Highly active	84 (70 %)	—	—
Physical activity ^b (Total minutes Aerobic PA)		270 (150–401)	30–900
Meets guideline for aerobic PA ^b	91 (76%)		
Meets guideline for both aerobic and muscle strengthening activities ^b	68 (57%)		
PA Perception			
Less active	9 (6.8%)	—	—
Same	52 (39.4%)	—	—
More active	71 (53.8%)	—	—
Total sitting (hours/day) ^c	—	4.5 (3-6)	1-13
Sedentary level ^c	—		
Low sedentary	50 (38.2%)	—	—
Moderate sedentary	71 (54.2%)	—	—
High sedentary	10 (7.6%)	—	—
Sleep (hours/night)	—	7 (6-8)	5-10
Below optimal (Less than 7 hours)	39 (29.5%)	—	—
Optimal (7-9 hours)	91 (68.9%)	—	—
Above optimal (More than 9 hours)	2 (1.5%)	—	—
Health Outcomes			
BMI (kg/m ²)	—	25.14 (22.31-28.90)	18.75-50.03
Weight status			
Normal weight	60 (45.5%)	—	—
Overweight	48 (36.4%)	—	—
Obese	24 (18.2%)	—	—
Number of NCDs	—	0 (0-1)	0-5
Has Hypertension	16 (12.1%)	—	—
Has Obesity	12 (9.1%)	—	—
Has Diabetes	6 (4.5%)	—	—
Has Heart Disease	3 (2.3%)	—	—
Has Arthritis	16 (12.1%)	—	—

Characteristics	n (%)^a	Median (IQR)	Min–Max
Has Mental Illness	5 (3.8%)	—	—
Has Other NCDs	9 (6.8%)	—	—
Multimorbidity			
No (0–1 conditions)	116 (87.9%)	—	—
Yes (≥ 2 conditions)	16 (12.1%)	—	—
Perceived General Health Score	—	75 (65-90)	40-100
Excellent: ≥ 92.13	29 (22%)	—	—
Very Good: 75.94–92.12	32 (24.2%)	—	—
Good: 59.75–75.93	54 (40.9%)	—	—
Fair: 43.56–59.74	16 (12.1%)	—	—
Poor: ≤ 43.55	1 (0.8%)	—	—

Note. ^aPercentages are calculated based on the number of valid (non-missing) responses, not from the full sample. ^bn = 120. ^cn = 131.

3.4.2 Group differences in health behaviors and outcomes by sociodemographic factors and community garden involvement

To compare physical health behaviors and health status across different sociodemographic groups and levels of community gardening involvement, a series of non-parametric group comparisons were conducted. Kruskal-Wallis H tests were utilized to evaluate differences among independent variables with three or more categories (e.g., age, education, income, and gardening involvement). For significant overall models, Dunn-Bonferroni post-hoc tests were applied to identify exactly which groups differed from one another. Mann-Whitney U tests were employed to compare dichotomous group which is sex. To ensure clarity, Table 3.4 highlights only the statistically significant group differences ($p < .05$), utilizing inequality symbols to explicitly map the direction of the post-hoc findings. All other evaluated group comparisons between sociodemographic factors and health outcomes did not significantly differ.

3.4.2.1 Fruit and vegetable intake

Fruit intake did not significantly differ across any demographic or CG involvement groups. Median intake ranged from approximately 1.0 to 1.79 cups per day, and no statistically significant differences were observed by age ($p = .874$), education ($p = .402$), income ($p = .163$), sex ($p = .773$), or community garden involvement ($p = .295$).

In contrast, differences in vegetable intake emerged for two comparisons. Female participants consumed significantly more vegetables than male participants (2.0 vs. 1.0 cups/day, $p = .013$). Community garden involvement was also associated with vegetable intake; individuals with high involvement reported significantly higher consumption (median = 2.0 cups/day) than those with low or moderate involvement ($p = .028$). No significant differences in vegetable intake were observed across age, education, or income levels.

3.4.2.2 Physical Activity and Sedentary behavior

Physical activity levels varied by education and sex. Participants with advanced degrees reported lower levels of total weekly MET-minutes compared to those without a degree and those with at least a college degree ($p = .002$). Additionally, males reported significantly higher physical activity than females ($p = .012$). No significant differences in physical activity were found across age ($p = .392$), income ($p = .471$), or garden involvement ($p = .246$).

Sitting time did not vary significantly across any groups. Median sitting ranged from 4 to 5 hours per day, with no meaningful differences detected by age (p

= .941), education ($p = .213$), income ($p = .944$), sex ($p = .063$), or community garden involvement ($p = .794$).

3.4.2.3 Sleep

Hours of sleep varied by education and income. Participants with at least a college degree or an advanced degree reported significantly more sleep (median = 7 hours) compared with those without a degree (median = 6 hours; $p = .008$). Income was also related to sleep duration, with low-income participants reporting more sleep (median = 8 hours) compared with high-income participants (median = 7 hours; $p = .008$).

No statistically significant differences in sleep duration were observed based on age ($p=0.50$), sex ($p = .157$) and community garden involvement ($p = .087$).

3.4.2.4 Weight Status

BMI differed significantly by age group ($p = .017$). Midlife adults (35–64 years) had higher BMI than young adults (18–34 years), while older adults (≥ 65 years) did not differ from either group. No statistically significant differences in BMI were observed based on education ($p = .870$), income ($p = .624$), sex ($p = .920$), or community garden involvement ($p = .077$).

3.4.2.5 Presence of non-communicable diseases

The number of reported NCDs differed significantly by age group ($p < .001$). Older adults reported a higher number of NCDs (median = 1) compared with both young and midlife adults, who typically reported none. No significant differences in

NCD prevalence were observed across education ($p = .128$), income ($p = .183$), or sex ($p = .070$) and community garden involvement ($p = .050$).

3.4.2.6 Perceived general health

Perceived general health scores did not significantly differ across any demographic or CG involvement groups. Median score ranged from 65 to 90 , and no statistically significant differences were observed by education ($p = .089$), age ($p = .089$), income ($p = .182$), sex ($p = .733$), or community garden involvement ($p = .132$).

Table 3.4. Summary of significant group comparisons for health outcomes and behaviors

Grouping Variable	Health Outcome and Behaviors	Test Statistic	p	Significant Group Differences (Medians)
Age Group	BMI (kg/m ²)	$\chi^2 = 8.10$	.017	Midlife (25.97) > Young adults (24.36)
	Number of NCDs	$\chi^2 = 29.42$	<.001	Older (1) > Midlife (0) & Young adults (0)
Education level	Physical activity (Total Met-min/week)	$\chi^2 = 12.25$	.002	Without degree (4959) & College (4713) > Advanced (3672)
	Sleep (Hours)	$\chi^2 = 9.62$	.008	College (7) & Advanced (7) > Without degree (6)
Income level	Sleep (Hours)	$\chi^2 = 9.66$	.008	Low income (8) > High income (7)
Gender	Vegetable intake (cup/day)	$U^2 = 2715$	.013	Females (2.0) > Males (1.0)
	Physical activity (Total Met-min/week)	$U^2 = 1322$	.012	Males (4959) > Females (3928)
CG Involvement Level	Vegetable intake (cup/day)	$\chi^2 = 7.15$	.028	High involvement (2.0) > Low involvement (1.0)

Note. χ^2 represents the Kruskal-Wallis H statistic; U represents the Mann-Whitney U statistic. Values in parentheses denote medians. Post-hoc comparisons were evaluated using Dunn-Bonferroni tests. The ">" symbol indicates a statistically significant difference in median ranks between the specified groups. Only statistically significant relationships ($p < .05$) are displayed.

3.4.3 Community gardening involvement and health outcomes

A two-block hierarchical regression analyses were used to examine the crude and adjusted association of frequency of community gardening involvement with health outcomes and health behaviors, including daily fruit intake, vegetable intake, and physical activity. However, neither the bivariable block nor the multivariable block achieved statistical significance for any of the behavioral outcomes (all overall model $p > .05$), and they were thus excluded from tabular presentation. The frequency of community gardening involvement was categorized into three levels in this study: low (once a month or 2–3 times a month), moderate (once a week), and high (2–3 times a week or daily).

3.4.3.1 Perceived general health

A hierarchical multiple linear regression was conducted to evaluate the relationship between community gardening involvement and perceived general health (Table 3.5). In the unadjusted bivariable model (Model 1), frequency of community gardening involvement did not significantly predict general health scores. The inclusion of sociodemographic covariates in Model 2 yielded a statistically significant overall model fit and accounted for an additional 12% of the variance in general health scores ($\Delta R^2 = 0.12$). While community gardening involvement remained non-significant in the adjusted model, age and education emerged as significant independent predictors for this sample. Specifically, young adults ($B = 9.83$) and midlife adults ($B = 9.02$) reported significantly higher general health scores compared to older adults. Conversely,

individuals without a degree reported significantly lower general health scores compared to those with advanced degrees ($B = -18.44$).

Table 3.5. Hierarchical regression of perceived general health by community gardening involvement

Variables	Model 1 (Bivariable Relationship)	Model 2 (Multivariable Relationship)
	B (95% CI)	B (95% CI)
CG involvement		
Low-High	-5.97 (-12.76, 0.82)	-3.16 (-10.01, 3.67)
Moderate-High	-6.44 (-13.65, 0.76)	0.49 (-6.71, 7.69)
Covariates		
Gender (female-male)	—	-5.54 (-11.23, 0.13)
Age		
Young adult-Older adult	—	9.83 (0.95, 18.71)*
Midlife-Older adult	—	9.02 (0.83, 17.22)*
Education		
No degree-advanced degree	—	-18.44 (-27.54, -9.34)*
College degree-advanced degree	—	-0.004 (-6.38, 6.37)
Income		
Low-High	—	0.76 (-5.89, 7.40)
Middle-High	—	-2.46 (-9.97, 5.05)
Model fit		
R ² / Adj. R ²	0.04	0.23/0.16*
ΔR ²	—	0.12

Note. B values are unstandardized coefficients with 95% confidence intervals. Model 1 includes frequency of gardening involvement only. Model 2 adjusts for gender, age, education level, and income; $p < 0.05^*$

3.4.3.2 Body Mass Index

A similar hierarchical linear regression was performed to assess the crude and adjusted association between community gardening involvement and BMI (Table 3.6).

The unadjusted model (Model 1) containing only community gardening involvement was not a significant predictor of BMI. Adjusting for demographic covariates in Model 2

significantly improved the overall model fit, accounting for an additional 5% of the variance ($\Delta R^2 = 0.05$). However, within the multivariable model, neither community gardening involvement nor the individual sociodemographic covariates (gender, age, education, and income) emerged as statistically significant independent predictors of BMI.

Table 3.6. Hierarchical regression of BMI by community gardening involvement

Variables	Model 1 (Bivariable Relationship)	Model 2 (Multivariable Relationship)
	B (95% CI)	B (95% CI)
CG involvement		
low-high	1.99 (-0.49, 4.48)	-0.94 (-1.68, 3.56)
moderate-high	1.53 (-1.10, 4.17)	1.72 (-1.02, 4.47)
Covariates		
Gender (female-male)	—	0.42 (-1.75, 2.59)
Age		
Young adult-Older adult	—	-2.54 (1.71, -5.83)
Midlife-Older adult	—	1.14 (-2.00, 4.28)
Education		
No degree-advanced degree	—	-0.25 (-3.7, 3.2)
College degree-advanced degree	—	-2.35 (-4.80, 0.09)
Income		
Low-High	—	1.07 (-1.47, 3.61)
Middle-High	—	-0.47 (-3.35, 2.40)
Model fit		
R ² / Adj. R ²	0.02	0.14/0.07*
ΔR^2	—	0.05

Note. B values are unstandardized coefficients with 95% confidence intervals.

Model 1 includes frequency of gardening involvement only. Model 2 adjusts for gender, age, education level, and income; $p < 0.05^*$

3.4.3.3 Presence of non-communicable diseases

To appropriately analyze count data, a hierarchical Poisson regression was utilized to assess the crude and adjusted association of community gardening involvement with the number of NCDs (Table 3.7). In the unadjusted bivariable model, low community gardening involvement was associated with a higher incidence rate of NCDs compared to high involvement (IRR = 2.07). Adjusting for sociodemographic factors (Model 2) significantly improved model fit over Model 1 (Analysis of Deviance $p < .001$). In this multivariable model, the effect of low gardening involvement lost significance, but moderate community gardening involvement emerged as a significant protective factor, demonstrating a 74% lower incidence rate of NCDs compared to high involvement (IRR = 0.26). Furthermore, age and education were highly significant covariates. Similar to the result of the group comparisons analysis, younger adults and midlife adults had significantly lower incidence rates of NCDs compared to older adults. Moreover, those with a college degree had lower rates of NCDs than those with an advanced degree. Alternatively, participants without a degree experienced a significantly higher rate of NCDs (IRR = 2.63) compared to the advanced degree reference group.

Table 3.7. Hierarchical Poisson regression of non-communicable diseases by community gardening involvement

Variables	Model 1 (Bivariable Relationship)	Model 2 (Multivariable Relationship)
	IRR (95% CI)	IRR (95% CI)
CG involvement		
Low-High	2.07 (1.19, 3.64)*	0.63 (0.31, 1.27)
Moderate-High	0.52 (0.19, 1.20)	0.26 (0.09, 0.67)*
Covariates		
Gender (female)	—	1.44 (0.84, 2.51)
Age		
Young adult- Older adult	—	0.03 (0.01, 0.11)*
Midlife-Older adult	—	0.32 (0.16, 0.62)*
Education		
No degree-advanced degree	—	2.63 (1.02, 6.30)*
College degree-advanced degree	—	0.35 (0.16, 0.71)*
Income		
Low-High	—	1.24 (0.69, 2.22)
Middle-High	—	0.43 (0.14, 1.08)
Model fit		
Residual Deviance	167.00	105.09
Δ Deviance (χ^2)	—	61.91***

Note. IRR = Incidence Rate Ratio. 95%CI = 95% Confidence Interval. Model 1 evaluates the unadjusted effect of community gardening involvement. Model 2 adjusts for gender, age, education, and income. The inclusion of sociodemographic covariates in Model 2 significantly improved model fit over Model 1 (Analysis of Deviance $p < .001$). * $p < .05$. *** $p < .001$

3.5 Discussion

3.5.1 Characteristics of urban community gardeners in Kansas

The 132 gardeners included in this study had a median age of 39 years, representing predominantly young and midlife adults. This group of gardeners is somewhat younger than participants in community gardening studies conducted in Salt Lake City, Utah, and Denver, Colorado, where the mean age of gardeners was typically in the mid-40s (Zick et al., 2013; Litt et al., 2011). Gender distribution in the present study was nearly equal, with women comprising 48% of participants. This contrasts with prior cross-sectional studies in Denver, where 68% of gardeners were female (Litt et al., 2011), a more recent Denver based study reporting 80% female participation (Litt et al., 2023), and a study in San Jose, California, in which 84% of participants were women.

Most participants in this study identified as White (74%), which is similar to but somewhat higher than the racial composition reported in studies conducted in St. Louis, Missouri (65% White), San Jose, California (54% White), and Denver, Colorado (57%) (Wong et al., 2018; Zick et al., 2013; Litt et al., 2011). Educational attainment was also high among gardeners in this study, with approximately 74% holding at least an undergraduate degree. This proportion exceeds those reported in several previous studies (Algert et al., 2016; Delshad, 2022; Alaimo et al., 2024).

Additionally, gardeners in this sample tended to have higher household incomes, with nearly one third reporting annual earnings of \$100,000 or more. This represents a greater proportion of high-income participants compared with the gardeners interviewed by Delshad (2022) across 10 U.S. cities, where only 15% reported annual family incomes of at least \$100,000. As a whole, the community gardeners from urban Kansas in this

study exhibited distinct demographic characteristics, reflecting a relatively younger, more socioeconomically advantaged, and predominantly White sample when compared with many previous studies of community gardening.

3.5.2 Health behaviors and non-communicable diseases

3.5.2.1 Fruit and vegetable intake

Dietary adherence to recommended guidelines was low among community gardeners in this study. Participants reported a median daily fruit intake of 1.25 cup-equivalents, with fewer than half (42.4%, $n = 56$) meeting recommended daily intake levels. Vegetable consumption was even lower, with a median intake of 1.0 cup-equivalent per day and only 17.4% ($n = 23$) meeting established guidelines.

These findings contrast with prior research. Algert et al. (2016) reported that community gardeners consumed approximately 2 cups of vegetables per day, increasing to as much as 4 cups during the harvest season. Similarly, a randomized controlled trial by Litt et al. (2023) found that participants in the community gardening intervention consumed more than 4.5 cup-equivalents of fruits and vegetables per day across multiple follow-up periods. Earlier work by Litt et al. (2011) also reported substantially higher dietary adherence, with 56% of community gardeners meeting Healthy Eating Index recommendations of consuming fruits and vegetables at least five times per day. Overall, fruit and vegetable intake among community gardeners in the present study was lower than that reported in previous literature.

Despite these differences, intake among community gardeners remained higher than that observed in the general Kansas adult population. In this cohort, 42% met fruit

intake recommendations and 17% met vegetable intake recommendations, compared with 2015 Kansas estimates of 10% and 8.1%, respectively (Lee-Kwan et al., 2017).

Vegetable intake also differed by gender, with female participants consuming more vegetables than males (2.0 vs. 1.0 cups per day, $p = .013$), which is consistent with national BRFSS findings showing higher vegetable consumption among U.S. adult females (Lee-Kwan et al., 2022).

At the bivariate level, community garden involvement was associated with vegetable intake, as participants with high involvement reported significantly higher consumption (median = 2.0 cups per day) compared with those with low or moderate involvement ($p = .028$). However, this relationship was no longer significant after adjusting for sociodemographic covariates in multivariable regression models. This suggests that variation in fruit and vegetable intake was not independently explained by gardening participation alone. Moreover, although a greater proportion of community gardeners met recommended fruit and vegetable intake levels compared with the Kansas adults average, the rate of adequate vegetable consumption remains critically low. These findings suggest that community gardening may contribute to healthier dietary patterns but is not sufficient on its own. The fact that more than 80% of participants, despite being actively engaged in gardening and possessing strong food preparation skills, failed to meet vegetable intake recommendations underscores the persistent challenges of maintaining a healthy diet in neighborhoods with limited access to fresh food.

Together, these findings point to a notable gap between participants' favorable food environments, high cooking confidence, and actual dietary behaviors. Although 88.7% and 75.0% reported strong confidence and skills in preparing fruits and

vegetables, only 17.4% met daily vegetable intake recommendations. This gap reflects the difference between perceived skill and actual consumption. High cooking confidence is often supported by convenience items such as pre-packaged meal bases and sauces, which save time but typically include insufficient vegetable volume to meet the recommended 2 to 3 cups per day (Wolf et al., 2023). Time constraints further limit healthy eating. Preparing fresh produce requires substantial effort, and daily fatigue or busy schedules often lead individuals to choose faster, calorie-dense options, even when they have the skills and access to cook (Raber et al., 2020). Access alone is also insufficient. While 96.2% of participants lived within 20 minutes of a community garden, social factors such as household preferences and cultural norms influence food choices. Garden participation may also be driven by recreation, stress relief, or social connection rather than food consumption (Caspi et al., 2012; Kingsley et al., 2019). Together, these structural, social, and motivational barriers limit the translation of access and skills into improved dietary behavior.

