

**Impact of the COVID-19 Pandemic on the Mindfulness, Loneliness, and Gardening Experiences  
of Older Cancer Survivors Participating in a Vegetable Gardening Intervention**

by

Autumn Shay Busbee

A thesis submitted to the Graduate Faculty of  
Auburn University  
in partial fulfillment of the  
requirements for the Degree of Master of Science

Auburn, Alabama

May 7, 2022

Keywords: Gardening; Harvest for Health; Mindfulness; Loneliness; Socio-horticulture

Copyright 2022 by Autumn Shay Busbee

Approved by

Dr. Carolyn Robinson, Chair, Associate Professor of Horticulture

Dr. Desmond Layne, Department Head and Professor of Horticulture

Dr. Wendy Demark-Wahnefried, Professor and Webb Endowed Chair of Nutrition Sciences,  
University of Alabama at Birmingham

## Abstract

Despite robust research on the mental benefits of gardening, the relationship between mindfulness, loneliness, and gardening, all topics that surged in public awareness due to the COVID-19 pandemic, has yet to be investigated. This study explored pandemic-related mindfulness, loneliness, and gardening and program experiences of participants in various stages of enrollment in Harvest for Health (H4H), a clinical research trial that examined the effects of a gardening intervention on the diet and exercise of older adults who had survived cancer. Study participants were surveyed and interviewed to determine differences in pre- and mid-pandemic mindfulness and loneliness and were assessed on how the COVID-19 pandemic impacted gardening and interventional experiences. Major findings include: 1) H4H participation and gardening experiences were not negatively impacted by the COVID-19 pandemic, however other life events had the potential to cause participants to deprioritize gardening; 2) participant mindfulness and loneliness were affected by the pandemic and were inversely correlated with one another; 3) loneliness increased while mindfulness decreased due to the pandemic; 4) gardening interest was found to be negatively associated with loneliness; and 5) intervention status was positively associated with mindfulness, those who had completed or started intervention had higher levels of mindfulness than those who had yet to begin.

## Acknowledgements

Lily Grace, our precious butterfly. There could have never been enough time with you and I am so appreciative of every second we had together. You made me who I am and I'm still figuring out who I will be without you.

Pepa, you shined with love and pride for me. I am honored to carry your light in my heart.

I am thankful for the research participants who contributed to this study. I admire y'all's resilience and have been humbled by our conversations. Thank you for telling me your story; what a beautiful one it is.

I would like to thank Dr. Carolyn Robinson for helping me realize and pursue my interests in horticulture to the fullest potential. Two years of your mentorship and friendship have flown by and I find it so bittersweet. Your kindness, grace, and patience have touched my soul.

I thank my graduate committee, Dr. Wendy Demark-Wahnefried and Dr. Des Layne, for their encouragement and involvement in my project and for their devotion to improving lives through research.

I would like to thank Beth Clendenen, Skye Fuller, Ms. Leanne Meacham, and Ms. Nancy Heard, for their willingness to always lend a helping hand, find a solution, and have a good laugh.

I'm thankful for the support I've received from my partner, Kevin. I have cherished seeing you every few months and am so excited to soon call North Carolina our home.

I would like to thank my family and friends for always being a phone call away. I am grateful to those who visited and understand that life got in the way for those who were unable. I look forward to seeing each of you and celebrating the victories we've had along the way.

# Table of Contents

Abstract.....	ii
Acknowledgements.....	iii
Table of Contents.....	v
List of Tables.....	vii
List of Figures.....	viii
Chapter 1: Introduction.....	9
Definition of Terms.....	11
Basic Assumptions.....	13
Limitations.....	13
Delimitations.....	14
Chapter 2: Literature Review.....	15
Introduction.....	15
Harvest for Health and Older Cancer Survivors.....	15
Therapeutic Benefits of Gardening.....	20
COVID-19 Pandemic.....	23
Loneliness.....	25
Mindfulness.....	27
Conclusion.....	30
Chapter 3: Methodology.....	32
Study Overview.....	32
Institutional Review Board (IRB) Approval and Risks.....	32
Recruitment and Sample Description.....	33
Instrument: Online Survey.....	34
Instrument: Phone Interview.....	36
Data Collection and Saturation.....	37
Data Analysis: Survey.....	38
Data Analysis: Interview.....	38
Chapter 4: Assessing the Impacts of the COVID-19 Pandemic on Gardening and Interventional Experiences of Harvest for Health (H4H) Participants.....	39

Summary .....	39
Introduction.....	40
Materials and Methods.....	43
Results .....	48
Discussion.....	57
Chapter 5: Assessing the Impacts of the COVID-19 Pandemic on the Mindfulness and Loneliness of Older Gardeners .....	61
Summary .....	61
Introduction.....	62
Materials and Methods.....	65
Results .....	69
Discussion.....	75
Chapter 6: Observations and Conclusions .....	78
References .....	80
Tables .....	92
Figures.....	107
Appendices.....	111
Appendix A- Online Survey.....	111
Appendix B- Phone Interview Script .....	125
Appendix C- Recruitment Emails.....	126
Appendix D- Social Media Post .....	131
Appendix E- Recruitment Postcard .....	132
Appendix F- Announcement Letter for Prize Winners.....	133
Appendix G- IRB Approval and Documentation.....	134

## List of Tables

Table 1. Demographic information of participants enrolled in H4H prior to October 2020 who participated in the MLOG and GIEH studies. ....	92
Table 2. Most frequently selected statements by MLOG and GIEH participants when asked to identify motivations to participate in H4H. ....	94
Table 3. Response frequencies of MLOG and GIEH participants when asked to identify how the COVID-19 pandemic affected their interest in gardening. ....	95
Table 4. Response frequencies of MLOG and GIEH participants when asked to identify their typical state of gardening interest after previously indicating that the COVID-19 pandemic did not affect their interest in gardening. ....	96
Table 5. Frequencies of the gardening importance between March and June 2020 as selected by MLOG and GIEH participants who had completed or started H4H intervention prior to or between March and June 2020. ....	97
Table 6. Frequencies of the how the COVID-19 pandemic impacted the time spent gardening by MLOG and GIEH participants who had completed or started H4H intervention prior to or between March and June 2020. ....	98
Table 7. Frequencies of garden size manipulation between March and June 2020 by MLOG and GIEH participants who had completed or started H4H intervention between March and June 2020.....	99
Table 8. Most frequently selected statements by MLOG and GIEH participants when asked to identify motivations for increasing their garden size between March and June 2020.....	100
Table 9. Most frequently selected statements by MLOG and GIEH participants when asked to identify motivations for maintaining their garden size between March and June 2020. ....	101
Table 10. Most frequently selected statements by MLOG and GIEH participants when asked to identify motivations for decreasing their garden size between March and June 2020. ....	102
Table 11. Most frequently selected statements by MLOG and GIEH participants when asked to identify motivations for removing their garden between March and June 2020.....	103
Table 12. Paired samples t-test results of pre-pandemic and mid-pandemic CAMS-R and dJGLS group mean scores of MLOG and GIEH participants. ....	104
Table 13. ANOVA comparing the pre- and mid-COVID-19 pandemic dJGLS group loneliness means of MLOG and GIEH participants by the pandemic’s impact on gardening interest.....	105
Table 14. Correlation of pre- and mid-pandemic CAMS-R and dGJLS mean scores of MLOG and GIEH participants. ....	106

## List of Figures

Figure 1. Data collection timeline.....	107
Figure 2. Frequencies of how the COVID-19 pandemic impacted the time spent gardening by MLOG and GIEH participants, organized by H4H intervention status between March and June 2020.....	108
Figure 3. Box-and-whiskers plot comparing the pre- and mid-COVID-19 pandemic CAMS-R group mindfulness means of MLOG and GIEH participants.....	109
Figure 4. Box-and-whiskers plot comparing the pre- and mid-COVID-19 pandemic dJGLS group loneliness means of MLOG and GIEH participants by marital status.....	110

## Chapter 1: Introduction

Loneliness is a public mental health crisis that was exacerbated by the COVID-19 pandemic (Palgi et al., 2020). Loneliness is not merely an emotion; it has been linked to coronary heart disease, affective disorders, and even increased risk of mortality (Luo et al., 2012; Steptoe et al., 2004). Conversely, gardening and practicing mindfulness became popular ways to pass the time and cope with the surreal reality created by pandemic-related stay-at-home orders. Research indicates that gardening and mindfulness can contribute to increased socialization and reduce loneliness (Lindsay et al., 2019; Creswell et al., 2012; Saini et al., 2021; Brown et al., 2004). Currently, minimal literature explores the interconnectedness of mindfulness and gardening, even though gardening offers innumerable opportunities to practice mindfulness; after all, the success of gardening heavily lies on being present-focused. The COVID-19 pandemic created serendipitous timing to investigate the intersection of mindfulness, gardening, and potential therapeutic impacts on loneliness in older adults by bringing these subjects to the forefront of society's attention.