3.5.2.2 Physical activity and sedentary behaviors of the community gardeners

Participants exhibited high physical activity levels, with all classified as active and 76% meeting aerobic activity guidelines. However, a lower proportion (57%) met the guideline for both aerobic and muscle strengthening activities. Nevertheless, this result is still better compared to the proportion of US adults meeting aerobic guidelines in 2020 (47%) and guidelines for both aerobic and muscle-strengthening activities (24.2%) (Elgaddal et al., 2022). These finding aligns with the result of the RCT in Denver where community gardening participants showed a significant increase

in their moderate-to-vigorous physical activity (~6 extra minutes/day of MVPA compared with the control group), although sedentary time remained unchanged (Litt et al., 2023). Similarly, an eight-week gardening program for African American women produced measurable increases in daily step counts, rising from 4,938 steps at baseline to 5,819 steps after the intervention, along with indications of increased light-intensity activity (Canton et al., 2025).

The high level of physical activity reported by community gardeners in this study was reflected in their subjective self-assessments. Most participants (53.8%) accurately perceived themselves as being more active than average, while only a small proportion (6.8%) viewed themselves as less active. This favorable physical activity profile was accompanied by generally low levels of sedentary behavior. Participants reported a median sitting time of just 4.5 hours per day, which is substantially lower than the average sedentary time among U.S. adults, estimated at 9.5 hours per day (Matthews et al., 2021). Consistent with this finding, the majority of gardeners were classified as having moderate (54.2%) or low (38.2%) sedentary behavior, and only 7.6% of the sample exhibited highly sedentary patterns.

Physical activity varied by sex and education. Males were more active than females ($p = .012$), a pattern consistent with 2020 data indicating that a higher proportion of U.S. adult men (28.3%) than women (20.4%) met guidelines for both aerobic and muscle-strengthening activities (Elgaddal et al., 2022). Moreover, participants with advanced degrees reported lower total weekly MET-minutes than those with less education ($p = .002$). This finding is similar with the results of a large national cohort study in Sweden, which showed that adults with higher educational attainment spent less

time in light-intensity physical activity and sedentary behavior compared with those with lower education levels (Regan et al., 2025).

No significant differences in physical activity were observed by age, income, or community garden involvement. Sitting time did not differ significantly across any demographic or gardening groups. This indicates that within the current sample, variance in physical activity behaviors is not significantly explained by community gardening participation or the primary demographic factors such as age and income.

3.5.2.3 Amount of sleep

Sleep is a critical determinant of physical health, as habitual sleep durations of fewer than seven hours per night have been associated with numerous adverse health outcomes, including obesity, diabetes, hypertension, cardiovascular disease, stroke, depression, and increased all-cause mortality (Watson et al., 2015). In the present study, most community gardeners (68.9%) reported an optimal sleep duration of seven to nine hours per night.

Despite this generally favorable pattern, sleep duration differed significantly by education and income. Gardeners with at least a college degree reported longer sleep durations than those without a degree, and lower-income gardeners reported more sleep than higher-income participants (both $p = .008$). These findings are partly consistent with those of Wetzel and Bilal (2024), who reported that U.S. adults with higher educational attainment had a significantly lower prevalence of insufficient sleep. However, in contrast to the results of this study, Wetzel and Bilal (2024) found that lower-income adults experienced a higher prevalence of insufficient sleep than their higher-income

counterparts. No significant differences in sleep duration observed by sex or community garden involvement.

3.5.2.4 Weigh status and presence of non-communicable diseases

Physical health outcomes among community gardeners in this study were generally favorable. The reported median BMI (25.14 kg/m²) was slightly above the lower threshold of the overweight category. Obesity prevalence among community gardeners was moderate to high, at 9.1% based on self-reported obesity diagnoses and 18.1% based on BMI calculated from self-reported weight and height. This discrepancy suggests that BMI derived from self-reported anthropometric data may reflect overestimated weight that is not evident in clinical diagnoses of obesity. However, this observation contrasts with prior research indicating that BMI calculated from self-reported data tends to underestimate BMI relative to measured values in national surveys (Flegal et al., 2019). Despite this discrepancy, obesity prevalence among community gardeners in this study remained substantially lower than the national adult prevalence of 40.3% reported for 2021–2023 (Emmerich et al., 2024).

Hierarchical linear regression analyses indicated that community gardening involvement was not independently associated with BMI. Although the inclusion of demographic covariates significantly improved overall model fit and explained an additional 12% of the variance in BMI, neither community gardening involvement nor individual sociodemographic characteristics (gender, age, education, and income) emerged as statistically significant predictors in the fully adjusted model. These findings suggest that, within this sample, BMI may be influenced by broader unmeasured factors beyond gardening participation and basic demographic characteristics.

Nevertheless, group comparison revealed that BMI differed significantly by age group ($p = .017$). Midlife adults (35–64 years) exhibited higher BMI compared with young adults, while older adults did not differ significantly from either group. This age-related pattern closely mirrors national trends, which show higher obesity prevalence among adults aged 40–59 relative to those aged 20–39 or adults aged 60 and older (Emmerich et al., 2024).

Multimorbidity among community gardeners in this study was substantially lower than the national prevalence of multiple chronic conditions (MCCs) among U.S. adults, which has been estimated at 51.4% (Watson et al., 2025). Only a small proportion of gardeners in this sample, 12.1%, reported having two or more NCDs. As expected, older adults had a significantly higher number of NCDs compared with both young and midlife adults, who typically reported none. This age-related pattern is consistent with findings reported by Watson et al. (2025), who showed that the highest prevalence of MCCs occurred among older adults at 78.8%, representing 47.2 million individuals in the U.S. population. In contrast, MCC prevalence was 27.1% among young adults and 52.7% among midlife adults.

Overall, the prevalence of non-communicable diseases in this study was low, with a median of zero conditions reported. The prevalence of individual conditions was below 7% for most diseases, except for hypertension and arthritis. The most common conditions are hypertension (12.1%) and arthritis (12.1%), while severe metabolic and cardiovascular conditions like diabetes (4.5%) and heart disease (2.3%) are exceptionally low. These estimates remain considerably lower than those observed in the general U.S. adult population, where the prevalence of hypertension is approximately 48.1% (CDC,

2025), diabetes is 14.9% among adults (CDC, 2026), heart disease affects 5.5% of U.S. adults (CDC, 2023), and the age-adjusted prevalence of arthritis is 18.8% (Elgaddal et al., 2024).

A hierarchical Poisson regression was conducted to assess the IRR of NCDs. In the bivariable model (Model 1), low community gardening involvement was associated with a significantly higher rate of NCDs compared to high involvement (IRR = 2.07, 95% CI [1.19, 3.64]). However, upon adjusting for sociodemographic covariates in Model 2, this effect was fully attenuated and lost statistical significance (IRR = 0.63, 95% CI [0.31, 1.27]), indicating that initial differences were driven by underlying demographic disparities, particularly, these community gardeners are highly educated, higher-income, and relatively young (median age 39).

Notably, after controlling for sociodemographic covariates, individuals with moderate community gardening involvement (i.e., once a week) exhibited a 74% lower incidence rate of NCDs compared to the high-involvement reference group (IRR = 0.26, 95% CI [0.09, 0.67]). This non-linear relationship suggests that while a regular, moderate 'dose' of gardening may confer optimal protective health benefits, the higher incidence of NCDs among the most frequent gardeners (i.e. more than once a week or daily) likely reflects a therapeutic self-selection bias. Specifically, individuals already managing multiple chronic conditions may intentionally increase their garden visits to utilize the space for gentle physical rehabilitation, stress reduction, and social support which is supported by Thompson (2018) as he reported the restorative or therapeutic effect of exposure to green space and regular gardening. In this context, high garden involvement acts as a method of chronic disease management rather than primary prevention.

On the other hand, Model 2 revealed that older age and lower educational attainment were the true drivers of the differences in NCD accumulation among the community gardeners. The higher NCD burden observed among older participants reflects the unavoidable realities of the lifecourse, where the prevalence of multimorbidity naturally increases with biological aging and cumulative physiological 'wear and tear' (Barnett et al., 2012). Parallel to this, education impacts long-term health independently of income by shaping both health literacy and lifelong occupational trajectories (Zajacova & Lawrence, 2018). Moreover, individuals without college degrees are disproportionately exposed to physically demanding labor, delayed preventative care, and chronic stress. Over a lifetime, these structural stressors compound the body's allostatic load, directly accelerating the onset of conditions like arthritis and hypertension (Guidi et al., 2021).

3.5.2.5 Perceived health status among community gardeners

Health status refers to individuals' self-assessment of their overall health and is commonly measured in population-based surveys and surveillance systems using common response categories, including excellent, very good, good, fair, or poor. In this study, perceived general health among gardeners remained consistently high, with 87.1% of participants rating their health as "Good," "Very Good," or "Excellent" (median score = 75). Moreover, perceived health status in this study did not differ significantly across demographic groups or levels of community gardening involvement, with median scores ranging from 65 to 90. Regression analyses further indicated that gardening frequency was not a significant predictor of general health; however, sociodemographic factors

explained an additional 19% of the variance in general health scores ($\Delta R^2 = 0.19$). In particular, younger and midlife adults reported significantly higher general health scores than older adults, while individuals without a degree reported lower scores compared to those with advanced degrees. These findings align with national data from the National Health Interview Survey, which show a clear age-related decline in perceived health, with the highest prevalence of fair or poor health reported among adults aged 65 and older (CDC, 2023).

It can also be noted from this study that the high positive self-assessment of health among these gardeners is firmly grounded in their low actual incidence of chronic disease. An almost identical proportion of the sample (87.9%) reported an absence of multimorbidity (having 0 or 1 NCD). Interestingly, there is a striking parallel at the lower end of the health spectrum: there are 12.9% of the gardeners who rated their health as "Fair" or "Poor" which mirrors the proportion of participants experiencing multimorbidity (≥ 2 conditions) at 12.1%. Overall, results suggest that for this sample of community gardeners, the absence of symptomatic, diagnosed chronic diseases is a strong driver of perceived wellness.

While these findings provide valuable insights, several limitations should be considered when interpreting the results of this study. First, the survey included only the community garden participants and did not include a non-gardening comparison group, increasing the potential for selection bias and the healthy participant effect. As a result, it is unclear whether community gardening itself contributes to improved health outcomes or whether individuals with healthier behaviors and health profiles are more likely to participate in gardening activities. Moreover, the reliance on self-reported data for key

behavioral and anthropometric variables, including dietary intake, physical activity, height, and weight, also introduces the possibility of recall and social desirability biases. Finally, only 4% of the ‘parent’ survey responses were retained for the final analysis of this study component. The high prevalence of excluded invalid responses suggests vulnerabilities in online recruitment, and this raises the possibility that some remaining responses could still contain undetected inaccuracies.

3.6 Conclusions

In summary, the urban community gardeners in this study demonstrated highly favorable physical health outcomes that closely aligned with their strong perceived general health. Compared to national averages, participants exhibited substantially lower rates of obesity, individual NCDS and overall multimorbidity. While initial bivariate analyses suggested uniform health perceptions across the cohort, multivariable models revealed a more nuanced reality: for both perceived health and total number of NCDs, the frequency of garden involvement factor was dominated by the heavy influence of baseline sociodemographic. Specifically, younger age and higher educational attainment emerged as the primary, independent drivers of overall well-being. However, the specific emergence of moderate gardening involvement as a highly protective factor against NCDs suggests that sustainable, balanced participation in urban community gardening, working in tandem with favorable social determinants, fosters a uniquely protective environment for long-term health. Ultimately, these findings indicate that the health benefits of community gardening are deeply intertwined with not only how often individuals participate, but who is using the space and for what underlying therapeutic purpose.

Chapter 4 - Community Gardening in an Urban Context: A Qualitative Study on Participation Motivations and Perceived Impacts on Health Among Adults in a Small Urban Area

4.1 Introduction

Rapid urbanization has intensified public health challenges related to diet quality, physical activity, and chronic disease prevention. By 2050, an estimated 68% of the global population will reside in urban areas, with the United States projected to reach 89% urbanization (Center for Sustainable Systems, 2024). This trend is reflected in Kansas, where urban county populations continue to grow and now account for over half of the state's residents, including Riley County, one of the most densely populated counties (Kansas Health Matters, n.d.).

Community gardens represent a central and widely studied form of urban agriculture, providing shared spaces where residents collectively grow food. In addition to strengthening local food systems, community gardens have been associated with multiple health benefits, including improved nutrition, increased physical activity, and stronger social connections.

Research consistently demonstrates that community gardening can improve food security and dietary behaviors. Participation in community gardens has been linked to higher fruit and vegetable intake compared to non-participation (Alaimo et al., 2008; Barnidge et al., 2013), with recent research showing greater inclusion of seasonal produce in gardeners' diets (Alaimo, 2023). Improved access to fresh produce through

community gardening is particularly meaningful in urban settings where healthy food options may be limited. Studies also suggest that urban gardens contribute to more diverse diets and improved food security among participants and their households (Audate et al., 2018). These dietary benefits are especially relevant given that only a small proportion of U.S. adults meet recommended fruit and vegetable intake levels (Lee et al., 2022).

Community gardens may also influence other lifestyle behaviors related to chronic disease risk. Sedentary behavior and inadequate physical activity are associated with obesity, cardiovascular disease, and type 2 diabetes (Henson et al., 2023), yet only about half of U.S. adults meet recommended aerobic physical activity levels (Fulton et al., 2016). Gardening involves regular light- to moderate-intensity physical activity and has been linked to enjoyment, stress reduction, and improved well-being. In Riley County, where a substantial share of residents are overweight and chronic diseases such as heart disease and cancer remain leading causes of death (Kansas Department of Health and Environment, 2022), understanding the potential role of community gardens in supporting healthier behaviors is particularly important.

Despite growing evidence linking community gardening to positive health outcomes, much of the existing research emphasizes large metropolitan areas and relies primarily on quantitative measures. As a result, there is limited understanding of how individuals in smaller urban settings perceive and experience the benefits of community gardening. This absence of qualitative, place-specific research limits the ability of public health practitioners and community organizations to design garden programs that reflect local needs and social contexts.

To address this gap, the present study uses a qualitative narrative approach to explore the lived experiences of community gardeners at a specific site in Manhattan, Kansas. By centering gardeners' perspectives, the study examines whether health-related benefits widely reported in the literature, including improved dietary practices, increased physical activity, positive physical health outcomes, and enhanced well-being, are evident in this local context. The findings contribute context-rich insight to the literature on community gardening and public health and inform future garden-based health promotion efforts in smaller urban communities.

4.1.1 Objectives

The aim of this study was to qualitatively explore the motives and perceived impacts of gardening on fruit and vegetable intake, physical activity, and overall health in a sample of gardeners in a community garden in Manhattan, Kansas. Specifically, this study aims to address three main questions:

1. What are the personal reasons given by people for participating in an urban community garden?
2. How do participants perceive the health benefits of engaging in community gardening?
3. How do participants perceive the role of community gardening in influencing their fruit and vegetable intake and physical activity habits?

4.2 Related literature

4.2.1 Motivations for participation in community gardening

Participation in community gardens is influenced by a range of interrelated motivations that extend beyond an interest in horticulture. Literature shows that individuals are drawn to community gardening for reasons related to emotional connections with nature, social interaction and community building, food access and material needs, health and well-being, cultural identity and neighborhood improvement, and education and knowledge exchange.

4.2.1.1 Emotional and personal connections to nature

Emotional attachment to nature is a foundational motivation for many community gardeners. In the study of gardeners in Melbourne, Australia, found that participants often traced their engagement with gardening to childhood experiences shaped by family traditions and early interactions with natural environments (Kingsley et al., 2019). These early experiences shaped enduring environmental values and a sense of stewardship that influenced participation later in life. Gardening provided a meaningful way for individuals to reconnect with nature, reinforce personal identities, and support emotional well-being through engagement with living systems.

4.2.1.2 Social interaction and sense of community

Social motivations consistently emerge as a key reason for participating in community gardens (Kingsley et al., 2019). According to Kingsley et al. (2019), many gardeners valued the social relationships developed within garden spaces even more than the act of cultivation itself. Gardens served as places where individuals could build

friendships, reduce social isolation, and experience a sense of belonging (Kingsley et al., 2019; Guitart et al., 2012). This social dimension was also evident in Austin, Texas, where Lee and Matarrita-Cascante (2019) found that community gardens strengthened social ties and mutual support across diverse populations. Participation in shared gardening activities generated collective feelings of ownership and pride, contributing to social cohesion and encouraging civic engagement within neighborhoods (Lee & Matarrita-Cascante, 2019; Guitart et al., 2012).

4.2.1.3 Food access and practical benefits

Food production remains a central and tangible motivation for involvement in community gardens. Armstrong (2000) documented that gardeners in Upstate New York frequently joined gardens to meet basic needs, particularly access to fresh and affordable fruits and vegetables. This motivation continues to be prominent, as Delshad (2022) found that improving access to fresh food was the most commonly reported reason for participation among community gardeners. In urban contexts where healthy food options may be limited, community gardens function as practical responses to food insecurity while also supporting household food self-provisioning and resilience (Armstrong, 2000; Delshad, 2022; Guitart et al., 2012).

4.2.1.4 Health, well-being, and enjoyment

Health-related motivations, including physical activity, mental health benefits, and enjoyment, play a significant role in sustaining participation in community gardening. Armstrong (2000) reported that gardeners frequently experienced emotional

benefits such as stress reduction, while Lee and Matarrita-Cascante (2019) identified community gardens as spaces that support health through physical movement, outdoor exposure, and social engagement. Quantitative findings from Delshad (2022) further indicated that 66.1% of gardeners participated to spend more time outdoors and 36.7% were motivated by opportunities for physical exercise.

Enjoyment operates as an affective component of health and well-being rather than as a separate motivation. Sonti and Svendsen (2018) described enjoyment as a personal process through which individuals experience pleasure, satisfaction, and emotional restoration while gardening. These positive emotional experiences contributed to improved mood, reduced stress, and a sense of accomplishment, reinforcing sustained participation in community gardening (Sonti & Svendsen, 2018; Armstrong, 2000). As such, enjoyment functions both as a pathway to and an outcome of improved mental and emotional health in community garden settings.

4.2.1.5 Cultural identity, personal history, and neighborhood improvement

Cultural identity and personal history also shape motivations for community garden participation. In a qualitative study of community gardeners in New York City, Sonti and Svendsen (2018) found that participants were motivated by connections to family heritage, cultural traditions, and broader community identities. Gardening allowed individuals to cultivate culturally meaningful crops and sustain traditional practices within an urban environment (Sonti & Svendsen, 2018). Additionally, participants expressed a strong desire to improve their neighborhoods through visible, hands-on efforts such as maintaining and beautifying shared garden spaces (Sonti & Svendsen,

2018). This motivation to enhance local environments generated feelings of pride, responsibility, and attachment to place, contributing to neighborhood revitalization and community development (Guitart et al., 2012).

4.2.1.6 Education and knowledge exchange

Educational opportunities and knowledge sharing represent another important motivational dimension. Sonti and Svendsen (2018) identified education as a distinct motivation among gardeners who valued opportunities to teach others about food production, sustainability, and cultural practices. Community gardens function as informal learning environments where experiential knowledge is exchanged across generations and social groups (Guitart et al., 2012; Sonti & Svendsen, 2018). These exchanges strengthen individual skills while also building collective capacity and resilience within communities (Guitart et al., 2012).

Overall, the literature demonstrates that community garden participation fulfill multiple, overlapping motivations. While food access and practical benefits may initially draw individuals to participate, continued involvement is strongly supported by health and well-being outcomes, including enjoyment, stress reduction, and social connection. Emotional ties to nature, cultural identity, educational opportunities, and neighborhood improvement further deepen engagement. Together, these motivations underscore the role of community gardens as multifunctional spaces that support individual well-being and broader community development (Armstrong, 2000; Guitart et al., 2012; Kingsley et al., 2019).

4.2.2 Evidence of health impacts of community gardening

4.2.2.1 Contribution of community gardening to physical health

Potential to improve nutritional status

Community gardens have been widely associated with positive influences on dietary habits and nutritional outcomes among participants. Qualitative research suggests that these benefits are closely tied to gardeners' preferences for self-grown produce and the meanings they attach to the gardening experience. Kingsley et al. (2009) found that gardeners strongly preferred fruits and vegetables they cultivated themselves, citing greater freshness, perceived nutritional value, and the absence of harmful chemicals compared to store-bought produce. These preferences were often linked to organic growing practices and a sense of self-sufficiency, which contributed to feelings of empowerment and increased health awareness. Additionally, Algert et al. (2016) highlighted the role of community gardens in enhancing food security and promoting the consumption of culturally diverse vegetables through increased agrobiodiversity.

Quantitative studies further support the association between community gardening and improved fruit and vegetable intake. Alaimo et al. (2008) reported that adults living in households with a community gardener consumed fruits and vegetables 1.4 times more per day and were 3.5 times more likely to meet the recommended daily intake of five servings. More recent findings by Alaimo et al. (2023) indicated that gardening was associated with increased seasonal eating and dietary changes driven by multiple motivations, including access to fresh produce, emotional connections to plants, pride, self-reliance, and opportunities to try new foods. Similarly, Litt et al. (2011) found that gardeners in Denver consumed fruits and vegetables more frequently than non-gardeners.

Beyond dietary quality, community gardens have also been shown to influence food access and affordability. Johnson and Smith (2006) reported that more than half of participants in Moses Lake, Washington increased their fruit and vegetable consumption during garden participation, with many using the garden to help stretch their food budgets. Delshad (2022) likewise found that 61.2% of respondents experienced an increase in produce intake due to involvement in community gardening. However, evidence across studies is not entirely consistent. Brown et al. (2022) reported no significant changes in motivation or readiness to improve fruit and vegetable intake, while Booth et al. (2017) suggested that gardening frequency may shape outcomes, with occasional gardeners demonstrating greater dietary improvements than non-participants, potentially reflecting behavioral changes or selection effects.

Qualitative evidence enriches understanding of how community gardens influence eating behaviors. In a study by Beaver et al. (2019), gardeners described greater access to fruits and vegetables, superior taste and freshness of garden produce, emotional connections to food they had grown themselves, enjoyment of sharing produce with others, and a desire to avoid food waste as key reasons for consuming garden-grown foods. Together, these findings suggest that community gardens influence dietary behaviors not only through increased availability of fresh produce but also through experiential, emotional, and social mechanisms that shape food choices.

Contributes to increased physical activity

Community garden participation has been widely recognized as a contributor to increased physical activity, particularly through its integration into daily routines and

lifestyle changes. Algert et al. (2016) found that gardeners identified exercise as one of the top benefits of their involvement, alongside social interaction and learning from peers. Kingsley et al. (2009) echoed this in their qualitative study, where participants described gardening as physically engaging and therapeutic. Activities such as digging and bending were seen as beneficial for muscle strength and mobility, and many participants noted that walking or cycling to the garden added to their overall physical fitness. Research also supports the classification of gardening as a light to moderate-intensity physical activity. Hawkins et al. (2015) found that various gardening activities offer physical exertion ranging from light to moderately intense levels (1.9–5.7 METs), making them suitable for promoting fitness among healthy older adults. Lampert et al. (2021) summarized that regular gardening tasks can help older adults meet recommended guidelines for moderate physical activity. Bird (2004) emphasized that gardening is suitable for all fitness levels and can serve as a preventive health strategy by reducing the risk of cardiovascular disease. In a randomized controlled trial, found that community garden participants engaged in 5.8 more minutes of moderate-to-vigorous physical activity per day than non-participants, although no significant differences were observed in sedentary behavior (Litt et al., 2023). Similarly, Mangadu et al. (2017) reported that most gardeners in New Mexico experienced increased physical activity due to community garden involvement. Delshad (2021) reported that gardeners associated their improved well-being with being outdoors and staying active. Moreover, 80.5% of respondents agreed that gardening increased their time outdoors, and 69% reported increased physical activity (Delshad, 2022). These findings collectively suggest that community gardening promotes exercise and encourages healthier, more active lifestyles.

4.2.2.2 Contributions in the reduction of NCD risk

Community garden participation has shown potential in reducing risk factors associated with NCDs, particularly through improvements in physical health and lifestyle behaviors. Dyg et al. (2020) reviewed existing research and found that gardening may contribute to lower body weight and blood pressure, increased physical activity, and enhanced food knowledge. In a quasi-experimental study, researchers reported significant differences in BMI between gardeners and non-gardeners. Women gardeners had a BMI reduction of 1.84 and men 2.36, translating to approximately 11 and 16 pounds of weight difference, respectively. Furthermore, gardeners were notably less likely to be overweight or obese (46% for women and 62% for men) compared to their non-gardening neighbors (Zick et al., 2013). Despite these promising findings, not all studies have shown consistent results. Brown et al. (2022) conducted a feasibility study among Native American adults with prediabetes or diabetes and found no significant differences in BMI, blood pressure, or HgbA1C between community garden participants and non-participants.

4.2.3 Health impacts of community gardening beyond physical health

4.2.3.1 Role in reducing stress and promoting better mental health

Community garden participation has been widely associated with improved mental well-being and reduced stress. Spano et al. (2020) noted that the psychosocial benefits of gardening were especially evident in individualist societies like the United States, where personal well-being is often emphasized. Zinaic et al. (2025) further

emphasized that community gardens serve as affordable spaces for positive social interaction and emotional relief, offering healing through engagement with green spaces. These gardens were described as places of mindfulness, relaxation, and restoration, helping to alleviate anxiety and provide a break from daily stressors. Participants also reported feeling revitalized through their connection to nature, which was a key motivator for their continued involvement in gardening activities.

Additional studies reinforce the mental health benefits of community gardening across diverse populations. Dyg et al. (2020) found that gardening positively influenced individual self-esteem, independence, and personal control, particularly among refugees, while also strengthening social ties within communities. Delshad (2022) reported that 94.6% of survey respondents agreed that gardening improved their mood, and 61.9% cited mental health as a reason for joining. Booth et al. (2017) observed that both regular and occasional gardeners experienced better mental health, increased empowerment, and reduced distress. Similarly, Schanbacher and Cavendish (2023) found that community garden leaders in Central Florida viewed gardens as safe, outdoor refuges where individuals could relieve stress and connect with neighbors. Together, these findings highlight the role of community gardens as nurturing environments that support emotional resilience and mental wellness.

4.2.3.2 Developing and strengthening community and social ties

Community gardens play a vital role in fostering social connections and building a sense of community. Algert et al. (2016) found that gardeners valued not only the physical benefits of gardening but also the opportunity to spend time with neighbors,

friends, and family, which brought happiness and learning. Glover (2005) emphasized that community gardens are often more about cultivating relationships than plants, serving as hubs for social engagement and collective involvement. Similarly, Zinaic et al. (2025) described community gardens as spaces that generate social capital and empower individuals both personally and collectively.

Recent studies further demonstrate the social impact of community gardening. Dyg et al. (2020) found that gardens positively influence relationships and neighborhood cohesion. Delshad (2022) reported that 78.9% of gardeners felt more connected to their neighbors, and 86.3% believed their neighborhood's appearance improved due to the garden. Many participants also noted that gardens helped bridge racial and ethnic divides. Booth et al. (2017) observed that regular participants experienced a stronger sense of community than non-participants. In Moses Lake, Washington, Johnson and Smith (2006) found that gardens provided communal space for those lacking access at home, further enhancing social inclusion. Lastly, Litt et al. (2015) reported that gardening increased social involvement and perceptions of neighborhood aesthetics and collective efficacy, which were linked to better self-rated health. These findings collectively underscore the role of community gardens in strengthening social ties and enhancing communal well-being.

4.2.4 Gaps in literature

Despite a growing body of research on community gardens, several important gaps remain related to geographic representation, participant perspectives, and the contextual understanding of health impacts and health-related motivations. First, prior research has been

geographically concentrated, with a strong emphasis on large metropolitan areas, particularly along the East and West Coasts of the United States. Guitart et al. (2012) found that one-third of community garden studies were conducted in New York and surrounding areas, with an additional 20 % originating in California. Smaller proportions of studies focused on cities such as Flint and Detroit, Michigan, Denver, Colorado, Philadelphia , and St. Louis, Missouri, while relatively few studies examined other Midwestern or Southern states. More recent research continues this pattern, with studies centered in major urban areas including Denver, Colorado (Litt et al., 2023; Alaimo et al., 2023), New York City (Limerick et al., 2023), San Jose and Riverside, California (Algert et al., 2016; Heilmayr and Friedman, 2018), St. Louis, Missouri (Wong et al., 2018), and Austin, Texas (Ponstingel, 2023). As a result, the extent to which these findings can be applied to small- and medium-sized Midwestern cities remains unclear. This is particularly relevant for Kansas, where differences in population size, land use patterns, social networks, and local food environments may shape community gardening experiences in distinct ways. These limitations underscore the need for more place-specific research that reflects local urban contexts and lived experiences.

A second gap concerns the limited attention given to participants' own perspectives and interpretations of community gardening. While many studies document associations between community gardening and outcomes such as increased fruit and vegetable intake or physical activity (Hume et al., 2022), fewer studies explore how gardeners themselves understand these experiences. Much of the literature emphasizes measurable outcomes rather than the meanings participants assign to gardening, how they describe changes in their daily routines, or how they perceive the relationship between gardening and their overall well-

being. As a result, important experiential and contextual dimensions of community gardening in urban setting remain underexplored.

Finally, there is limited evidence regarding whether health considerations play a role in motivating individuals to participate in community gardens in the context of urban areas. Although health-related benefits such as improved diet, increased physical activity, and reduced stress are well documented, existing studies largely examine these benefits as outcomes rather than as factors influencing initial participation. Prior research suggests that motivations such as emotional connections with nature, social interaction and community building, food access and material needs, health and well-being, cultural identity and neighborhood improvement, and education and knowledge exchange are the drivers of involvement. However, it remains unclear whether participants consciously consider potential health benefits when deciding to join a community garden or whether such benefits are recognized only after participation begins. Addressing this gap requires qualitative inquiry that highlights participants' voices and explores how health motivations are constructed within specific local contexts.

4.2.5 Relevance to Current Study

The present study is designed to directly respond to key gaps identified in the existing literature on community gardening. First, by focusing on a community garden in Manhattan, Kansas, this research contributes place-based evidence from a small Midwestern city that has not been represented in prior studies. Given that much of the existing research emphasizes large metropolitan areas along the East and West Coasts, this localized focus enhances understanding of how community gardening operates within a distinct geographic, social,

and food environment, thereby improving the transferability of findings to similar small cities in the Midwest.

Second, this study addresses the limited attention given to participants' perspectives by adopting a qualitative research approach that foregrounds gardeners' lived experiences. Rather than emphasizing measurable outcomes alone, this research explores how individuals describe their motivations for participation and how they interpret the impacts of community gardening on their daily lives. By centering participants' voices, the study provides deeper insight into the meanings, perceptions, and contextual factors that shape engagement in community gardening.

Finally, the study responds to the lack of clarity regarding whether health considerations motivate participation in community gardens or are recognized primarily as outcomes of involvement. Through in-depth qualitative inquiry, this research examines how participants perceive the health benefits of gardening and how they understand its role in influencing fruit and vegetable intake, physical activity, and overall health. Specifically, the study seeks to answer the following research questions: (1) What personal reasons do individuals give for participating in an urban community garden? (2) How do participants perceive the health benefits associated with community gardening? and (3) How do participants perceive the role of community gardening in shaping their fruit and vegetable intake and physical activity habits. By addressing these questions, the study contributes nuanced, context-sensitive insights that complement existing quantitative findings and advance understanding of community gardening as a health-related practice within smaller urban settings.

4.3 Methodology

4.3.1 Research Design

This study employed a qualitative research design using narrative inquiry to explore community gardeners' motivations for participation and their perceived impacts of gardening on fruit and vegetable intake, physical activity, and overall health. Narrative inquiry focuses on understanding lived experience through the stories individuals tell and the meanings they assign to those experiences over time (Clandinin et al., 2016). This approach was particularly appropriate for examining how participants described their reasons for participating in community gardening and how they perceived changes in health behaviors within specific social and environmental contexts.

To provide contextual background on the community garden from which participants were recruited, an interview was conducted with the president of the Volunteer Advisory Board, which oversees the operation of the Manhattan Community Gardens, including the Riley Lane Garden, the site of this study. Information regarding the physical attributes of the garden, its operation, and the purpose and type of community garden was obtained (Appendix A).

4.3.2 Location

The community garden site for this study is located in Manhattan, Kansas. Manhattan, Kansas is classified as a small city, with an estimated population of 54,700 in 2024, 27,064 housing units, and a population density of 2,339.67 persons per square mile in 2020 (U.S. Census Bureau, n.d.). Manhattan is located in Riley County, which is

classified as a small metropolitan county under the 2024 Urban Influence Codes of the U.S. Department of Agriculture's Economic Research Service (ERS).

4.3.3 Participants

Nine participants were recruited using purposive sampling from the Riley Lane Community Garden. This site was designated as an urban community garden and served a diverse population of local residents. Participants recruited were gardeners at the site who were community members involved in planting, harvesting, and other related garden responsibilities. Eligible participants were identified and contacted by the researcher in collaboration with the garden's Board President.

Inclusion criteria were as follows: (1) returning gardeners (i.e., individuals who had participated in the garden for more than one growing season); (2) active engagement in gardening activities, defined as visiting the garden at least once per week during the growing season; (3) age 18 years or older; (4) physical ability to participate in gardening tasks; (5) living independently in the community (i.e., not residing in institutional settings); and (6) ability to speak and understand English.

The number of participants was deemed sufficient based on the principle of thematic saturation, which occurs when additional interviews no longer produce new substantive themes. Prior research indicates that in qualitative studies using narrative inquiry, saturation can often be reached with a small number of interviews. Guest et al. (2006) reported that saturation can occur as early as six interviews, while Hennink and Kaiser (2022) found that nine interviews are typically sufficient to capture comprehensive themes within a relatively homogenous study population. Therefore,

interviewing nine participants provided an adequate and rich dataset for exploring gardeners' motivations, perceived health impacts, and behavior changes.

4.3.4 Data Collection

During recruitment, the researcher provided potential participants with detailed information about the purpose of the study, study procedures, and inclusion criteria. Individuals who met the eligibility requirements and expressed interest in participation were invited to take part in the study. Written informed consent was obtained from participants prior to data collection. For the seven participants interviewed in person, consent was collected using a signed written consent form. For the two participants interviewed via telephone, informed consent was obtained electronically through an online consent form prior to the interview. Participants were informed of the incentive for participation, which consisted of a \$20 gift card provided upon completion of the interview.

Data were collected through in-depth, semi-structured interviews to elicit participants' narratives and lived experiences related to community gardening. This interview format allowed participants to provide open-ended responses while ensuring that key topics related to motivations for participation and perceived physical health impacts were systematically explored. Interviews were conducted by the researcher either face-to-face or by telephone, depending on participant preference and availability. All interviews were audio-recorded with participants' permission to ensure accurate capture of their narratives.

Individual interviews were conducted with active community gardeners to obtain rich, detailed accounts of their reasons for participating in the community garden, their experiences with gardening over time, and their perceptions of its influence on fruit and vegetable intake, physical activity, and overall health. Interviews followed a semi-structured interview guide (Table 4.1), which was developed based on the study's research questions and relevant literature. The interview guide was reviewed by two qualitative research advisers prior to data collection to ensure the questions were appropriate, relevant, and aligned with the study objectives. Following this review, the guide was pilot tested with four participants who shared similar characteristics with the target study population. The pilot testing helped assess the clarity, sequence, and comprehensibility of the questions. Feedback from both the advisers and pilot participants was used to revise the interview guide in order to improve the clarity, wording, and flow of the questions before the final data collection began. Most interviews lasted approximately 30–45 minutes. Audio recordings were transcribed verbatim and transcripts were reviewed for accuracy prior to analysis. All data were de-identified and securely stored in password-protected files accessible only to the research team. Recruitment and data collection continued until thematic saturation was achieved, defined as the point at which no new substantive themes emerged from successive interviews.

Table 4.1. Semi-structured interview guide

Main questions	Probe questions
What motivated you to start participating in this community garden?	Can you describe any personal or life experiences that influenced your decision? Were there any specific goals or expectations you had when you joined? How did you first hear about the garden, and what made you decide to get involved?
What motivates you to continue participating in the community garden over time?	What keeps you engaged or committed to the garden? Have your reasons for participating changed since you first joined the garden? If so, how?
In what ways, if any, has participating in the community garden affected your health?	Can you share any specific experiences where gardening impacts your health? Have you noticed any changes in your stress levels, mood, or overall well-being?
Has your involvement in the garden had any impact on your fruit and vegetable consumption? If so, could you describe it?	Have you noticed any changes in how often you eat fruits and vegetables since joining the garden? Has participating in the garden influenced the types of produce you include in your meals?
Has your involvement in the garden influenced your physical activity in any way? If yes, how so?	Has your overall level of physical activity changed since you started gardening? Can you describe any specific activities or routines you've adopted since joining the garden that you weren't doing before?
Concluding question: Is there anything else you would like to share about your experience with community gardening and how it has influenced your health?	

4.3.5 Data Analysis

Qualitative data from participant interviews were analyzed by the researcher using thematic analysis, adapting a deductive–inductive coding approach as described by Fereday and Muir-Cochrane (2006). An initial set of a priori codes and provisional themes was developed based on the study’s three research questions and relevant literature. This approach ensured that the analysis remained grounded in existing research on community gardening and public health while allowing for the incorporation of unanticipated insights emerging from participants’ lived experiences. The three research questions focused on: (1) motivations for participation in urban community gardening, (2) perceived health benefits of gardening, and (3) perceived influences of gardening on fruit and vegetable intake and physical activity behaviors.

Following development of the initial code set, the analysis proceeded directly to application of the initial codes. All interview transcripts were imported into Taguette, an open-source, web-based qualitative data analysis software, which was used to organize transcripts, apply codes (referred to as “tags”), retrieve coded excerpts, and export coded data for synthesis and reporting. Because Taguette does not support hierarchical coding structures, a structured tag-naming convention was used to maintain analytic clarity. Tags were labeled to reflect both the relevant research question and thematic content (e.g., Q3_IMPROVED_DIETARY_INTAKE, Q2_INCREASED_PHYSICAL_ACTIVITY). This approach facilitated consistent coding across transcripts and enabled clear grouping of findings during analysis and manuscript preparation.

During coding, emergent codes were identified to capture concepts not represented in the initial set. These emergent codes were reviewed and either integrated

into existing themes when conceptually aligned or used to create new themes when they reflected distinct patterns appearing consistently across the dataset. This iterative process produced a refined thematic structure encompassing both pre-determined concepts and participants' unique experiences, ensuring that the analysis remained comprehensive and data-driven.

For the first research question on motivations for participation, codes were organized into two categories: initial motivations (factors influencing participants to join the garden) and persistent motivations (factors sustaining continued participation). A second round of coding was conducted to verify code assignment, refine theme boundaries, and ensure that no relevant data segments were overlooked. Motivations for participation were treated as a discrete analytic construct tied specifically to participants' decisions to join and continue gardening. Therefore, analysis for this research question was limited to data derived from the motivation-specific interview question.

For the research questions addressing perceived health benefits and the influence of community gardening on fruit and vegetable intake and physical activity, conceptually related codes were merged during the coding process to reflect the interconnected nature of participants' experiences. These merged codes were then examined through distinct analytic lenses aligned with each research question. Research Question 3 focused on participants' perceptions of how community gardening influenced their dietary practices and physical activity behaviors, including changes in fruit and vegetable consumption and engagement in physical activity. Research Question 2 examined participants' perceived health benefits of gardening, such as emotional well-being, stress reduction,

and overall perceptions of health. Although overlapping codes contributed to both analyses, themes were distinguished based on analytic focus rather than data source.