Harvest for Health is a randomized control trial that is testing whether vegetable gardening has significant effects on the diet, physical activity, and physical functioning of older cancer survivors, who are at higher risk of functional decline and behavior-mediated diseases that can negatively impact their quality of life (Bluethmann et al., 2016). The study population consists of 381 older cancer survivors who reside in 30 counties of Alabama and have completed primary treatment for at least one of several cancers that have 5-year survival rates of 60% or greater (Demark-Wahnefried, 2021). Harvest for Health participants are divided into

cohorts and have been randomly assigned to immediate intervention or to an identical intervention that is delayed by one year. Participants are given gardening supplies and partnered with an Alabama Cooperative Extension System (ACES) Master Gardener, who teaches the participant how to grow vegetables from the comfort of their home for three growing seasons. In 2020, Harvest for Health temporarily directed participants and Master Gardeners to meet and communicate virtually due to stay-at-home orders. At that time, approximately two-thirds of participants had completed the intervention while the remaining one-third was either mid-intervention or awaiting intervention. These circumstances created an ideal situation in which pragmatic data on mindfulness, loneliness, and gardening could be collected and potentially impact a population that has much to gain.

This study aims to answer the following questions: 1) Has the COVID-19 pandemic impacted the mindfulness, loneliness, and gardening experiences of Harvest for Health participants; 2) How does the mindfulness and loneliness of participants in varying stages of intervention compare before and during the pandemic? This study is built on a sturdy foundation of existing research and has been designed to address gaps in literature.

The methodology and logistical underpinnings of the current study are to: 1) Conduct surveys to collect quantitative data on Harvest for Health participants' gardening experience, mindfulness, and loneliness in relation to the COVID-19 pandemic; 2) Conduct interviews with Harvest for Health participants to collect qualitative data regarding the pandemic and gardening interest; and 3) Determine if correlates exist between gardening, mindfulness, and loneliness.

This thesis is organized into the following chapters: 1) Introduction, 2) Literature

Review, 3) Methodology, 4) Assessing the Impacts of the COVID-19 Pandemic on Gardening and Interventional Experiences of Harvest for Health (H4H) Participants 5) Assessing the Impacts of the COVID-19 Pandemic on the Mindfulness and Loneliness of Older Gardeners, and 6) Observations and Conclusions. In Chapter 2, the literature review provides a detailed gleaning of scholarly articles and market research on the study's main components and argues the need for additional data. Chapter 3 describes the study's framework, timeline, analysis methods, obstacles, and evaluation. Chapters 4 and 5 feature scientific articles in response to each research question. The final chapter, Observations and Conclusions, discusses and evaluates the data and its implications.

#### Definition of Terms

1. Harvest for Health (H4H): a randomized controlled trial (RCT) sponsored by the National Cancer Institute and conducted by the University of Alabama at Birmingham in collaboration with Auburn University. The RCT is studying the efficacy of a gardening intervention on improving the physical health and vegetable intake of older cancer survivors who were mentored on how to garden at home by Master Gardeners (Demark-Wahnefried, 2021).
2. Loneliness: a subjective experience that occurs when there are discrepancies between social and emotional expectations and realities (de Jong Gierveld, 1987).
3. Master Gardener: a volunteer who works brings reliable, relevant, and reached horticultural information and opportunities to their community. Master Gardener programs are hosted through land grant universities and state extension offices. Master

Gardeners are trained by horticultural professionals and are required to volunteer for 50 hours annually. (Alabama Cooperative Extension System, 2021).

4. Meditation: an ancient mental activity that involves an individual focusing their attention on and awareness of an item, noise, idea, or experience (West, 1979).
5. Mental health: the state of an individual's well-being in which abilities are recognized and life stressors are dealt with, resulting in a productive and contributing life experience (World Health Organization, 2004).
6. Mindfulness: a subjective experience that occurs when an individual maintains attention so that it focuses on the immediate experience in a way that is curious, open, and accepting; thoughts should be noted as observations instead of as distractions that can be catastrophized (Bishop et al., 2004).
7. Mindfulness-based stress reduction: a clinical program in which individuals are taught to manage emotions and stress through mindfulness practices such as meditation (Bishop, 2002).
8. Mixed methods research: a study design that collects and analyzes numerical and social data (Drew et al., 2008).
9. Older adult: a person who is at least 50 years of age or older (Centers for Disease Control and Prevention, 2015).
10. Physical health: the well-being of the physical body and its needs (Ware, 1987).
11. Qualitative research: a method of collecting data on social phenomena (Drew et al., 2008).

12. Quantitative research: the systematic collection and analyzation of numerical data that is typically guided by theories and hypotheses (Drew et al., 2008).
13. State mindfulness: the intentional practice of achieving and maintaining mindfulness and is exemplified by meditation practice and mindfulness-based stress reduction intervention (Lau et al., 2006).
14. Trait mindfulness: the internalization of mindfulness practices that result in positive behaviors and coping mechanisms, has also been associated with promising health outcomes (Murphy et al., 2012).

### Basic Assumptions

The following are assumed true and contextualize this study:

Part 1: It is assumed that all participants will answer survey items and interview questions honestly based on their experiences, opinions, and feelings. It also is assumed that participants will accurately remember their experiences, opinions, and feelings before the COVID-19 pandemic and between March and June 2020.

Part 2: It is assumed that data from participants of this study accurately represents the Harvest for Health population.

### Limitations

Pre-pandemic mindsets (experiences, opinions, and feelings) and the mindsets of participants between March and June 2020 are reflective; data were not collected at these specific times as they occurred before this study. Not all Harvest for Health participants had the opportunity to participate in this study due to being enrolled in Harvest for Health after data collection concluded for this study. It is not guaranteed that all Harvest for Health participants

who were invited to this study received the invitation; this is due in part to the inaccessibility of technology, changes in participant contact information, and participants receiving the invitation after data collection concluded.

## Delimitations

This mixed-methods study investigated the following mental states and experiences of older cancer survivors who lived in Alabama and participated in the Harvest for Health clinical trial: pre-pandemic and mind-pandemic (March through June 2020) mindfulness and loneliness levels; gardening experiences, opinions, and feelings during the COVID-19 pandemic; and experiences, opinions, and feelings about Harvest for Health participation.

## Chapter 2: Literature Review

### Introduction

The COVID-19 pandemic has brought the issues of mindfulness and loneliness to the forefront of public mental health. In part due to stay-at-home orders, the pastime of gardening also rose in prominence as a way to pass time, procure vegetables, and improve mental health. While robust literature exists on the topics of gardening, mindfulness, and loneliness, little research exists that combines the three areas. The following literature review provides support to conduct focused study on the intersection of gardening, mindfulness, and loneliness among older cancer survivors.

### Harvest for Health and Older Cancer Survivors

Harvest for Health (H4H) is a collaborative study between the University of Alabama at Birmingham O'Neal Comprehensive Cancer Center and the Alabama Cooperative Extension System Master Gardener volunteer program. This study was designed to improve the lifestyle behaviors of older cancer survivors, specifically by improving diet and physical activity as a means to improve physical functioning. H4H began in 2016, following three successful pilot studies, and is expected to conclude in 2022 and involve 381 participants. Participants of this study are partnered with Master Gardeners and are then equipped with gardening supplies and taught how to grow vegetables at home for three growing seasons.

H4H was preceded by three smaller feasibility studies. The first study, which took place between 2011 and 2012, consisted of 12 adult and child cancer survivors who were paired with Master Gardeners and evaluated the feasibility of the gardening intervention and the effects of

the intervention on diet, physical activity and function, and quality of life (Blair et al., 2013). Between baseline and the conclusion of the intervention at one year, 90% of participants showed improvement in 75% of the objective measures of physical function and 60% of participants increased the amount of time they were physically active by 30 minutes or more per week. Blair et al. (2013) also saw a one serving increase in the amount of produce eaten daily by 40% of participants. These findings supported the conduct of a larger-scale study that would include a control group, larger sample size, and allow for more extensive data collection.