The final stage of analysis involved clustering codes and finalizing themes across research questions. For analyses related to health behaviors and perceived health benefits, the impact of community gardening on health served as an overarching analytic context. Accordingly, all relevant data pertaining to health behaviors and perceived health impacts, including segments discussed beyond the specific interview questions, were included to capture participants' experiences comprehensively. The final set of themes is summarized in Appendix D.

4.3.6 Ethical Considerations

This study was conducted in full compliance with Kansas State University's Institutional Review Board ethical guidelines (K-State IRB #: 13218) to ensure the rights, well-being, and confidentiality of all participants. Prior to participation, all interviewees were provided with a detailed information outlining the purpose of the study, the voluntary nature of participation, and any potential risks involved. Participants were informed of their right to withdraw from the study at any time without penalty or negative consequences. Informed consent (Appendix C) was obtained from all participants, ensuring that they fully understood the nature of the research and their involvement in the study.

4.4 Results

4.4.1 The community garden

Riley Lane Garden is one of the community garden sites managed by Manhattan Community Gardens, a cooperative gardening program overseen by UFM (University for Mankind), locally known as the UFM Community Learning Center. Established in 1974 with the support of a grant, Riley Lane Garden originally featured 60 plots and expanded over time with assistance from the City of Manhattan, volunteers, local nurseries, and additional donations and grants. Manhattan Community Gardens is recognized as the oldest community garden program in Kansas and has provided residents with gardening space for more than 51 years (UFM Community Learning Center, n.d.; L. Shivers, personal communication, September 30, 2025).

The program now operates at two locations. The Riley Lane and 9th Street site is leased from the City of Manhattan, while the Collins Lane site at 1435 Collins Lane is leased from Riley County. The Collins Lane site was added in 2012 with support from Howie's Trash and Recycling Services and the City's Parks and Recreation Department. This location is open to all Riley County residents, not only those living in Manhattan.

In 2025, 166 families participated in the program, including Kansas State University students, faculty, and staff, retired residents, and other members of the local community. According to the president of the garden's Volunteer Advisory Board, the gardens also attract participants from international backgrounds who grow diverse crops that are not commonly found in the area, adding unique variety to the produce available. Across both locations, gardeners collectively used 280 plots (UFM Community Learning Center, n.d.; L. Shivers, personal communication, September 30, 2025).

A modest rental fee helps cover program costs, ranging from \$18 for a 220 square foot plot to \$58 for a 714 square foot plot. Reduced fees are available for low income families. Registration typically takes place between November and March, or until all plots are rented. In return for their plot, gardeners contribute several hours to general maintenance tasks such as spreading wood chips on paths, mowing, tilling, setting up hoses, and weeding. These tasks help support the overall operation of the garden (UFM Community Learning Center, n.d.; L. Shivers, personal communication, September 30, 2025).

4.4.2 The participants' profile

A total of nine community gardeners participated in the study (Table 4.2). Participants represented a broad age range, with equal representation across two adult age categories. Specifically, four participants were 40 to 64 years old, and five were 65 years old and above, indicating participation from both middle-aged and older adults. In terms of gender, five participants identified as male, while four identified as female, reflecting a relatively balanced gender distribution. The sample was predominantly White ($n = 6$), with two participants identifying as Asian and one identifying as Hispanic. Regarding employment status, five participants were currently employed, while four were retired, suggesting a mix of participants at different stages of working life. Experience in community gardening was generally high; six participants reported gardening at the site for 10 years or more, whereas only three participants had been involved in the community garden for less than 10 years.

Overall, the participant profile reflects a small but diverse group in terms of age, employment status, and gardening experience, with long-term participation being common among respondents.

Table 4.2. Demographic characteristics of participants

Characteristics	Number of Participants
Age	
40-64 (midlife adults)	4
65 and above (older adults)	5
Gender	
Male	5
Female	4
Race/Ethnicity	
White	6
Asian	2
Hispanic	1
Employment Status	
Currently employed	5
Retired	4
Years gardening at the community garden site	
Less than 10 years	3
10 years or more	6

4.4.3 Motivations for participating in the community garden

Analysis of participants' responses revealed three overarching themes that were consistent for both initial (Table 4.3) and sustained motivations (Table 4.4) for community gardening participation. These themes capture the value-based, social, and practical reasons that influenced participants' decisions to join and continue engaging in community gardening. The three themes identified were the following: Value- and Purpose-Driven Motivations, Socially Driven Motivations, and Practical and Self-Development Motivations.

4.4.3.1 Initial reasons for joining

Value- and Purpose-Driven Motivations

Gardeners first joined the community garden to meet clear, meaningful goals. They wanted access to fresh, high-quality foods that were sometimes hard to get elsewhere, to follow emotional or cultural ties to gardening and food, and to act on environmental and ethical values, such as reducing food travel and avoiding pesticides. These reasons show that joining was not just starting a casual hobby, but a purposeful choice connected to what participants value about food, themselves, and caring for the environment.

A. Access to Fresh and High-Quality Produce

Some participants joined the community garden to get fresher, better-tasting, and sometimes unique produce, including heirloom varieties and culturally specific vegetables, that they could not find or could not get in good quality at stores. The

garden's full sun, good soil, and control over growing conditions offered them quality, flavor, and reliable results from the start.

B. Emotional and Identity-Based Connection to Gardening

Many participants said that gardening is part of who they are, shaped by childhood experiences, family traditions, training, or cultural food practices. Joining the community garden provided a space to actively express this identity. It allowed them to maintain a family way of living that feels like it is "in my blood," fulfill a personal drive to work hands-on or "from scratch," and cultivate vegetables that are central to their cultural traditions.

C. Environmental Stewardship & Purpose

Some gardeners joined the community garden for clear environmental reasons. They wanted to reduce their carbon footprint by growing foods that are usually imported, like garlic, onions, and tomatoes, and to cut down on the energy used in long-distance food transport. Others focused on having control over how their food was grown, such as using organic methods, as part of caring for the environment.

Socially Driven Motivations

Gardeners mostly decided to join the community garden because of social reasons. Two main patterns stood out: (1) Social influence, where friends, family, coworkers, or community members encouraged them or helped them get involved, and (2) Looking forward to social connection and community, where they expected to meet other gardeners, be part of a familiar group, and spend meaningful time with family. Overall,

these reasons show that joining the garden was not just a personal choice but a decision influenced by relationships and the desire to be part of a community.

A. Social influence

About half of the participants reported that they joined the community garden after personal referrals, invitations, or exposure through friends, family, colleagues, or community involvement. These social connections made the garden more visible, reduced uncertainty, and provided a clear way to get started, including practical guidance on how to apply.

B. Social connection and community building

At the time they decided to join, several participants expected social benefits, such as meeting and getting to know other gardeners, being part of a familiar social circle, learning by observing others' plots, and spending quality time with family. These expectations of connection and community were part of what initially attracted them, not just advantages they experienced later.

Practical and Self-Development Motivations

Many people decided to join the community garden because of a mix of challenges and benefits. On one hand, problems at home, such as too much shade or not enough space to grow vegetables, pushed them away from using their own yards. On the other hand, the community garden pulled them in by offering positive experiences. Gardeners enjoyed growing healthy food, spending time outdoors, and feeling less stressed. They

also like sharing their gardening knowledge. Together, these practical needs and personal benefits explain why participants were motivated to start community gardening.

A. Home space constraints

For several participants, the catalyst for joining the community garden was highly practical, driven by environmental barriers in their own backyards. Gardeners described struggling with poor growing conditions at home, such as heavy clay soil and excessive shade from mature trees, which severely limited their agricultural success. One participant noted that their shady yard meant they "did not get any tomatoes till October," prompting the shift to the city garden. Another sought out the space specifically to secure the sunshine required for a youth agricultural project. In these instances, the community garden functioned as a necessary physical solution, providing the optimal land and sunlight that participants lacked at home.

B. Enjoyment

Beyond resolving spatial limitations, the intrinsic enjoyment of the gardening process served as a powerful pull factor. Participants were drawn to the simple, restorative pleasure of the activity itself, noting that they "just enjoy planting things and watching them grow." For others, previous positive involvement in community gardens left them with a "real pleasant experience" that they actively wanted to replicate. This suggests that the fundamental joy and satisfaction derived from cultivation are strong enough to motivate individuals to seek out community garden plots, even when it requires traveling away from their homes.

C. Sharing knowledge

Participation was motivated by a desire for self-development and generativity, specifically through educating others. Gardeners viewed the community space as an interactive classroom where they could impart their agricultural skills. This motivation extended to both the broader community, with participants expressing that they "like teaching people how to garden," as well as to their own families. The desire to "introduce gardening to my son" highlights how the garden is perceived as a valuable setting for intergenerational mentorship, allowing participants to pass down practical life skills while connecting with others.

Table 4.3. Themes and subthemes related to initial motivations for community gardening participation

Main Theme	Subtheme	Example Quote
Value- and Purpose-Driven Motivations	Access to Fresh and High-Quality Produce	"We grow some lettuce varieties that you can't find in the grocery store... Black Seeded Simpson... makes a good salad." (P03) "The reason why I wanted to do it is because I try to be somewhat conscious about the quality of the food I eat... so my goal was to try to consume better quality foods as much as we can." (P09) "Tomatoes particularly... picked green and transported [in stores]... don't have the taste that tomatoes pulled right out of the garden." (P03) "I wanted to raise organic food, like I'd grown up with." (P06)

Main Theme	Subtheme	Example Quote
	Emotional and Identity-Based Connection to Gardening	“I started gardening when I was a preschooler... it’s one of those things I have to do. It’s in my blood.” (P04) “I remember being very young and going out with my mother when she had planted the garden.... When spring comes, I need to be planting things.” (P02) “Because it’s part of my nature... to grow what we can grow, and to know that it doesn’t have herbicide or pesticide contamination in it.” (P01) “I studied agriculture... I’m interested in plants in the garden... I really love planting vegetables.” (P07) “I like to do things from scratch ... and adding heirloom tomatoes... growing food was natural for me to get into.” (P09) “I grew up in the countryside... it’s natural for me to like planting... I planted specific vegetables we like.” (P08) “We plant [type of vegetable] ... use them to cook with eggs and make [other dishes] ...[it’s] family’s favorite.” (P08)
	Environmental Stewardship & Purpose	“I try to be somewhat conscious about... the carbon footprint that every food item carries... reducing the amount of energy it takes to get those foods to my plate is important to me.” (P09) “I wanted to raise organic food, like I’d grown up with.” (P06)

Main Theme	Subtheme	Example Quote
		“...to grow what we can grow, and to know that it doesn’t have herbicide and pesticide contamination.” (P01)
Socially Driven Motivations	Social Influence	“We had some friends... I think they probably told us. They were both active a lot in the community.” (P03) “My friend invited me... He actually planned to join the community garden earlier than me.” (P07) “We’ve lived here for a long time... friends who were gardening there said, ‘You should try it’.” (P02) “My daughter had a community garden before I did... I started becoming familiar with it because she had one.” (P05) “Talking to a gentleman in the horticulture program... piqued my interest... He mentioned the community gardens and told me how to apply through UFM.” (P09)
	Social Connection and Community Building	“I thought it would be fun to know the people who garden there.” (P02) “We know most of them... another professor plants very well.” (P07) “I like to see other people’s gardens. I really enjoy it.” (P02) “I wanted to introduce gardening to my son... have some quality time with the family. That’s why it got started.” (P09) “I’ve been in a community garden... with an Indian friend of mine. It was a real pleasant

Main Theme	Subtheme	Example Quote
		experience.” (P06) (prior positive social experience shaping the decision to join again)
Practical and Self-Development Motivations	Enjoyment	“I just enjoy planting things and watching them grow...” (P03) “I’ve been in a community garden... It was just a real pleasant experience.” (P06)
	Home Space Constraints	“There’s too much shade and the soil is fairly heavy clay... I needed more sunshine when I was in 4-H to grow stuff for my 4-H project.” (P04) “...the trees are really tall and our yards are shady... We did not get any tomatoes till October, so we got the idea to go to City Garden.” (P06) “Our backyard... was not good for the garden... I decided I was not having much luck with the garden in the backyard, and I would try the community garden.” (P01)
	Sharing Knowledge	“I like teaching people how to garden too.” (P04) “I wanted to introduce gardening to my son...(P09)

4.4.3.2 Persistent motivations

Value- and Purpose-Driven Motivations

Gardeners continue to participate because the garden aligns with what they value, such as food quality, safety, and local sourcing, as well as their sense of purpose, including expressing their identity, strengthening family and community connections, and caring for the environment.

A. Access to fresh and high-quality produce

A central reason participants continue to engage in the community garden is the dependable access to fresh, flavorful, and often organic produce, particularly tomatoes and beets, which they perceive as superior to what is available in stores. The consistent high quality and reliable yield make the effort of gardening worthwhile year after year.

B. Emotional and identity-based connection to gardening

Majority of the participants describe gardening as an integral part of who they are, shaped by upbringing, family culture, and personal routines, and as a source of joy, meaning, and connection to themselves, their families, and the community. Their roles, such as serving on the board, and practices, such as spending time with a child, enjoying quiet moments, or learning from others, strengthen this identity over time.

C. Environmental stewardship and purpose

Participants' ongoing engagement in the community garden reflects not only practical ecological concerns but also a sense of purpose grounded in doing what they

believe is right. Gardening allows them to put their personal ethics into practice by reducing food transport, supporting local production, and controlling how their food is grown by avoiding pesticides and using organic practices. For these gardeners, stewardship is both intentional and value-driven, offering a way to contribute, even in small ways, to environmental responsibility while living in alignment with deeply held beliefs about food, ecology, and care for their surroundings.

Socially Driven Motivations

Gardeners continue participating because community gardening is fundamentally social. It provides a sense of belonging and community, where people learn from, support, and motivate one another. It also strengthens close connections and reciprocity with family and friends through shared work, food exchanges, and daily routines. These social interactions give the gardening experience lasting meaning that goes beyond simply producing food.

A. Family and friendship bonding and reciprocity

Ongoing participation is supported by meaningful routines with close connections, such as gardening with children, preserving and exchanging canned goods with friends, and sharing extra harvests. For many gardeners, gardening becomes a social way of life woven into family and friendship networks.

B. Social connection and community building

The garden encourages continued participation by creating a community of practice, where people talk, share ideas, learn by watching others' plots, and engage

in a multicultural, supportive environment. This added social and learning value is something that a private home garden cannot provide.

Practical and Self-Development Motivations

People continue to participate in community gardening for both practical reasons and personal growth. Gardening provides clear benefits such as fresh and healthy food and regular physical activity. At the same time, it helps people relax, enjoy themselves, learn new skills, and grow as individuals. Participation is not driven only by necessity. Instead, gardening becomes part of their everyday lifestyle and supports their health, happiness, confidence, sense of identity, and curiosity to keep learning.

A. Health, well-being, and enjoyment

Community gardening supports participants' physical, mental, and emotional well-being, making it an enjoyable and restorative activity that motivates sustained involvement. Gardening is commonly described as a form of exercise, a way to relax or relieve stress, and a pleasurable outdoor experience. Participants emphasize the joy of watching plants grow, the satisfaction of harvesting food, and the simple pleasure of being in the garden environment. These benefits transform gardening from labor into an activity that feels rewarding and intrinsically motivating.

B. Learning and skill development

Learning new skills also motivates people to stay involved in community gardening. Gardeners often learn through trial and error, watching others, sharing ideas,

and interacting with people from different cultures. Gardening failures are seen as opportunities to learn, while success helps build confidence and skills. Many participants also enjoy teaching others, including children, neighbors, and new gardeners. Sharing knowledge helps strengthen their sense of identity and commitment. In this way, the community garden becomes a place where people continue to learn practical skills, cultural knowledge, and personal experience over time.

Table 4.4. Themes and subthemes related to persistent motivations for community gardening participation

Main Theme	Subtheme	Example Quote
Value- and Purpose-Driven Motivations	Access to Fresh and High Quality Produce	“We look most forward to tomatoes. Just having good vegetables... we like gardening... [because] we really like fresh produce.” (P03) “Just the good results. We got a lot of produce, lots of tomatoes and beets, really good food.” (P02) “We can harvest organic and fresh vegetables for my family and also share with friends.” (P07) “It’s partly that it’s much fresher. It’s much cheaper.” (P01) “When you purchase a tomato from the store, that’s not sweet... In our garden, we wait until the tomato turns red, then we pick it... that’s why it’s sweet.” (P07)

Main Theme	Subtheme	Example Quote
	Emotional and Identity-Based Connection to Gardening	“Because it’s just part of my nature... to grow what we can grow.” (P01) “I just love growing stuff. I like gardening... that’s what I love to do.” (P04) “Every time I get to go to the garden... my son and I went out and planted the garlic... those moments are pretty good for me because I get to spend time with him, connect with him.” (P09) “I also enjoy being down there at the garden... I like to just be there... I also like seeing the people there. I’m on the gardening board now, so I feel some responsibility.” (P02) “I guess I just like it... it’s part of my life... we both make a lot of canned stuff and we exchange it and it’s just kind of part of our life.” (P05) “When you plant seeds... you are looking forward to [seeing them] germinate and produce.” (P07)
	Environmental Stewardship & Purpose	“Not having to wonder about how it was grown or where it was grown. It’s not transported all that far... It’s ecologically more sound than buying lettuce all the way from California or Mexico, Guatemala, Brazil.” (P03) “Because it’s just part of my nature... to grow what we can grow, and to know that it doesn’t

Main Theme	Subtheme	Example Quote
		have herbicide and other pesticide contamination in it.” (P01) “I like to have healthy, organic food... We both love insects... we like to see a lot of really interesting things in the garden.” (P06) “It’s a connection to my cultural history... I think that I’m eating locally...” (P06)
Socially Driven Motivations	Family & Friendship Bonding and Reciprocity	“My son and I... planted the garlic for next year’s crop... those moments are pretty good for me because I get to spend time with him, connect with him... and then we get to enjoy the good garlic we grew ourselves.” (P09) “It’s just part of my life... my best friend... has a garden also. We both make a lot of canned stuff and we exchange it and it’s just kind of part of our life.” (P05) “When I harvest... I cannot eat all, I like to share with [a] friend. I bring some for her.” (P08)
	Social Connection and Community Building	“I enjoy the community aspect... I get to talk to quite a few gardeners... bounce ideas... Sometimes I just see what they’re doing and I’ll say, ‘Okay, I’m going to try that next year.’... Doing it at the garden and talking to the community gardeners around me, it’s an extra layer of value for me.” (P09) “I also end up meeting a lot of interesting people there because it’s an international garden... families from Africa, China, Ukraine, Mexico, Brazil, Armenia,

Main Theme	Subtheme	Example Quote
		Afghanistan... One year, when an Armenian gardener was away, a Chinese gardener took care of their garden.” (P01)
Practical and Self-Development Motivations	Health, Well-being, and Enjoyment	“I like to have healthy food. That’s the main thing. Also, it’s mentally therapeutic to me. It’s pleasurable.” (P06) “It’s very interesting and gardening is also an excellent activity to exercise, for health.” (P07) “I like to get out in the fresh air. I like to get the exercise, and this does both.” (P01) “I also enjoy being down there at the garden... I sit and enjoy being there.” (P02) “If you have a garden, you can spend some time... to relax. Relax your brain.” (P08) “I enjoy the exercise too.” (P03)
	Learning and Skill Development	“Even when you get a crop failure, you learn something.” (P03) “There’s a culture out there from different nationalities, grow different things... you learn from how other people garden.” (P03) “I like to walk through and see what other people have in their gardens.” (P02) “I get to bounce ideas with them... and I’ll say, ‘Okay, I’m going to try that next year.’” (P09) “When my kids were growing up, I wanted them to know how to raise their own food.” (P06)

Main Theme	Subtheme	Example Quote
		“I end up explaining a lot about gardening to different people. I love sharing my knowledge.” (P01)

4.4.4 Perceived influence on health behaviors

The analysis identified several ways in which participation in the community garden shaped participants’ health behaviors, particularly those related to fruit and vegetable intake (Table 4.5) and physical activity (Table 4.6). Participants’ narratives illustrate how gardening influenced not only what they ate and how frequently fruits and vegetables were consumed, but also how they moved, allocated time, and structured their daily routines. Findings are organized into three domains for each category of health behavior change. For dietary behaviors, themes included: increased access driving greater and more diverse produce consumption; quality, freshness, and taste shaping consumption practices; and limited or seasonal change among some gardeners. for physical activity behaviors, themes included: gardening as routine-embedded and incidental movement; gardening as a replacement or reorganization of other activities; and physical demands of gardening and reduced sedentary time. Overall, these themes illustrate how community gardening functions as a medium that supports multiple health-promoting behaviors through habitual, purposeful, and experience-driven engagement.