The two following feasibility studies had a two-arm design in which participants either began the gardening intervention with Master Gardeners immediately or were waitlisted for one year. In 2013, the H4H team began an intervention with 82 female breast cancer survivors residing within the metropolitan Birmingham area (Bail et al., 2018). The primary outcome of this study was to assess feasibility based on participant recruitment, retention, and high satisfaction with the gardening intervention. The secondary outcomes of this study included vegetable consumption, physical activity, and physical performance, and health-related quality of life (Bail et al., 2018). Participants in the intervention group reported spending more time being physically active during the week (a gain of 14.2 minutes weekly compared to a loss of 17.1 minutes weekly;  $p=.02$ ) and consuming more vegetables by 0.86 servings daily ( $p=.0002$ ). Intervention group participants also had better results in the 2-Minute Step Test ( $p=.01$ ) and Arm Curl ( $p=.002$ ) than participants in the control group and averaged of 21.9 more steps and 2.7 more arm curls from baseline compared to 10.0 more steps and 0.1 more arm curls from baseline in the control group. The intervention also garnered excellent satisfaction scores (all participants rated their experience as “good to excellent”) and retention (95% of participants)

and was also proven to be safe, thus meeting all feasibility criteria. Moreover, at 2-year follow-up, 86% of survivors reported that they continued to garden. These results indicated a need for a larger study to explore the benefits and lasting impact of an at-home gardening intervention for senior breast cancer survivors.

The third feasibility study, which started in 2014, recruited 46 older male and female cancer survivors residing across the state of Alabama. This study had the same outcomes as previous, i.e., to determine feasibility and health-related impact of an at-home gardening intervention with Master Gardener mentors. Results of this trial were like the others; participants in the experimental group consumed more produce and performed better in several physical performance tests (Demark-Wahnefried et al., 2018). Despite the beneficial aspects of intervention, participants who gardened also had decreased telomerase activity, which has been linked to psychological stress, and health and disease risk (Epel et al., 2009); these findings are congruent with the 2013 Ornish et al. findings of the telomerase activity of prostate cancer survivors enrolled in a lifestyle intervention.

The current, National Cancer Institute funded, Harvest for Health study has been active since 2016 and is a randomized controlled trial that is fully powered to test whether vegetable gardening has a significant effect on diet quality, physical activity, and physical functioning. This study has a population of 381 senior cancer survivors who reside in 30 counties of Alabama and have completed primary treatment for at least one of several cancers that have five-year survival rates of 60% or greater (Demark-Wahnefried, 2021). In addition, enrolled participants are required to have at least one limitation in physical functioning, such as difficulty walking one block, bathing or dressing, or other limitations as defined by the Medical Outcomes Study

Short Form-36 Physical Function subscale (Ware & Sherbourne, 1992). Additionally, the eligibility criteria were delimited to participants who had not maintained a vegetable garden in recent years, ate fewer than two and a half cups of vegetables and fruit daily, and exercised (moderately to vigorously) for fewer than 150 minutes weekly.

Participants of H4H undergo baseline assessments in which a variety of self-reported and objective measures are collected. Then they are randomly assigned to receive the intervention immediately or are assigned to the delayed intervention (or waitlist); those in the delayed intervention arm wait one year to receive the intervention. Prior to starting the intervention, participants meet their Master Gardener partner and receive instructions and supplies (such as grow boxes, soil, hand tools, and seeds) at "meet and greet" events. Once the intervention begins, Master Gardeners schedule home visits at the participant's residence once a month to help plan and maintain the garden for three growing seasons. Additionally, Master Gardeners must communicate with their mentee at least once a month outside of home visits. Those who are waitlisted will receive the same intervention after one year of observation (Demark-Wahnefried, 2021).

The primary outcomes of Harvest for Health build on data from the pilot studies, and aim at detecting differences between the intervention and control arms in the percentage of participants who meet the following goals at one-year follow-up: 1) an increase on the Medical Outcomes Study Short Form 36 Physical Function subscale with a concurrent improvement on the Senior Fitness Battery; 2) increased consumption of vegetables and fruit by one daily serving daily along with a concurrent increase in plasma alpha-carotene levels; and an increase

of moderate-to-vigorous physical activity by at least 30 minutes weekly and a similar increase in physical activity data collected by accelerometry.

The secondary outcomes of Harvest for Health consist of improvements in objective and subject measures of physical health and activity, vegetable and fruit consumption, and quality of life as measured by the entire Medical Outcomes Study Short Form-36, which includes both the physical and mental health component summaries. The latter component summary score consists of 14 health-related quality of life items that are aggregated into one of the following categories: vitality; social functioning; role-limitations due to emotional distress; and mental health (Ware & Sherbourne, 1992). The Mental Health component summary scale has high internal consistency in community-living older adults (except for the social functioning category). However, a 2001 publication by Walters et al. suggests that the decline in health-related quality of life as one ages could be more attributed to the decline of physical health than mental health.

It must be noted that the COVID-19 pandemic began in the fourth year of Harvest for Health. By this stage of the study, approximately two-thirds of participants had completed the intervention, while the remaining one-third of participants were either mid-intervention or awaiting the intervention to begin. H4H researchers directed participants who were mid-intervention, and their Master Gardener partners to pause all in-person meetings and to communicate and “meet” online or over the phone throughout the spring and summer of 2020 instead only. In the fall of 2020, researchers gave participants the option to meet with their Master Gardener partners again, so long as meetings were held outside and both parties wore masks and practiced social distancing. H4H researchers also revised biological data collection

methods to ones that could be completed independently by participants and completed home-based assessments via Zoom®. Although Harvest for Health overcame obstacles set in place by the COVID-19 pandemic, data on how the participants' experiences were affected were unknown and these data could greatly contribute to the growing body of knowledge about the non-medical impact of the coronavirus.

Such information is potentially valuable to improve the health of older cancer survivors, who are at higher risk of functional decline and behavior-mediated diseases like diabetes and cardiovascular disease, which can negatively impact quality of life (Bluethmann et al., 2016). Given that senior cancer survivors represent the majority of cancer survivors, the average age of cancer diagnosis is 66 years old, and their prevalence growing faster than others (de Moor et al., 2013), there is a need for cost-effective, duplicable health interventions. Thus, if proven effective, Harvest for Health could offer older cancer survivors a holistic option to improve their health behaviors and overall health, particularly during a challenging time in which social isolation may incur a variety of negative health outcomes (Demark-Wahnefried, 2021).

### Therapeutic Benefits of Gardening

The soothing and healing power of greenspaces has been repeatedly documented in medical and psychological studies (Clatworthy et al., 2013; Soga et al., 2017). Two theories that seek to explain the regenerative effects of gardening via nature exposure are the Attention Restoration Theory and the Stress Recovery Theory (Berto, 2014). Kaplan's 1995 Attention Restoration Theory proposes that being immersed in nature leads to mental and emotional restoration by improving concentration, reducing mental fatigue, and inspiring interest and reflection. Similarly, the research of Ulrich et al. (1991) on the Stress Recovery Theory

postulates that the presence of natural scenery decreases the impact of stressful situations by generating positive emotions and feelings.

Despite being widely cited, the correlative strength of nature exposure and attention varies greatly among studies exploring the Attention Restoration Theory (Ohly et al., 2016). Similarly, studies based on the Stress Recovery Theory have mixed evidence on the physiological effects of spending time in nature but provide strong evidence on the positive psychological and emotional effects of being outdoors (Corazon et al., 2019). Participants of gardening interventions have reported increased feelings of hope, worth, social belonging, guidance, friendship, and general and psychological well-being (Chu et al., 2021; Brown et al., 2004; Heliker et al., 2001). Feelings and emotions such as these indicate that gardening has the potential to positively impact one's perception of life. Data from 298 seniors who identified as gardeners or non-gardeners confirms just that - gardeners have higher overall life satisfaction scores and responded to several quality-of-life statements more positively than non-gardeners (Sommerfeld, et al., 2010b); Waliczek et al. (2005) found similar results in a survey study with 400 respondents, of whom just over half gardening and non-gardening participants were age 65 or older.

The physiological benefits of gardening in senior populations have been well studied. Senior gardeners are more likely to improve their health through a well-balanced diet and are more likely to consume larger quantities of vegetables than non-gardeners (Sommerfeld et al., 2010a). Older adult gardeners exhibit more hand strength, pinch force, and better physical health (as determined by the Short-Form 36 Health Survey) than older adult non-gardeners (Park et al., 2008). In a study by Chen and Janke (2012), senior gardeners reported better

balance, gait speed, and fewer falls than seniors who did not garden; gardeners in this study also reported fewer functional limitations and chronic conditions than their counterparts. Similarly, a gardening intervention by Brown et al. (2004) had positive effects on skills necessary for independent living such as toileting and eating. Gardening has also demonstrated the potential to improve several aspects of sleep and cognition, as well as reduced agitation in patients with dementia (Lee & Kim, 2008).

It should be noted that despite the growing evidence that supports the positive impacts of gardening on health, the specific mechanisms that drive the therapeutic benefits of gardening remain unknown. Research suggests that the benefits of gardening are reaped from the combination of physical activity, social activity, and being in nature (Thompson, 2018).