4.4.4.1 Influence on fruit and vegetable intake

A. Increased access drives greater and more diverse produce consumption

For some participants, access to fresh and often difficult to obtain or culturally specific vegetables contributed to both increased frequency and quantity of consumption. This access extended beyond sheer availability to include greater dietary variety, particularly through the inclusion of Asian vegetables, heirloom varieties, and other specialty crops that are either costly or not readily available in local markets. In addition, the proximity of the garden enabled immediate harvest to meal use, which reinforced regular consumption patterns, such as harvesting produce after work for same day meals.

Participants also emphasized the role of cost savings and the perceived freshness or organic quality of garden produce as factors that supported consistent vegetable intake. These elements made vegetables more accessible and desirable as a routine part of daily meals for a few. In one case, gardening influenced overall meal composition, with participants incorporating vegetables into meals where they had not previously been common, such as breakfast.

Moreover, gardening encouraged practices that extended the availability of produce beyond the growing season. Participants described preserving surplus harvests through methods such as freezing and canning, allowing them to maintain higher levels of vegetable consumption over time. Together, these patterns illustrate how community gardening supports not only increased intake but also sustained dietary change through improved access, variety, and food-related practices.

B. Quality, freshness, and taste shape consumption practices

Garden-grown produce was widely perceived as superior in taste and freshness compared to store-bought options, and this sensory advantage influenced both food choices and eating practices. Participants described exploring a wider range of varieties, including heirloom tomatoes and specialty lettuces, and developing preferences based on flavor characteristics such as sweetness or lower acidity. This often led to greater culinary experimentation, with some preparing simple dishes that highlighted the natural taste of the produce, such as sautéed peppers or wilted lettuce with hot bacon dressing.

The perceived quality of garden produce also encouraged more frequent consumption. Participants reported eating tomato directly from the garden as snacks, incorporating vegetables more regularly into meals, and seeking greater variety by growing multiple types of the same crop, such as different pepper colors, lettuce, or tomato varieties. These practices reflect how sensory appeal can shape not only what people eat but also how often and in what forms they consume vegetables.

In addition, freshness and quality reinforced broader food-related values and behaviors. One participant noted reduced reliance on grocery stores, particularly during periods such as the COVID-19 pandemic, while others associated garden produce with being more natural or organic. These perceptions contributed to a sense of healthfulness and trust in the food they consumed. Overall, the sensory and perceived quality of garden-grown produce played a major role in supporting sustained dietary engagement and variety.

C. Limited or seasonal change among some gardeners

Some gardeners reported little to no change in overall vegetable intake, noting that they were already frequent consumers before joining the garden. For these participants, gardening influenced the source, seasonality, and types of produce consumed rather than the total amount or frequency. In some cases, seasonal abundance, such as an excess of tomatoes, led to short-term increases in consumption. One participant also described fatigue after garden work, which sometimes reduced motivation to cook, leading instead to lighter or more immediate forms of consumption such as snacking on tomatoes during harvest.

Fruit consumption showed even less change, largely due to practical limitations. Many gardeners noted that growing fruit was difficult because of shade, labor demands, animal interference, and garden regulations that restricted planting trees. As a result, fruit production was often minimal or avoided altogether.

Gardeners also made selective decisions about what to grow based on effort and yield. Crops that required intensive labor, were highly susceptible to pests, or produced more than households could reasonably consume were often reduced or avoided. Instead, participants favored crops that were easier to maintain and better matched their needs. Overall, these accounts suggest that while community gardening can enhance diet, its effects vary, with some gardeners experiencing shifts in sourcing and variety rather than substantial increases in overall intake.

Table 4.5. Themes related to the influence of community gardening on fruit and vegetable consumption

Main Theme	Example Quote
Increased Access Drives Greater and More Diverse Produce Consumption	“Oh, absolutely. Increase [referring to vegetable intake].” (P07) “I think it increased both... The bitter melons, the string beans... you couldn’t even buy those at the farmers market... I was the first person in town... to grow winter melons.” (P01) “We eat more tomatoes... We eat a lot of vegetables.” / “Probably more frequently.” (P02) “Yeah... we eat them all... if we do not have the garden, maybe we do not eat much... it’s very fresh and organic.” (P08) “Some vegetables are special in Asia... we can plant here... Silk melon... bitter melon... cowpea.” (P07) “We eat much vegetable from the Asia... long green beans... bok choy... bitter melon.” (P08) “We can harvest from my garden... after work, and then you can cook it for dinner.” (P07) “Then, when I had so many vegetables, I switched to eating vegetables for breakfast... every day now.” (P01) “We freeze [kale] as well... blanch it and then you put it in the freezer... add it to soup, stir-fries later in the year.” (P09) “I freeze them or can them [tomatoes]... use a colander and mash... so the skins stay in the colander.” (P02) “I froze so many strawberries and eat them over winter... roast and peel and freeze or dehydrate [peppers].” (P04) “Drying and preserving more stuff... dry tomatoes... can a lot of pickles... jam...” (P05)
Quality, Freshness, and Taste Shape Consumption Practices	“It certainly tastes different than what comes in a can... or from the grocery store.” (P03)

Main Theme	Example Quote
	“We grow some lettuce varieties that you can’t find in the grocery store... Black Seeded Simpson... wilted lettuce with hot bacon dressing... one of my favorites.” (P03) “Red [peppers] are the sweetest... yellow not quite as sweet... bell peppers... not as big as the ones in the grocery store... They were delicious.” (P02) “Tomatoes can have sweetness... one variety... ‘pineapple’... very low acidity... notes of apricot... I’ve never seen it [in stores].” (P09) “I’ve started just sautéing peppers by themselves... cold in a salad with mayonnaise and vinegar.” (P02) “I had to convince myself that I could eat plain tomatoes... now I do snack on them in the garden.” (P04)
Limited or Seasonal Change Among Some Gardeners	“I don't think so. We're pretty constant vegetable eaters... same frequency... with garden or without... source would be farmers’ market.” (P03) “Oh, I always ate a lot of vegetables.... I don’t think I eat any more.” (P05) “I’ve always grew up eating lots of vegetables... participating... has no effect because you really like eating vegetables.” (P06) “Only in November... Because like what can you do?... because probably I would just eat something else if I wasn't being forced to eat so many tomatoes right now..” (P05) “Maybe slightly more... but by the time I get home... I’m tired and I don’t feel like cooking... I try to snack as I harvest.” (P04) “Broccoli and cauliflower are very hard to grow... too hot too fast... sprouts rarely succeed.” (P01) “We don’t really grow fruit... not enough sun... Strawberries are too much work... weeds... animals love them.” (P02)

Main Theme	Example Quote
	“Not allowed to plant trees [in the community garden] ...then [at home] squirrels eat pears and apples... had to give up trying to grow fruit at home.” (P01)

4.4.4.2 Influence on physical activity

A. Gardening as routine-embedded and incidental movement

Participants commonly perceived community gardening as influencing their physical activity by becoming a regular part of their daily or weekly routines (Table 4.6). Gardening served as a reason to go outside frequently, often multiple times per week or nearly every day during the growing season. Through repeated visits, participants described staying physically active through incidental movement such as walking to the plot, standing, bending, watering, weeding, and harvesting. This activity was not framed as deliberate exercise but rather as movement that naturally occurred because gardening needed attention. For some participants, garden responsibilities structured their days and seasons, ensuring consistent outdoor movement even when they did not have a formal exercise routine.

Participants also noted that gardening created a habit of movement that felt purposeful and routine-driven rather than forced. The expectation of tending plants encouraged repeated physical engagement, integrating activity into daily life.

B. Gardening replaces or shifts other activities

Participants frequently perceived that community gardening changed the type and timing of physical activity they performed, rather than simply increasing total activity levels. Some described gardening as replacing other activities such as cycling, gym

workouts, or organized sports that they were doing when they were much younger. Others explained that gardening competed with time they previously dedicated to walking, particularly in summer. Many participants framed gardening as a positive substitute that helped them remain active as they aged, experienced injury, or reduced participation in higher-impact activities. Seasonal reorganization was common, with gardening becoming the dominant source of physical activity during warmer months and walking or other activities resuming in winter. Participants generally viewed this substitution as acceptable or beneficial, even when acknowledging trade-offs such as reduced step counts.

C. Physical demands of gardening and reduction of sedentary time

Participants clearly identified the physical demands of gardening tasks as meaningful contributors to their physical activity. Activities such as digging, hoeing, shoveling, mulching, hauling wheelbarrows, watering, and turning soil were repeatedly described as physically intensive. Some participants emphasized doing these tasks manually rather than using machinery, viewing this choice as an opportunity for exercise and strength training.

Participants also perceived gardening as reducing sedentary behavior by replacing time that might otherwise be spent sitting indoors, watching television, or using computers. Physical effort was understood through sensations of exertion, fatigue, soreness, and strength development rather than through formal exercise metrics. For a number of participants, especially older gardeners, gardening was valued as a form of

functional physical activity that helped maintain strength, mobility, and the ability to perform everyday movements.

Table 4.6. Themes related to the influence of community gardening on physical activity

Main Theme	Example Quote
Gardening as Routine-Embedded & Incidental Movement	“Sometimes after work, I go to the garden and do some more work.” (P07) “When the growing season begins, I visit almost every day, at least 10 or 15 minutes, because it’s on my way home.” (P09) “We have to keep the weeds down and go down to take care of things. It has added a bit to my activity.” (P02) “It gives you an opportunity to get that kind of regular outdoor exercise aerobically, because there’s always something to be done.” (P01)
Gardening Replaces or Shifts Other Activities	“The gardening now is sort of a replacement for the bicycling because after I retired, I didn’t have motivation to ride every day.” (P01) “If the garden wouldn’t be there, I would be even less active now after stopping from playing soccer.” (P09) “It just changes my activity. I spend more time gardening and less time walking.” (P05) “I walk less when I’m gardening than I do in the winter.” (P05)
Physical Demands of Gardening and Reduction of Sedentary Time	“I always dig the soil by myself. That gives you the opportunity to exercise.” (P08) “You do not just sit in your home watching TV or the computer. You spend a lot of time in the garden.” (P08) “My back usually hurts for a while in the spring, but after a while, I just get over it and I’m okay.” (P05)

	“We wheelbarrowed a thousand pounds of wood chips onto my garden.” (P06) “Pulling weeds or raking, it can be kind of wearing. So it’s good exercise.” (P04)
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4.4.4.3 Perceived impact of community gardening on health and well-being

The analysis of the interview transcripts identified four interrelated ways in which participation in the community garden contributed to gardeners’ health and well-being (Table 4.7). Participants consistently described the garden as more than a site for food production, emphasizing its role in shaping everyday dietary practices, supporting functional physical health, promoting psychosocial restoration, and fostering social connection and community engagement. Specifically, the findings are organized around four themes: (1) improved nutrition and dietary habits; (2) maintenance of functional mobility and physical health; (3) psychosocial restoration and stress mitigation; and (4) social connection and community engagement. Together, these themes illustrate how community gardening functions as a multifaceted health-promoting environment that influences nutrition, physical activity, mental well-being, and social life through routine participation and lived experience.

A. Improved nutrition and dietary habit

Participation in the community garden was closely tied to improvements in nutrition and everyday dietary habits, with participants describing the garden as a primary and trusted source of high-quality, organic produce. Garden-grown fruits and vegetables were frequently characterized as fresher, better-tasting, and healthier than store-bought alternatives, leading some gardeners to organize meals around vegetables. A couple of

participants emphasized nutritional benefits such as obtaining sufficient vitamins and minerals naturally, supporting digestive health, and avoiding artificial supplements. Others highlighted specific health-related motivations, including the consumption of lycopene-rich tomatoes or increased intake of leafy greens like kale and spinach. The superior taste and freshness of garden produce further reinforced these habits, with participants contrasting vine-ripened, heirloom, or home-harvested vegetables with commercially available produce picked early or treated for longer transportation. Taken together, these accounts indicate that community garden participation supports healthier diets not only by improving access to fresh produce, but also by shifting food priorities, making vegetables a more central part of daily meals, and strengthening confidence in the quality and healthfulness of what is consumed.

B. Maintenance of functional mobility and physical health

Participation in the community garden emerged as an important means of maintaining functional mobility and physical health, particularly among older gardeners who viewed gardening as a purposeful, whole-body form of exercise. Participants described gardening tasks such as digging, hoeing, planting, kneeling, and balancing on uneven soil as activities that engage multiple muscle groups while supporting endurance, strength, and coordination. Rather than structured exercise, gardening was framed as meaningful physical labor that helped preserve abilities essential for independent living, including the capacity to bend, get down on the ground, and stand back up. Several gardeners explicitly linked these movements to maintaining balance, back strength, and aerobic fitness, with some describing gardening as a substitute for other forms of exercise

they could no longer perform. Importantly, a few participants emphasized that the functional demands of gardening motivated them to stay physically active in ways that felt practical and enjoyable, such as being “away from the TV” or working toward visible outcomes (produce harvest). Although some acknowledged slower recovery or physical limitations with age, gardening was nonetheless viewed as a manageable and valuable way to sustain mobility, remain active, and support overall physical well-being through everyday movement embedded in routine life.

C. Psychosocial restoration and stress mitigation

Participation in the community garden played an important role in psychosocial restoration and stress reduction, with participants consistently describing it as a space for mental reset and emotional relief. Gardeners highlighted the calming effects of being outdoors and working with soil, plants, and routine tasks, which helped them step away from daily pressures and structured obligations. Many experienced gardening as meditative rather than labor intensive, noting that “puttering around” in the garden, feeling the fresh air, and quiet surroundings provided enjoyment and supported a sense of calm, focus, and mental clarity. The garden was also described as a place to process and release stress through reflection, repetitive movement, and the satisfaction of growing and harvesting food. Some participants further connected gardening with improved mood, better sleep, and greater emotional balance, suggesting that regular involvement supported overall mental well-being. Overall, these accounts show that community gardening serves as a restorative setting that supports emotional health by combining nature exposure, purposeful activity, and everyday moments of psychological relief.

D. Social connection and community engagement

Participation in the community garden strengthened social connection and community engagement by creating a shared space where relationships developed through the act of growing food. Participants described the garden as a culturally diverse environment where individuals from different backgrounds interacted, exchanged knowledge, and learned from one another's gardening traditions. Practices such as water use, crop selection, and food preparation became common points of connection that crossed cultural and generational lines. Through these interactions, gardeners were exposed to new techniques and perspectives, expanding their understanding of food and cultivation beyond their own experiences. The garden also functioned as an informal social setting where friendships formed through shared work, produce exchange, and participation in collective activities. For a few, it provided opportunities for family bonding, as multiple generations engaged in gardening together. Overall, these experiences illustrate how community gardening supports social integration, encourages intercultural learning, and fosters a strong sense of belonging through shared involvement with food and land.

Table 4.7. Themes related to the influence of community gardening on health and wellbeing

Main Theme	Example Quote
Improved Nutrition and Dietary Habit	"If we do not have the garden, maybe we do not eat much... those type are very fresh and also it's organic vegetable." (P08)

Main Theme	Example Quote
	"Spinach is much better when it's very fresh... we grow some lettuce varieties that you can't find in the grocery store." (P03) "I think eating the fruits and vegetables is, for many people, very important for their microbiome in their gastrointestinal tract and also for assuring that you get a sufficient balance of vitamins and minerals without having to take any artificial supplements. If you eat the right diet, you get all of what you need." (P01) "We eat organic vegetables more frequently... almost every day for lunch and dinner. I plant tomatoes because of the lycopene, which is good for the prostate... the taste is much better than the store ones and it is chemical-free." (P08) "I've started eating a lot more greens, especially kale and spinach... I also started growing heirloom tomatoes, which are much sweeter and have less acid than regular ones." (P09) "The tomatoes are so much better. They have a more acidic, I think but they taste so much better, whereas most of the ones you buy in the store are picked green and then gassed... we eat more chards, and cantaloupes and asparagus." (P03)
Maintenance of Functional Mobility and Physical Health	"I use a shovel to turn the ground over... it's better exercise than if I had a mechanical tiller. It's a good general aerobic exercise... a replacement for the bicycling I used to do." (P01) "I tell my physical therapist that I have to be able to get down on my hands and knees and get back up so I can garden." (P03)

Main Theme	Example Quote
	"It's a muscle-strengthening exercise. Hoeing and planting improve my upper body strength and I think it makes my back stronger." (P05) "Walking and balancing on the soft, silty loam is quite a bit of exercise... it's a good workout, though it takes me longer to recover than it used to." (P04) "It gets me away from the TV and the computer. Shoveling deep into the soil gives me a great opportunity to exercise." (P08)
Psychosocial Restoration and Stress Mitigation	"It gives you an outlet for your energy... the quiet away from the hectic parts of life, from where you work. It just makes a change from the rest of the routine." (P01) "I like to take my shoes off and touch the soil. It's very grounding and meditative... it puts my mind in a neutral, 'zen-like' state. It doesn't feel like work." (P09) "Being outdoors in nature is my most profound healing source for overall well-being. It's mentally therapeutic." (P06) "The time goes by really fast. For me, I do like being there a lot... I enjoy just having that time where I can just kind of putter around" (P05) "Just being outdoors in the fresh air makes me more relaxed, and the act of successfully harvesting crops gives me a deep sense of satisfaction." (P02) "Gardening helps me maintain a good mood and improve my sleep... it helps me cope better with stress." (P07)
Social Connection and Community Engagement	"I have many [garden] neighbors who are from all over the world... I like to share my knowledge with them and learn about what they are growing." (P01)

Main Theme	Example Quote
	"I enjoy seeing what the international gardeners grow... like people from India and the Middle East using pigweed and lamb's quarters as greens." (P04) "My Afghani neighbor built like a trench-irrigation system... it was amazing to see how people from arid places manage water..." (P03) "It's a great way to make friends with neighbors, harvest and share food together, and participate in garden socials." (P08) "I use it as a space to connect with my son while we plant crops together... it's a shared activity that we both enjoy." (P09)

4.5 Discussion

One of the main aims of this study was to examine motivations for participating in a community garden in Manhattan, Kansas and to compare these motivations with those reported in the broader community gardening literature. Overall, the motivations described by gardeners in this study closely match previously documented reasons for participation, while also showing how these motivations are experienced by community gardeners in a small city in Kansas.

4.5.1 Initial and Persistent Motivations

Results on why people joined the community garden can also be understood within the three motivational domains identified in this study. Value- and purpose-driven motivations,

such as producing high-quality food and supporting ethical or environmental goals, interacted with social motivations, including belonging, learning, and reciprocity, to sustain engagement. Practical and self-development motivations, such as having a reliable space to grow and opportunities for skill-building, also contributed to continued participation. Health and well-being benefits emerged across all three domains, showing that community gardening provides overlapping practical, social, and value-based rewards that together support long-term involvement.

Moreover, taken together, the findings suggest that initial and ongoing motivations are not separate categories but stages within the same motivational process for this group of urban community gardeners. Initial motivations primarily helped participants join the garden by addressing practical barriers, such as limited space or sunlight at home, providing social access through invitations or encouragement, and offering outcomes they already valued, such as fresh food or enjoyable outdoor activity. As participation continued, these motivations were reinforced through experience. Over time, gardeners described a growing range of benefits, including stronger personal and cultural identity, a sense of social belonging, improved health and well-being, opportunities to learn and teach, and a sense of ethical purpose related to food and environmental care. As these benefits accumulated, community gardening became integrated into participants' daily routines and value systems. What began as an activity they chose gradually became a practice that reflected who they were and how they wanted to live. This pattern suggests continuity in motivation, where early reasons for joining supported the deeper commitments that sustained long-term participation.

This shows why people keep committed on their community garden participation. Initial participation often responds to practical needs or opportunities, but over time, it develops into a meaningful activity that supports personal values, well-being, and social connection. Participation evolves from solving practical problems to becoming an ongoing social and value-driven practice. Consistent with this interpretation, initial and ongoing motivations largely overlapped rather than functioning as separate or competing factors. Practical considerations, such as access to fresh food or limited gardening space, encouraged participation at the start, while continued engagement was reinforced by accumulated benefits including enjoyment, health, social relationships, learning, and a sense of purpose. This aligns with prior research indicating that motivations for community gardening are dynamic yet interconnected, with multiple influences operating together rather than in strict sequence (Armstrong, 2000; Kingsley et al., 2019).

Finally, these findings clarify the role of health in community gardening participation. While some participants had prior interests in fresh food, outdoor activity, or gardening traditions, health was rarely mentioned as a reason for joining. Instead, physical activity, mental restoration, and overall well-being emerged over time as experienced outcomes of participation. This suggests that, for this group, health is primarily a consequence rather than a direct motivator. Some studies have described a “healthy gardener” effect, where gardeners may already be predisposed to healthier behaviors, such as valuing fresh food, outdoor activity, and civic engagement (Alaimo et al., 2008; Armstrong, 2000). This raises the possibility that some observed health benefits reflect self-selection, with individuals already inclined toward healthy lifestyles more likely to join community gardens. By situating these observations within this broader literature, the study responds to the lack of clarity regarding

whether health considerations drive participation or are recognized mainly as outcomes. At the same time, other research shows that the garden environment itself reinforces health-supportive behaviors and well-being (Kingsley et al., 2019), a perspective supported by the experiences shared by participants in this study.

4.5.2 Influence on fruit and vegetables consumption

Participation in the community garden shaped fruit and vegetable consumption primarily by increasing access to fresh, desirable produce and expanding the range of foods gardeners routinely ate. Many participants described eating vegetables more frequently and in larger amounts during the gardening season because produce was immediately available, affordable, and difficult to obtain elsewhere. This aligns with quantitative findings showing higher intake among community gardeners compared to nongardeners and home gardeners, and to a wait-list control group (Alaimo et al., 2008; Litt et al., 2011; Alaimo et al., 2023). Consistent with Algert et al. (2016), gardeners in this study also emphasized access to culturally specific and specialty vegetables, such as bitter melon, Asian greens, and heirloom varieties, which encouraged both experimentation and regular consumption.

Beyond access, perceptions of quality, freshness, and taste strongly shaped consumption practices. Gardeners consistently expressed a preference for self-grown produce, describing it as fresher, better tasting, and healthier than store-bought options. These preferences motivated behaviors such as snacking directly from the garden, eating vegetables at every meal, and incorporating unfamiliar varieties into regular cooking routines. Such findings closely reflect Kingsley et al. (2019), who found that gardeners valued homegrown produce for its perceived nutritional superiority and lack of chemicals, and Beaver et al. (2019), who

highlighted taste and freshness as key drivers of increased intake. The sensory experience of gardening and harvesting appeared to reinforce positive attitudes toward vegetables and sustained their inclusion in everyday diets, echoing Litt et al.'s (2011) qualitative observation that gardening can “awaken the senses” and support healthier eating patterns.

Social, emotional, and experiential factors further mediated how garden participation translated into dietary change. Participants described pride in growing food, satisfaction in self-sufficiency, and enjoyment in sharing produce with neighbors, friends, or family. These experiences fostered stronger emotional connections to food and reduced food waste, encouraging gardeners to consume what they grew. Similar mechanisms were identified by Alaimo et al. (2023), who noted that dietary changes among gardeners were driven not only by access but also by emotional connections to plants, personal pride, and opportunities to try new foods. In this study, preservation practices such as freezing, drying, and canning further extended the garden's influence by enabling year-round consumption, reinforcing the role of experiential learning in shaping eating behaviors.

At the same time, the findings highlight important variation in dietary impacts. Some gardeners reported minimal overall change because they already consumed high levels of fruits and vegetables prior to joining the garden, suggesting a source substitution effect rather than a large increase in intake. Others experienced changes that were seasonal or constrained by barriers such as pests, climate conditions, time, or difficulty growing fruit. Overall, the findings suggest that community gardens most strongly influence fruit and vegetable consumption through increased availability, improved sensory quality, and meaningful engagement with food.

4.5.3 Impact on physical activity

Participants in this study perceived community gardening as influencing their physical activity primarily by embedding movement into everyday routines rather than by promoting structured exercise. Gardening created frequent and predictable reasons to spend time outdoors, often several times per week during the growing season, resulting in incidental physical activity such as walking to plots, standing, bending, lifting, watering, and harvesting. Many participants rarely framed these movements as “exercise”; instead, activity was understood as a natural outcome of tending the garden. This perception aligns with prior qualitative studies in which gardeners described gardening as physically engaging and therapeutic, with bodily movement emerging organically through routine tasks (Kingsley et al., 2019; Algert et al., 2016). These findings also support research classifying gardening as light-to-moderate physical activity that can be sustained through habitual participation rather than intentional training (Hawkins et al., 2015).

Rather than reporting uniform increases in overall physical activity, participants often described community gardening as reshaping or substituting other forms of movement. Gardening frequently replaced activities such as cycling, walking, gym exercise, or organized sports, particularly during warmer months or following life transitions such as retirement, injury, or aging. For many, this substitution was perceived positively, as gardening provided a flexible and accessible way to remain active when higher-impact or time-intensive activities became less feasible. This perception is consistent with experimental findings showing increases in light-intensity and total physical activity among gardeners, even when changes in moderate-to-vigorous activity or sedentary time in experimental studies are mixed (Canton et al., 2023; Litt et al., 2023). Participants’ emphasis on consistency rather than net

increase suggests that gardening may be especially important for maintaining activity patterns over time, a conclusion echoed by Lampert et al. (2021).

Participants also highlighted the physical demands of gardening tasks as central to how gardening influenced their activity. Manual labor such as digging, hoeing, shoveling, mulching, and hauling materials was commonly described as physically taxing but beneficial, contributing to strength, endurance, and mobility. Some participants, particularly males, intentionally avoided mechanized tools in favor of manual methods, explicitly framing this choice as an opportunity for exercise. These perceptions align with physiological research indicating that common gardening activities fall within moderate-intensity ranges sufficient to support functional fitness, particularly among older adults (Hawkins et al., 2015). Consistent with Mangadu et al. (2017), participants also described gardening as replacing sedentary indoor behaviors, such as watching television or sitting at home, with productive physical work, even when they did not perceive dramatic increases in total activity.

Taken together, these findings help explain why community gardening has been associated with favorable long-term health outcomes in observational studies, despite modest short-term effects in experimental designs. By integrating routine movement, functional exertion, and adaptive substitution into daily life, gardening offers a form of physical activity that is sustainable, meaningful, and responsive to changing capacities across the life course. This perspective is consistent with evidence showing lower BMI and reduced cardiometabolic risk among community gardeners compared with non-gardeners (Zick et al., 2013; Veldheer et al., 2023). Rather than functioning as a time-limited exercise intervention, community gardening appears to support physical activity as a lifestyle practice, reinforcing

the value of gardens as public health resources that promote ongoing movement through everyday participation.

4.5.4 Influence on health and wellbeing

The findings from this study highlight the wide-ranging health impacts of urban community gardening, showing how these shared green spaces function as active settings for overall health promotion rather than simply places for growing food. Consistent with literature conceptualizing psychosocial well-being (Eiroa-Orosa, 2020), the participants in this study experienced the garden as crucial infrastructure for holistic health. By shaping daily eating habits, supporting physical functioning, restoring emotional balance, and fostering social connection, the lived experiences of these gardeners demonstrate how regular, purposeful engagement with nature and community yields integrated health benefits that span physical, mental, and social domains.

At the nutritional level, participation catalyzed a fundamental reorganization of dietary habits, moving vegetables from side dishes to the center of daily meals. This shift was driven by the superior taste, freshness, and trusted organic quality of garden-grown produce. Participants reported targeted health motivations, such as consuming lycopene-rich tomatoes or increasing leafy greens, extending prior quantitative findings linking gardening with higher fruit and vegetable intake (Johnson & Smith, 2006; Alaimo et al., 2008; Litt et al., 2011; Algert et al., 2016). Participants' strong confidence in the healthfulness of self-grown, chemical-free food emerges as a key mechanism sustaining household-level dietary improvements commonly associated with community gardening (Canton et al., 2025).

Beyond dietary shifts, the physical demands of cultivating food provided essential, purposeful exercise, particularly for older adults focused on maintaining functional mobility. Participants framed tasks like hoeing, balancing on uneven soil, and kneeling not as structured workouts, but as meaningful labor necessary for preserving independent living. This perspective provides crucial context for experimental trials where short-term gardening interventions increased physical activity but yielded mixed or insignificant immediate changes in BMI or adiposity (Litt et al., 2023). Our findings suggest the immediate physical value of gardening lies in sustained functional strength, flexibility, and routine movement rather than rapid weight loss. Furthermore, viewing gardening as a sustainable substitute for traditional aerobic exercise supports recent epidemiological evidence linking long-term gardening to significantly lower odds of cardiovascular disease, stroke, and poor physical health among older adults (Veldheer et al., 2023; Zick et al., 2013).

The physical exertion of gardening is closely intertwined with profound psychological restoration, as some participants consistently described the garden as a grounding, meditative space for stress mitigation. The tactile experiences of touching the soil, working outdoors, and observing plant growth facilitated a mental reset that offered relief from daily pressures and structured obligations. These narratives strongly reinforce the consistent emergence of mental health benefits across both qualitative and quantitative research, where gardening is associated with significant reductions in perceived stress and anxiety (Litt et al., 2023; Sonti & Svendsen, 2018). As noted from the study of Alaimo et al., 2024, the restorative capacity of these urban community gardens is operationalized through a combination of nature exposure, repetitive physical movement, and the tangible satisfaction of harvesting, which collectively foster emotional resilience, improved mood, and better sleep.

Finally, the individual physical and psychological benefits of gardening are amplified by the rich social capital and community cohesion cultivated within these shared spaces. The garden environment naturally dissolved cultural and generational barriers, prompting diverse participants to exchange agricultural knowledge, such as Afghani irrigation techniques or the cultivation of culturally specific greens. This intercultural bridging aligns with studies highlighting community gardens as vital hubs for mutual support, relationship building, and neighborhood pride (Wong et al., 2018; Delshad, 2022). Furthermore, the opportunities for intergenerational family bonding observed in this study echo findings in a study from New York, City that gardens support family connection and collective engagement (Althaus Ottmann et al., 2010). Ultimately, the shared labor of growing food weaves a stronger social fabric, demonstrating that community gardening is a deeply integrated public health intervention that simultaneously nourishes the body, mind, and community.

However, this qualitative study has several limitations that should be considered when interpreting the findings. The results are not intended to be generalizable to other cities of U.S., as they are based on in-depth interviews with a small group of participants from a single urban community garden, many of whom were long-term gardeners with strong interests in food and gardening, potentially underrepresenting individuals with lower engagement or less positive experiences. In addition, the analysis is inherently interpretive, as theme development reflects the researcher's analytic lens, and the interviews capture perspectives at a single point in time rather than across multiple growing seasons, limiting insight into changes over time. Participants' experiences were also shaped by contextual factors such as climate, pest pressure, and garden infrastructure, particularly in relation to fruit production, which may affect the transferability of findings to other settings. Despite

these limitations, this qualitative study still provides rich, context-specific insight into how and why community gardening influences health behaviors, well-being, and sustained participation.

4.6 Conclusion

This study shows that community gardening often begins as a practical or interest-based activity but gradually develops into a meaningful, value-driven, and socially embedded lifestyle practice. Initial motivations, such as access to space, fresh food, or social encouragement, help gardeners join, while continued participation is sustained through accumulated benefits, including enjoyment, identity, social connection, and a sense of purpose. Gardening also supports physical activity not as structured exercise but as routine, functional movement embedded in daily tasks; activities such as digging, planting, and harvesting provide regular outdoor movement, often replacing or reshaping other forms of activity and reducing sedentary time. In terms of diet, community gardening influences fruit and vegetable consumption by improving access, enhancing taste and freshness, and creating meaningful personal and social experiences. Many participants reported increased variety and frequency of vegetable intake, although changes were influenced by seasonality, prior habits, and environmental constraints. Importantly, these combined effects have clear implications for the prevention of noncommunicable diseases. By fostering regular physical activity, increasing intake of nutrient-dense foods, and supporting mental well-being, community gardening addresses key behavioral risk factors for conditions such as cardiovascular disease, diabetes, and obesity. While immediate or uniform health changes

may not always occur, the practice promotes consistent, long-term habits that support overall well-being. Taken together, these findings highlight community gardens as multifaceted spaces that integrate nutrition, movement, psychosocial restoration, and social connection, representing a practical and sustainable approach to enhancing individual and community health while reducing the risk of chronic disease.

Chapter 5 – Summary and Reflections

In summary, the three studies provide an integrated examination of community gardening as a preventive strategy for non-communicable diseases among adults in urban settings. Drawing from national evidence, regional quantitative data, and local qualitative insights, the findings illustrate how community gardening supports multiple health-related behaviors through regular participation. The synthesis of existing research demonstrates consistent associations between community gardening and improved dietary quality, increased engagement in light to moderate physical activity, and enhanced psychosocial well-being, particularly through stress reduction and social connection. Findings from urban Kansas further show that adult community gardeners exhibit higher physical activity levels, lower obesity prevalence, and fewer chronic conditions than national averages. Although these favorable outcomes are shaped in part by sociodemographic advantages, moderate engagement in community gardening appears to function as a protective factor against non-communicable diseases. Qualitative findings from a small urban setting add depth to this evidence by illustrating how gardeners experience participation as a meaningful lifestyle practice. Rather than viewing gardening as formal exercise, participants emphasized functional movement, routine engagement, emotional restoration, and social interaction as core benefits. Collectively, the studies demonstrate that community gardening integrates nutrition, physical activity, and psychosocial well-being into daily urban life, addressing several modifiable risk factors for chronic disease simultaneously.

The findings highlight the importance of community gardens as low-cost, preventative health infrastructure that extends beyond food production. Their restorative qualities and capacity to foster social cohesion suggest that community gardens should be recognized and

supported as mental health and social resources within urban environments. In neighborhoods experiencing high stress, social isolation, or demographic change, gardens serve as accessible communal spaces that encourage intercultural interaction and intergenerational connection. Urban planning and public health policies should prioritize the protection of existing gardens and the development of new ones, explicitly acknowledging their role in building neighborhood resilience and social capital.

The results also support a reconceptualization of physical activity for health promotion among adults. Rather than emphasizing structured exercise alone, community gardening offers an option for purposeful, routine movement that may be more sustainable for individuals with established sedentary patterns or physical limitations. Integrating community gardens into social prescribing or green prescription frameworks allows healthcare providers to guide individuals toward gardening opportunities when such activities align with their interests, cultural background, or practical needs. This approach emphasizes choice and readiness, reducing reliance on mandated behavior change while supporting long-term engagement to light-moderate physical activity.

Equally important are the equity implications of these findings. Although community gardening offers clear health benefits, participation and baseline health outcomes are strongly influenced by sociodemographic factors such as education and age. To function as an effective population-level intervention, structural barriers to access must be addressed. Municipal and organizational efforts should consider subsidized plot fees, accessible transportation options, multilingual programming, and inclusive garden design that accommodates physical disabilities. Addressing these barriers is essential to ensuring that the health benefits of community gardening are equitably distributed across urban populations.

Finally, drawing on reflections from the study as a whole, although the tangible prospect of harvesting fresh produce often serves as the initial anchor drawing individuals to urban community gardens, the true value of participation lies in the ongoing process of cultivation rather than in the final product. Access to fresh food is the most common catalyst for involvement; however, long-term gardeners remain deeply committed even when a successful harvest is not guaranteed. In this sense, the community garden functions as a microcosm of life. It acts as a distinct and dynamic "third space" outside the traditional realms of home and the workplace. Engaging in a community garden provides a structured yet organic sense of purpose. The overarching goal of growing food compels participants to continually show up, and this persistent presence naturally triggers many other benefits. It demands physical movement, fosters knowledge-sharing and socialization with fellow gardeners, and carves out quiet, restorative moments during solitary tasks. The garden is also a space of shared adversity and resilience. Participants navigate unpredictable challenges, from pest management, weather, to interpersonal dynamics with neighboring plot holders, and overcoming these hurdles builds a strong sense of confidence. Furthermore, the garden anchors participants in the present moment. It allows them to feel more alive by observing the intricate ecosystems, right down to the butterflies, insects, and the life cycles of the plants. Ultimately, when the harvest arrives, the reward is not merely dietary. It is the physical manifestation of hard work, adaptability, and the willingness to experiment. Therefore, the community garden is not just a site for agricultural production; it is an alternative sphere where individuals experience an enriched, multidimensional way of living.

References

- Alaimo, K., Beavers, A. W., Coringrato, E., Lacy, K., Ma, W., Hurley, T. G., & Hébert, J. R. (2023). Community gardening increases vegetable intake and seasonal eating from baseline to harvest: Results from a mixed methods randomized controlled trial. *Current Developments in Nutrition*, 7(5), 100077. <https://doi.org/10.1016/j.cdnut.2023.100077>
- Alaimo, K., Packnett, E., Miles, R. A., & Kruger, D. J. (2008). Fruit and vegetable intake among urban community gardeners. *Journal of nutrition education and behavior*, 40(2), 94–101. <https://doi.org/10.1016/j.jneb.2006.12.003>
- Algert, S. J., Diekmann, L., Renvall, M., & Ready, A. (2016). Community and home gardens increase vegetable intake and food security of residents in San Jose, California. *California Agriculture*, 70(2), 77–82. <https://doi.org/10.3733/ca.v070n02p77>
- Althaus Ottman, M. M., Maantay, J. A., Grady, K., Cardoso, N., & da Fonte, N. N. (2010). Community gardens: An exploration of urban agriculture in the Bronx, New York City. *Cities and the Environment*, 3(1), 20.
- Ansai, N., & Wambogo, E. A. (2021). *Fruit and vegetable consumption among adults in the United States, 2015–2018* (NCHS Data Brief No. 397). National Center for Health Statistics. <https://stacks.cdc.gov/view/cdc/100470>
- Armstrong D. (2000). A survey of community gardens in upstate New York: implications for health promotion and community development. *Health & place*, 6(4), 319–327. [https://doi.org/10.1016/s1353-8292\(00\)00013-7](https://doi.org/10.1016/s1353-8292(00)00013-7)
- Audate, P. P., Fernandez, M. A., Cloutier, G., & Lebel, A. (2018). Impacts of urban agriculture on the determinants of health: Scoping review protocol. *JMIR Research Protocols*, 7(3), e89. <https://doi.org/10.2196/resprot.9427>
- Audate, P. P., Fernandez, M. A., Cloutier, G., & Lebel, A. (2019). Scoping review of the impacts of urban agriculture on the determinants of health. *BMC Public Health*, 19(1), 672. <https://doi.org/10.1186/s12889-019-6885-z>
- Barnidge, E. K., Hipp, P. R., Estlund, A., et al. (2013). Association between community garden participation and fruit and vegetable consumption in rural Missouri. *International Journal of Behavioral Nutrition and Physical Activity*, 10, 128. <https://doi.org/10.1186/1479-5868-10-128>

- Bauermeister, M., Savio, Y., & Swain, S. (2013, September). Community Garden University of California Agriculture and Natural Resources Publication. <https://anrcatalog.ucanr.edu/>
- Beavers, A. W., Atkinson, A., & Alaimo, K. (2019). How gardening and a gardener support program in Detroit influence participants' diet, food security, and food values. *Journal of Hunger & Environmental Nutrition*. <https://doi.org/10.1080/19320248.2019.1587332>
- Bird, D. W. (2004). *Natural fit: Can green space and biodiversity increase levels of physical activity?*. RSPB. Blair, S. N., Kohl, H. W., Paffenbarger, R. S., Clark, D. G., Cooper, K. H., & Gibbons, L. W. (1989). *Physical fitness and all-cause mortality. A prospective study of healthy men and women*. *JAMA*, 262(17), 2395–2401. <https://doi.org/10.1001/jama.1989.03430170057028>
- Booth, J. M., Chapman, D., Ohmer, M. L., & Wei, K. (2017). Examining the Relationship Between Level of Participation in Community Gardens and their Multiple Functions. *Journal of Community Practice*, 26(1), 5–22. <https://doi.org/10.1080/10705422.2017.1413024>
- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. <https://doi.org/10.1191/1478088706qp063oa>
- Brown, B., Dybdal, L., Noonan, C., Pedersen, M. G., Parker, M., & Corcoran, M. (2020). Group Gardening in a Native American Community: A Collaborative Approach. *Health promotion practice*, 21(4), 611–623. <https://doi.org/10.1177/1524839919830930>
- Canton, I., Jakachira, V., Blackman, D., Rose, H., & Aguiñaga, S. (2025). A culturally tailored community gardening approach to improving physical activity, fruit and vegetable consumption, and psychological health among African American women: A pre-post feasibility study. *Health Promotion Perspectives*, 15(2), 122–137. <https://doi.org/10.34172/hpp.025.43243>
- Caspi, C. E., Sorensen, G., Subramanian, S. V., & Kawachi, I. (2012). "The local food environment and diet: A systematic review." *Health & Place*, 18(5), 1172–1187. <https://doi.org/10.1016/j.healthplace.2012.05.006>
- Center for Sustainable Systems, University of Michigan. (2024). *U.S. cities factsheet* (Pub. No. CSS09-06). University of Michigan. <https://css.umich.edu/factsheets/us-cities-factsheet>
- Centers for Disease Control and Prevention. (2021). Overweight & obesity. <https://www.cdc.gov/obesity/index.html>

- Centers for Disease Control and Prevention. (2024, May 14). Adult obesity facts. U.S. Department of Health and Human Services. <https://www.cdc.gov/obesity/adult-obesity-facts/index.html>
- Choi, B. C., Pak, A. W., & Tam, M. (2017). Factors influencing physical activity in low-income neighborhoods: A qualitative study of a community-based intervention program. *American Journal of Public Health, 107*(2), 235-242. <https://doi.org/10.2105/AJPH.2016.303511>
- Clandinin, D., Huber, J., Menon, J., Murphy, M., & Swanson, C. (2016). Narrative inquiry: conducting research in early childhood. In A. Farrell, S. L. Kagan, E. M. Tisdall (Eds.) *Narrative inquiry: Conducting research in early childhood* (Vol. 0, pp. 240-254). SAGE Publications Ltd, <https://doi.org/10.4135/9781473920859.n15>
- Dankbar, H., Zimmerman, E. K., Chennault, C., Basche, A. D., Nester, J. A., Pierre, M., & Roesch-McNally, G. (2017). Lettuce learn: Student reflections on building and sustaining a community donation garden. *Journal of Critical Thought and Praxis, 6*(3), Article 5. <https://doi.org/10.31274/jctp-180810-85>
- Delshad, A. B. (2022). Community gardens: An investment in social cohesion, public health, economic sustainability, and the urban environment. *Urban Forestry & Urban Greening, 70*, 127549. <https://doi.org/10.1016/j.ufug.2022.127549>
- Drewnowski, A., & Almiron-Roig, E. (2010). Human perceptions and preferences for fruit and vegetables: An introduction to the U.S. consumption trends. *Journal of the American Dietetic Association, 110*(6), 857-866. <https://doi.org/10.1016/j.jada.2010.03.010>
- Dyg, P. M., Christensen, S., & Peterson, C. J. (2020). Community gardens and wellbeing amongst vulnerable populations: A thematic review. *Health Promotion International, 35*(4), 790–803. <https://doi.org/10.1093/heapro/daz067>
- Egli, V., Oliver, M., & Tautolo, E.-S. (2016). The development of a model of community garden benefits to wellbeing. *Preventive Medicine Reports, 3*, 348–352. <https://doi.org/10.1016/j.pmedr.2016.04.005>
- Eiroa-Orosa F. J. (2020). Understanding psychosocial wellbeing in the context of complex and multidimensional problems. *International Journal of Environmental Research and Public Health, 17*(16), 5937. <https://doi.org/10.3390/ijerph17165937>
- Fereday, J., & Muir-Cochrane, E. (2006). Demonstrating rigor using thematic analysis: A hybrid approach of inductive and deductive coding and theme development.

International Journal of Qualitative Methods, 5(1), 80–92.
<https://doi.org/10.1177/160940690600500107>

- Firth, C., Maye, D., & Pearson, D. (2011). Developing "community" in community gardens. *Local Environment*, 16(6), 555–568. <https://doi.org/10.1080/13549839.2011.586025>
- Fulton, J. E., Carlson, S. A., & Pratt, M. (2016). The state of physical activity in America. U.S. Department of Health and Human Services.
<https://health.gov/sites/default/files/2019-11/The-State-of-Physical-Activity-in-America.pdf>
- Garcia, M. T., Ribeiro, S. M., Germani, A. C. C. G., & Bógus, C. M. (2018). The impact of urban gardens on adequate and healthy food: A systematic review. *Public Health Nutrition*, 21(2), 416–425. <https://doi.org/10.1017/S1368980017002944>
- Giles-Corti, B., Sallis, J. F., & Frank, L. D. (2016). Environmental correlates of physical activity: A review of the evidence. *American Journal of Preventive Medicine*, 36(3), 212–220. <https://doi.org/10.1016/j.amepre.2013.01.032>
- Glover, T. D., Parry, D. C., & Shinew, K. J. (2005). Building Relationships, Accessing Resources: Mobilizing Social Capital in Community Garden Contexts. *Journal of Leisure Research*, 37(4), 450–474. <https://doi.org/10.1080/00222216.2005.11950062>
- Gregis, A., Ghisalberti, C., Sciascia, S., Sottile, F., & Peano, C. (2021). Community garden initiatives addressing health and well-being outcomes: A systematic review of infodemiology aspects, outcomes, and target populations. *International Journal of Environmental Research and Public Health*, 18(4), 1943. <https://doi.org/10.3390/ijerph18041943>
- Guitart, D., Pickering, C., & Byrne, J. (2012). Past results and future directions in urban community gardens research. *Urban Forestry & Urban Greening*, 11(4), 364–373. <https://doi.org/10.1016/j.ufug.2012.06.007>
- Harris, T. S., Tabriz, C. E., & Shulman, R. (2014). Time constraints and physical activity: The role of work and family responsibilities in the United States. *Journal of Physical Activity and Health*, 11(4), 457–465. <https://doi.org/10.1123/jpah.2013-0150>
- Hawkins, J. L., Smith, A., Backx, K., & Clayton, D. A. (2015). Exercise intensities of gardening tasks within older adult allotment gardeners in Wales. *Journal of Aging and Physical Activity*, 23(2), 161–168. <https://doi.org/10.1123/japa.2013-0171>

- Heilmayr, D., & Friedman, H. S. (2018). Cultivating healthy trajectories: An experimental study of community gardening and health. *Journal of Health Psychology*, 25(13–14), 2418–2427. <https://doi.org/10.1177/1359105318800784>
- Henson, J., De Craemer, M., & Yates, T. (2023). Sedentary behaviour and disease risk. *BMC Public Health*, 23, 2048. <https://doi.org/10.1186/s12889-023-16867-2>
- Henson, J., De Craemer, M., & Yates, T. (2023). Sedentary behaviour and disease risk. *BMC Public Health*, 23, 2048. <https://doi.org/10.1186/s12889-023-16867-2>
- Hume, C., Grieger, J. A., Kalamkarian, A., D’Onise, K., & Smithers, L. G. (2022). Community gardens and their effects on diet, health, psychosocial and community outcomes: A systematic review. *BMC Public Health*, 22(1), 1247. <https://doi.org/10.1186/s12889-022-13591-1>
- Institute for Health Metrics and Evaluation. (2024). *Global burden of disease 2021: Findings from the GBD 2021 study*. IHME. <https://www.healthdata.org/gbd/2021>
- Johnson, D. B., & Smith, L. T. (2006). Testing the recommendations of the Washington State Nutrition and Physical Activity Plan: the Moses Lake case study. *Preventing chronic disease*, 3(2), A59. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1563950/>
- Kansas Department of Health and Environment. (2022). *Annual summary of vital statistics*. Kansas Department of Health and Environment. <https://www.kdhe.ks.gov/1089/Public-Health-Statistics>
- Kansas Health Matters. (n.d.). Adults with fair or poor health – Riley County, Kansas. *Kansas Health Matters*. <https://www.kansashealthmatters.org/indicators/index/view?indicatorId=5681&localeId=1020>
- Kingsley, J., Foenander, E., & Bailey, A. (2019). "You feel like you're part of something bigger": exploring motivations for community garden participation in Melbourne, Australia. *BMC public health*, 19(1), 745. <https://doi.org/10.1186/s12889-019-7108-3>
- Kunpeuk, W., Spence, W., Phulkerd, S., Suphanchaimat, R., & Pitayarangsarit, S. (2020). The impact of gardening on nutrition and physical health outcomes: a systematic review and meta-analysis. *Health promotion international*, 35(2), 397–408. <https://doi.org/10.1093/heapro/daz027>
- Kwartnik-Pruc, A., & Droj, G. (2023). The role of allotments and community gardens and the challenges facing their development in urban environments: A literature review. *Land*, 12(2), Article 325. <https://doi.org/10.3390/land12020325>

- Lampert, T., Costa, J., Santos, O., Sousa, J., Ribeiro, T., & Freire, E. (2021). Evidence on the contribution of community gardens to promote physical and mental health and well-being of non-institutionalized individuals: A systematic review. *PloS one*, 16(8), e0255621. <https://doi.org/10.1371/journal.pone.0255621>
- Langer, A. M., Ettinger, A. K., & Lewis, S. D. (2017). Impact of food deserts on the dietary behavior of low-income individuals in the United States. *Journal of Hunger & Environmental Nutrition*, 12(1), 1-9. <https://doi.org/10.1080/19320248.2016.1199353>
- Lawson, L. J. (2005). *City bountiful: A century of community gardening in America*. University of California Press. Lawson, L. J. (2005). *City bountiful: A century of community gardening in America*. University of California Press.
- Lee, J. H., & Matarrita-Cascante, D. (2019). The influence of emotional and conditional motivations on gardeners' participation in community (allotment) gardens. *Urban Forestry & Urban Greening*, 42, 21–30. <https://doi.org/10.1016/j.ufug.2019.05.006>
- Lee-Kwan, S. H., Moore, L. V., Blanck, H. M., Harris, D. M., & Galuska, D. (2017). Disparities in state-specific adult fruit and vegetable consumption—United States, 2015. *Morbidity and Mortality Weekly Report*, 66(45), 1241–1247. <https://doi.org/10.15585/mmwr.mm6645a1>
- Lee, S. H., Moore, L. V., Park, S., Harris, D. M., & Blanck, H. M. (2022). Adults meeting fruit and vegetable intake recommendations — United States, 2019. *Morbidity and Mortality Weekly Report*, 71(1), 1–9. <https://www.cdc.gov/mmwr/volumes/71/wr/mm7101a1.htm>
- Limerick, S., Hawes, J. K., Gounaridis, D., Cohen, N., & Newell, J. P. (2023). *Community gardens and the 15-minute city: Scenario analysis of garden access in New York City*. *Urban Forestry & Urban Greening*, 89, 128107. <https://doi.org/10.1016/j.ufug.2023.128107>
- Litt, J. S., Lambert, J. R., & Glueck, D. H. (2017). Gardening and age-related weight gain: Results from a cross-sectional survey of Denver residents. *Preventive Medicine Reports*, 8, 221–225. <https://doi.org/10.1016/j.pmedr.2017.10.018>
- Litt, J. S., Schmiede, S., Hale, J. W., Buchenau, M., & Sancar, F. (2015). *Exploring ecological, emotional and social levers of self-rated health for urban gardeners and non-gardeners: A path analysis*. *Social Science & Medicine*, 144, 1–8. <https://stacks.cdc.gov/view/cdc/35083>

- Litt, J. S., Soobader, M.-J., Turbin, M. S., Hale, J. W., Buchenau, M., & Marshall, J. A. (2011). The influence of social involvement, neighborhood aesthetics, and community garden participation on fruit and vegetable consumption. *American Journal of Public Health*, 101(8), 1466–1473. <https://doi.org/10.2105/AJPH.2010.300111>
- Malambo, P., Kengne, A. P., De Villiers, A., Lambert, E. V., & Puoane, T. (2016). Built Environment, Selected Risk Factors and Major Cardiovascular Disease Outcomes: A Systematic Review. *PloS one*, 11(11), e0166846. <https://doi.org/10.1371/journal.pone.0166846>
- Mangadu, T., Kelly, M., Orezza, M. C. E., Gallegos, R., & Matharasi, P. (2017). Best practices for community gardening in a US-Mexico border community. *Health promotion international*, 32(6), 1001–1014. <https://doi.org/10.1093/heapro/daw025>
- Motairek, I., Lee, E. K., Janus, S., Farkouh, M., Freedman, D., Wright, J., Nasir, K., Rajagopalan, S., & Al-Kindi, S. (2022). Historical neighborhood redlining and contemporary cardiometabolic risk. *Journal of the American College of Cardiology*, 80(2), 171–175. <https://doi.org/10.1016/j.jacc.2022.05.010>
- National Center for Education Statistics. (n.d.). *Locale definitions*. U.S. Department of Education. <https://nces.ed.gov/surveys/annualreports/topical-studies/locale/definitions>
- National Center for Health Statistics. (2024). Obesity and overweight. Centers for Disease Control and Prevention. <https://www.cdc.gov/nchs/fastats/obesity-overweight.htm>
- National Heart, Lung, and Blood Institute. (2013). Managing overweight and obesity in adults: Systematic evidence review from the Obesity Expert Panel. <https://www.nhlbi.nih.gov/sites/default/files/media/docs/obesity-evidence-review.pdf>
- National Institute of Diabetes and Digestive and Kidney Diseases. (2020). Health risks of being overweight. <https://www.niddk.nih.gov/health-information/weight-management/health-risks-overweight>
- Pan American Health Organization. (n.d.). Noncommunicable diseases. Retrieved January 15, 2025, from <https://www.paho.org/en/topics/noncommunicable-diseases>
- Papanek, A., Campbell, C. G., & Wooten, H. (2023). *What is urban agriculture?* (FCS3380/FY1519). *EDIS*, 2023(3). <https://doi.org/10.32473/edis-fy1519-2023>
- Patil R. R. (2014). Urbanization as a determinant of health: a socioepidemiological perspective. *Social work in public health*, 29(4), 335–341. <https://doi.org/10.1080/19371918.2013.821360>

- Patil, R. R. (2014). Urbanization as a determinant of health: A socioepidemiological perspective. *Social Work in Public Health, 29*(4), 335–341. <https://doi.org/10.1080/19371918.2013.821360>
- Ponstingel, D. (2023). Community gardens as commons through the lens of the diverse economies framework: A case study of Austin, TX. *Applied Geography, 154*, 102945. <https://doi.org/10.1016/j.apgeog.2023.102945>
- Raneng, J., Howes, M., & Pickering, C. M. (2023). Current and future directions in research on community gardens. *Urban Forestry & Urban Greening, 79*, 127814. <https://doi.org/10.1016/j.ufug.2022.127814>
- Raber, M., et al. (2020). "Barriers to Preparing and Cooking Vegetables Are Associated with Decreased Home Availability of Vegetables in Low-Income Households." *Nutrients, 12*(7), 2056. <https://doi.org/10.3390/nu12072056>
- Riley County Health Department. (2023). *Overview of the Riley County Community Health Improvement Planning Process*. Riley County Government. <https://www.rileycountyks.gov/DocumentCenter/View/23655/RCCHIP-Report---Final-2023>
- Robinson, C., Hudson, D., & Shattuck, M. (2008). Barriers to fruit and vegetable consumption in the U.S.: Examining structural inequalities and access issues. *Journal of Nutrition Education and Behavior, 40*(2), 104–113. <https://doi.org/10.1016/j.jneb.2007.10.002>
- Schanbacher, W. D., & Cavendish, J. C. (2023). The effects of COVID-19 on Central Florida's community gardens: lessons for promoting food security and overall community wellbeing. *Frontiers in public health, 11*, 1147967. <https://doi.org/10.3389/fpubh.2023.1147967>
- Shaker, Y., Grineski, S. E., Collins, T. W., et al. (2023). Redlining, racism and food access in US urban cores. *Agriculture and Human Values, 40*, 101–112. <https://doi.org/10.1007/s10460-022-10340-3>
- Sonti, N. F., & Svendsen, E. S. (2018). *Why garden? Personal and abiding motivations for community gardening in New York City*. *Society & Natural Resources, 31*(10), 1189–1205. <https://doi.org/10.1080/08941920.2018.1484971>
- Spano, G., D'Este, M., Giannico, V., Carrus, G., Elia, M., Laforteza, R., Panno, A., & Sanesi, G. (2020). Are Community Gardening and Horticultural Interventions Beneficial for Psychosocial Well-Being? A Meta-Analysis. *International journal of environmental research and public health, 17*(10), 3584. <https://doi.org/10.3390/ijerph17103584>

- Thompson, W. R., O'Connor, P., & Brown, D. (2019). The impact of screen time on physical activity and obesity in U.S. adults. *Journal of American Lifestyle Medicine*, 22(2), 105–113. <https://doi.org/10.1080/1543961X.2018.1557957>
- Trendov, N. M. (2018). Comparative study on the motivations that drive urban community gardens in Central Eastern Europe. *Annals of Agrarian Science*, 16(1), 85–89. <https://doi.org/10.1016/j.aasci.2017.10.003>
- UFM Community Learning Center. (n.d.). *Manhattan Community Gardens*. Retrieved March 25, 2026, from <https://tryufm.org/community-gardens/>
- U.S. Census Bureau. (2024, December 16). *Urban and rural*. <https://www.census.gov/programs-surveys/geography/guidance/geo-areas/urban-rural.html>
- U.S. Census Bureau. (n.d.). *QuickFacts: Manhattan City, Kansas* (Table PST045224). U.S. Department of Commerce. Retrieved January 23, 2026, from <https://www.census.gov/quickfacts/fact/table/manhattancitykansas/PST045224#qf-flag-X>
- U.S. Department of Agriculture. (n.d.). Urban Agriculture and Innovative Production. Retrieved January 17, 2025, from <https://www.usda.gov/farming-and-ranching/agricultural-education-and-outreach/urban-agriculture-and-innovative-production>
- U.S. Department of Agriculture. (n.d.). Urban agriculture. *U.S. Department of Agriculture*. Retrieved February 27, 2025, from <https://www.usda.gov/farming-and-ranching/agricultural-education-and-outreach/urban-agriculture-and-innovative-production>
- Veldheer, S., Tuan, W. J., Al-Shaar, L., Wadsworth, M., Sinoway, L., Schmitz, K. H., Sciamanna, C., & Gao, X. (2023). Gardening is associated with better cardiovascular health status among older adults in the United States: Analysis of the 2019 Behavioral Risk Factor Surveillance System Survey. *Journal of the Academy of Nutrition and Dietetics*, 123(5), 761–769.e3. <https://doi.org/10.1016/j.jand.2022.10.018>
- Wagstaff, R. K., & Wortman, S. E. (2015). Crop physiological response across the Chicago metropolitan region: Developing recommendations for urban and peri-urban farmers in the north central US. *Renewable Agriculture and Food Systems*, 30(1), 8–14. <https://doi.org/10.1017/S174217051300046X>

- Walker, R. E., Keane, C. R., & Burke, J. G. (2010). Disparities and access to healthy food in the United States: The role of food deserts. *Public Health Nutrition*, 13(7), 1008-1017. <https://doi.org/10.1017/S1368980009993165>
- Ward, Z. J., Bleich, S. N., Long, M. W., & Gortmaker, S. L. (2021). Association of body mass index with health care expenditures in the United States by age and sex. *PloS one*, 16(3), e0247307. <https://doi.org/10.1371/journal.pone.0247307>
- Ward, Z. J., Willett, W. C., Hu, F. B., Pacheco, L. S., Long, M. W., & Gortmaker, S. L. (2022). Excess mortality associated with elevated body weight in the USA by state and demographic subgroup: A modelling study. *EClinicalMedicine*, 48, 101429. <https://doi.org/10.1016/j.eclinm.2022.101429>
- Wolf, A., et al. (2023). "Frequency of Convenience Cooking Product Use Is Associated with Cooking Confidence, Creativity, and Markers of Vegetable Intake." *Nutrients*, 15(5), 1133. <https://doi.org/10.3390/nu15051133>
- Wong, R., Gable, L., & Rivera-Núñez, Z. (2018). Perceived Benefits of Participation and Risks of Soil Contamination in St. Louis Urban Community Gardens. *Journal of community health*, 43(3), 604–610. <https://doi.org/10.1007/s10900-017-0459-8>
- Woodside, J. V., Nugent, A. P., Moore, R. E., & McKinley, M. C. (2023). Fruit and vegetable consumption as a preventative strategy for non-communicable diseases. *Proceedings of the Nutrition Society*, 82(2), 186–199. <https://doi.org/10.1017/S0029665123002161>
- World Health Organization. (2024, December 23). *Noncommunicable diseases*. World Health Organization. <https://www.who.int/news-room/fact-sheets/detail/noncommunicable-diseases>
- World Health Organization. (2025, March 19). *Urban health*. World Health Organization. <https://www.who.int/news-room/fact-sheets/detail/urban-health>
- Zick, C. D., Smith, K. R., Kowaleski-Jones, L., Uno, C., & Merrill, B. J. (2013). Harvesting more than vegetables: the potential weight control benefits of community gardening. *American journal of public health*, 103(6), 1110–1115. <https://doi.org/10.2105/AJPH.2012.301009>
- Zinaic, R., Correa, T., Etowa, E., Owolabi, R., Bhatt, Y., & Wong, J. P.-H. (2025). Exploring the impact of community gardens on mental health: A scoping review. *Wellbeing, Space and Society*, 8, 100263. <https://doi.org/10.1016/j.wss.2025.100263>

Appendix A . Interview Questions for the Garden Management Personnel

1. Can you tell me about the brief history and mission of this community garden?
2. How would you classify this community garden? (e.g., allotment-style, communal/shared plots, educational, therapeutic, urban farm, etc.)
3. What are the primary goals of the garden (e.g., food production, education, social connection)?
4. Can you describe the layout and size of the garden?
5. What types of plots are available (e.g., individual, shared, raised beds)?
6. Are there any features designed for accessibility (e.g., wheelchair access, seating areas)?
7. What kinds of plants are typically grown here?
8. Are there any structures or facilities (e.g., tool sheds, compost stations, water access)?
9. Is the garden open year-round or seasonal?
10. Who oversees the management and maintenance of the garden?
11. Is the garden affiliated with any organizations, schools, or local government?
12. Are there any partnerships or sponsors that support the garden?
13. Are there specific programs or initiatives tied to health, nutrition, or wellness?
14. Is the garden open to the public or limited to specific groups?
15. How do individuals or groups typically become involved or part of the garden?
16. Who typically participates in the garden (e.g., age groups, families, students, seniors)?
17. Are there any eligibility requirements to join?
18. Do you track demographic information about members (e.g., age, gender, background)?
19. How diverse is the participant base in terms of ethnicity or socioeconomic status?
20. Have you noticed any trends in who joins or stays involved over time?

Appendix B . Recruitment Survey Questionnaire

Q1 First name

Q2 Age

Q3 Race

- ☐ American Indian or Alaska Native
- ☐ Asian
- ☐ African American
- ☐ Hispanic or Latino
- ☐ Native Hawaiian or Native Pacific Islander
- ☐ White
- ☐ Other: _____
- ☐ Prefer not to answer

Q4 How many years have you been gardening at home or in a community garden?

Q5 How many years have you been gardening at Riley Lane Garden?

Do you meet the following eligibility requirements? ☐ you are 18 years or older ☐ A returning gardeners ☐ Have been actively involved (visiting the garden at least once per week during the growing season) ☐ Are living independently in the community (i.e., not residing in institutional settings) ☐ Physically able to do gardening tasks ☐ Can speak and understand English

- ☐ Yes
- ☐ No

Q7 Preferred contact method

- ☐ e-mail _____
- ☐ phone number _____

Q8 Please let us know your most convenient day and time for the interview, or feel free to suggest a specific date.

Appendix C . Informed Consent Form

Informed Consent Form

K-State IRB #: 13218

Title of this Research Study

A Qualitative Study on Participation Motivations and Perceived Impacts on Health Among Free-Living Adults Participants of Community Garden in an Urban Area

Invitation

You are being invited to take part in a doctoral study about the impact of urban community gardening on health of free-living adults. The information in this form is meant to help you decide whether or not to participate in it. If you have questions, please ask them at any time.

Why are you being asked to participate in this research study?

You are being asked to take part in this study because you actively participated in the community garden for at least one season, physically fit to participate in gardening tasks, more than 18 years old, and speaks English.

What is the reason for doing this research study?

The purpose of this study is to explore motives and the perceived impacts on health among free-living adults participating in a community garden in an urban area.

What will be done during this research study?

If you agree to participate, you will be asked to:

- You will be asked to participate in an interview that will last about 1 hour.
- This interview will be done in-person, or via Zoom (a video conferencing platform), or phone conferencing, whatever works for your convenience.
- All interviews will be recorded for transcription purposes. The transcript will be subjected to analysis with names and other sensitive data anonymized.

Are there experimental procedures involved?

There are no experimental procedures involved in this study.

What are the possible disadvantages and risks of taking part?

There are minimal risks associated with this study. However, discussing personal experiences may cause emotional discomfort. You may skip any question or stop the interview at any time.

What are the possible benefits of this research study for you?

By taking part in this study, you will be contributing to new understandings of the urban food growing sector. The information you provide will be used to better understand the actual health impacts of participation in urban community gardens.

Will you be paid for being in this research study?

You will receive a \$20 gift card as compensation for your time participating in this study. This compensation is provided for the time you spend taking part in the interview.

What should you do if you have a problem during this research study?

Your welfare is the major concern of the researcher of this study. If you have a problem as a direct result of being in this study, you should immediately contact and speak to the graduate student researcher or to her adviser:

Sheila F. Abacan, graduate student

e-mail: sfabacan@ksu.edu

Contact number: 7853170119

Priscilla Brenes, PhD (Adviser)

Email: pbrenes@ksu.edu

Contact number: 7853176812

How will your personal information be protected?

Reasonable steps will be taken to protect your privacy and the confidentiality of your study data. An announcement will be made at the beginning of the interview that your interview is strictly confidential. Your name will be kept confidential and instead of your name, codes will be used. A code will be used only by the researcher to help her transcribe interviews. Transcripts will not use any identifying information. All audio or videorecordings will be kept safe by the researcher for up to 5 years. After that, all recordings will be destroyed. The only person who will have access to your research data is the student researcher, the student's adviser, the Institutional Review Board (IRB), and any other person or agency required by law. The information from this study may be published in scientific journals or presented at scientific meetings, but your identities will be kept strictly confidential.

What are your rights as a research subject?

You have rights as a research subject. If you have any questions concerning your rights or complaints about the research, talk to the researcher or contact the Institutional Review Board Chairperson or the Associate Vice President for Research Compliance at K-State as listed below:

Lisa Rubin, Chair, Committee on Research Involving Human Subjects, 203 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224

Brad Woods, Associate Vice President for Research Compliance, 203 Fairchild Hall, Kansas State University, Manhattan, KS 66506, (785) 532-3224.

Voluntary Participation

Your participation is entirely voluntary. You may refuse to participate or withdraw at any time without penalty or loss of benefits to which you are otherwise entitled.

Please indicate your decision regarding participation in this study by checking one box below and completing the signature section.

☐ **Yes**, I consent to participate in this research study.

☐ **No**, I do not consent to participate in this research study.

Signature: _____

Printed Name: _____

Date: _____

Appendix D Final Themes and Codes

1. Initial reasons for joining the community garden

Themes and Sub-themes	Codes	Description
Value- and Purpose-Driven Motivations		
Access to Fresh and High-Quality Produce	Q1_FOOD_ACCESS	Participation motivated by desire to grow or access fresh food or rare varieties
	Q1_FOOD_QUALITY FRESHNESS	Mentions of freshness, taste, organic, or chemicalfree produce.
	em_Q1_foodsecurity	Statements about saving money, stretching food budgets, or reliable access.
	Q1_PLACE_ATTACHMENT	Emotional attachment to the garden as a meaningful place. Mentions they like gardening since they were young because their family or loved once exposed them to gardening or farming.
	em_Q1_natural_desire_planting	Mentions natural desire /love for planting due to other reasons aside from family background or heritage like horticulture or agriculture education background
Environmental Stewardship & Purpose (Eudaimonic Well-Being)-purpose-driven engagement	Q1_PURPOSE_STRUCTURE	Gardening provides routine, purpose, or daily structure or responsibility
	em_Q1_envt_sustainability	Mentions about shorter food transportation, lower carbon emission, or shorter food chain
Socially Driven Motivations		
Social Invitation/Influence	em_Q1_invited_influenced	Joined the community garden arising from interpersonal encouragement, invitations, or influence from others. This includes being invited, persuaded, recruited, or inspired by friends, family, neighbors, coworkers, or community members.
Social Connection and Community Building	Q1_SOCIAL_CONNECTEDNESS	Building relationships, friendships, or reducing isolation.
Practical and Self-Development Motivations		

Themes and Sub-themes	Codes	Description
Health, well-being, and enjoyment	Q1_ENJOYMENT	Gardening described as fun, enjoyable, or satisfying without health framing.
	Q1_MOOD_IMPROVEMENT	Positive emotions such as happiness or feeling good. or relaxing
Home Space Constraints	em_Q1_shaded_yard	Joined the community garden due to inadequate, poor-quality, or unavailable gardening space at home. This includes limitations such as lack of sunlight, limited yard space, unsuitable soil, unsafe environments, rental restrictions, or living arrangements that prevent gardening
Learning and Skill Development	em_Q1_learning	Joined the community garden to learn new skills, improve gardening knowledge, or share and teach skills with others.

2. Persistent motivations for community gardening

Themes and Sub-themes	Codes	Description
Value- and Purpose-Driven Motivations		
Access to Fresh and High-Quality Produce	Q1.1_FOOD_ACCESS	Participation motivated by desire to grow or access fresh food or rare varieties
	Q1.1_FOOD_QUALITY FRESHNESS	Mentions of freshness, taste, organic, or chemical-free produce.
	em_Q1.1_foodsecurity	Statements about saving money, stretching food budgets, or reliable access.
Emotional and Identity-Based Connection to Gardening	Q1.1_CONNECTION_TO_NATURE	Emotional or identity-based connection to nature.
	Q1.1_PLACE_ATTACHMENT	Emotional attachment to the garden as a meaningful place. Mentions they like gardening since they were young because their family or loved once exposed them to gardening or farming.
	em_Q1.1_natural_desire_planting	Mentions natural desire /love for planting due to other reasons aside from family background or heritage like horticulture or agriculture education background
Environmental Stewardship & Purpose (Eudaimonic Well-Being)-purpose-driven engagement	Q1.1_PURPOSE_STRUCTURE	Gardening provides routine, purpose, or daily structure or responsibility
	em_Q1.1_envt_sustainability	Mentions about shorter food transportation, lower carbon emission, or shorter food chain
Socially Driven Motivations		
Social Connection and Community Building	Q1.1_SOCIAL_CONNECTEDNESS	Building relationships, friendships, or reducing isolation.
	em_Q1.1_sharing_friends	Gardening provides produce that can be shared with friends or neighbors or bond with friends through produce from the garden (sharing or doing preserves together)

Practical and Self-Development Motivations		
Health, well-being, and enjoyment	Q1.1_ENJOYMENT	Gardening is described as fun, enjoyable, or satisfying without health framing.
	Q1.1_MOOD_IMPROVEMENT	Positive emotions such as happiness or feeling good. or relaxing
	em_Q1.1_outdoor_air	Feeling happy to be outdoors and getting fresh air
	em_Q1.1_good_health	Gardening gives them opportunity to do work or a form of exercise [framed for health]
Learning and Skill Development	em_Q1.1_learning	Joined the community garden to learn new skills, improve gardening knowledge, or share and teach skills with others.

3. Role of community gardening in influencing fruit and vegetable intake

Themes	Codes	Description
Dietary Behavior Change	Q3_IMPROVED_DIETARY_INTAKE	Eating more fruits and vegetables due to gardening.
	em_Q2_improved_diet	Gardening improves variety since they can plant their favorite vegetables or fruits, that are normally expensive or rare in stores
	Q3_FOOD_QUALITY_FRESHNESS	Preference for fresh quality of garden produce influencing diet.
	em_food_prep	Cooking and preserving because of the produce from the garden
	em_Q1.1_sharing_friends	Gardening provides produce that can be shared with friends or neighbors or bond with friends through produce from the garden (sharing or doing preserves together)
	em_Q3_no_change_fruit	Gardening did not change fruit behavior and practices
	em_Q3_improved_FV_variety	Gardening improves variety since they can plant their favorite vegetables or fruits, that are normally expensive or rare in stores

Themes	Codes	Description
Quality, Freshness, and Taste Shape Consumption Practices	em_access_FV	Certain vegetables became more accessible due to cost and availability
	Q3_FOOD_AFFORDABILITY	Ability to eat more produce because it is cheaper or accessible.
Limited or Seasonal Change Among Some Gardeners	em_Q3_no_change_vegetable	Gardening did not change vegetable behavior and practices
	em_Q3_no_change_fruit	Gardening did not change fruit behavior and practices
	em_seasonal	Change in produce consumption only in harvest season

4. Role of community gardening in influencing physical activity habits

Themes	Codes	Description
Gardening as Routine-Embedded & Incidental Movement	Q3_PURPOSE_STRUCTURE	Routine encouraging consistent physical activity.
	Q3_OUTDOOR_TIME	Gardening increases daily outdoor exposure, hence movement.
	Q3_PURPOSE_STRUCTURE	Routine encouraging consistent physical activity.
	em_less_sedentary	Gardening reduces sedentary time like watching TV
Gardening Replaces or Shifts Other Activities	em_Q3_no_change_PA	Gardening did not change PA behavior and practices
	em_activity_replacement	Community gardening replaces previous activity or exercise routine that they were doing such as cycling, playing soccer, etc
	Q3_PURPOSE_STRUCTURE	Routine encouraging consistent physical activity.
	Q3_PHYSICAL_ACTIVITY_ROUTINE	Gardening integrated into regular activity patterns.
Physical Demands of Gardening and Reduction of Sedentary Time	em_PA_type	Physical activities they typically do at the garden
	em_less_sedentary	Gardening reduces sedentary time like watching TV or using computer
	em_increased_PA	Community gardening increases physical activity

5. Perceived health benefits of engaging in community gardening

Themes	Codes	Description
Improved Nutrition and Dietary Habit	em_Q2_improved_diet	Gardening helps them to cook and eat or like more FV
	Q3_IMPROVED_DIETARY_INTAKE	Eating more fruits and vegetables due to gardening.
	Q3_FOOD_QUALITY_FRESHNESS	Preference for fresh quality of garden produce influencing diet.
	em_Q3_improved_FV_variety	Gardening improves variety since they can plant their favorite vegetables or fruits, that are normally expensive or rare in stores
	em_food_prep	Cooking and preserving because of the produce from the garden
	em_Q1.1_healthyfood	Specified that he/she likes healthy (fresh, organic) food hence decided to garden
	Q1.1_FOOD_QUALITY_FRESHNESS	Mentions of freshness, taste, organic, or chemical free produce.
	Q1_FOOD_QUALITY_FRESHNESS	Mentions of freshness, taste, organic, or chemical free produce.
Maintenance of Functional Mobility and Physical Health	Q2_INCREASED_PHYSICAL_ACTIVITY	Gardening as exercise or physical movement.
	em_increased_PA	Community gardening increases physical activity
	em_Q2_activity_replacement	Community gardening maintains health as it replaces previous activity or exercise routine that they were doing such as cycling, playing soccer, etc
	Q2_OUTDOOR_TIME_MOBILITY	Increased time outdoors or maintaining strength and mobility.
	Q2_REDUCED_NCD_RISK	Perceived benefits related to weight, blood pressure, diabetes, or heart health.
	em_Q2_better_sleep	Mentions getting good sleep because of gardening framed as a health benefit
	em_physical_health_benefit	Gardening helps to have stronger or maintain good body functioning such as back muscles
Psychosocial Restoration and Stress Mitigation	Q2_STRESS_REDUCTION	Stress relief, calming effects, or anxiety reduction.
	Q2_MENTAL_RESTORATION	Mindfulness, emotional healing, or mental clarity. /Autonomy, Solitude, and Personal Time
	Q2_MOOD_IMPROVEMENT	Improved mood framed as a health benefit. Gardening is an enjoyable activity.
	em_Q2_being_outdoor	Direct benefit perceptions from being outside (fresh air, sun/Vitamin D, “grounding”).
	em_Q2_satisfaction	Gives satisfaction or accomplishment in life

Themes	Codes	Description
	em_Q2_happiness_connecting	Related to mood improvement except mentions of enjoyment/happiness related to meeting other people/sharing produce
	em_Q2_purpose_structure	Gardening provides routine or purpose, hence gardeners are motivated to be physically fit so they can garden /Responsibility for plots drives consistent activity and self-care.
	Q3_PURPOSE_STRUCTURE	Routine encouraging consistent physical activity
	em_connection_to_nature	Emotional or identity-based connection to nature.
	Q1.1_CONNECTION_TO_NATURE	Emotional or identity-based connection to nature.
	Q1.1_ENJOYMENT	Gardening is described as fun, enjoyable, or satisfying without health framing.
	Q1_ENJOYMENT	Gardening is described as fun, enjoyable, or satisfying without health framing.
Social Connection and Community Engagement	em_social_connectedness	Building relationships, friendships, or reducing isolation as cited benefits of community
	Q1.1_SOCIAL_CONNECTEDNESS	Building relationships, friendships, or reducing isolation.
	Q1_SOCIAL_CONNECTEDNESS	Building relationships, friendships, or reducing isolation.
	em_Q1.1_sharing_friends	Gardening provides produce that can be shared with friends or neighbors or bond with friends through produce from the garden (sharing or doing preserves together)
	em_community_cohesion	Mentions shared responsibility with friends or working together, but not as a response to motivation to participate