Physical activity is positively correlated with improving overall physical health, performance status, and the improvement of mental health disorders such as anxiety and depression (Martinsen, 1990). Gardening has been documented as a successful way for seniors to attain the recommended amount of moderate-to-rigorous physical activity and improve physical health and performance (Park et al., 2008, 2014, 2016).

The social aspects of gardening can vary greatly. Senior gardeners in a study by Heliker et al. (2001) described how information and stories about gardening had been shared with them for much of their lives and how they took pride in continuing that legacy. In a different study, seniors in a gardening intervention study had increased scores among four facets of socialization including social belonging and guidance (Brown et al., 2004). Maas et al. (2009) propose that green spaces, such as community gardens, encourage social interaction and that there is a positive relationship between the amount of green space and feelings of loneliness

and perceived lack of social support - both of which influence the overall quality of life. While the benefits of gardening could plausibly be a result of social activity, physical activity, and being outdoors, there is still more to be known about the connectedness of this triad and their relationship to gardening.

In the 2021 National Gardening Survey, 20% of gardeners aged 65 and older reported that the COVID-19 pandemic increased their participation in gardening; 87% of these gardeners reported that they spent the same amount of time or significantly more time gardening due to the pandemic (Whitinger et al., 2021). Responders indicated that they gardened to get exercise, to relax, to grow their own produce, because they enjoyed growing plants, to connect with nature, and because they found gardening to be a good family activity; these reasons align with many of those found by Chalmin-Pui et al. (2021) prior to the onset of the pandemic (Whitinger et al., 2021). Similar to Harvest for Health findings, the vast majority of gardeners (90%) planned to garden the following year (Whitinger et al., 2021). While data such as these begin to illustrate life when stay at home orders were issued in 2020, more research is needed to better understand the value of gardening during the COVID-19 pandemic.

### COVID-19 Pandemic

On January 20, 2020, the first case of the novel coronavirus (COVID-19), a highly transmissible respiratory illness, was reported in the United States. By March 11, 2020, the World Health Organization (WHO) announced COVID-19 to be a global pandemic and its Director-General, Dr. Tedros Adhanom Ghebreyesus stated that the WHO was, "deeply concerned both by the alarming levels of spread and severity and by the alarming levels of inaction," and he called on countries to take action now to contain the virus" (Cucinotta &

Vanelli, 2020). Following this declaration, governments around the world started issuing stay-at-home orders to reduce the rate and probability of COVID-19 transmissions. While most COVID-19 cases experience mild, cold-like symptoms, 1.6% of cases in the United States have resulted in fatality; severe illness related to COVID-19 has been correlated with the prevalence of lifestyle-mediated diseases including diabetes, obesity, heart disease, chronic kidney disease, and chronic obstructive pulmonary disease (*CDC COVID Data Tracker, 2021*).

Between March 15 and May 31, 2020, 42 United States territories and states issued temporary stay-at-home mandates that impacted 73% of counties (Moreland et al., 2020). By July 2020, most states had reversed these mandates but continued other measures such as mandates requiring masks and banning the gatherings of various sizes (*CDC COVID Data Tracker, 2021*). COVID-19 vaccinations became available to at-risk adult populations in December 2020; by September 2021, most individuals aged 12 and over were eligible to be vaccinated at no cost. As of September 17, 2021, almost 41,600,000 cases of COVID-19 have been diagnosed and over 666,000 deaths have been linked to COVID-19 in the United States (*CDC COVID Data Tracker, 2021*).

On a societal level, effects of COVID-19 pandemic ranged from global supply chain disruption to concerns of mental health decline in individuals due to isolation and stress (Xu et al., 2020; Palgi et al., 2020). Pandemic-related social isolation and mental health decline of older adults became prominent concerns of public health leaders as COVID-19 continued to spread through 2020 and into 2021 (Smith et al., 2020; Berg-Weger and Morley, 2020); research indicates that social isolation and loneliness have been correlated with low mental and physical health, although the direction of causation is unknown (Leigh-Hunt et al., 2017). Data

collected in the early spring of 2020 by Bruine de Bruin (2021) indicated that older adults were four times less likely than younger adults to experience anxiety and depression in response to the COVID-19 pandemic; this finding is mirrored by data from Palgi et al. (2020) which also showed that older adults were less likely than younger adults to experience mental health decline due to the pandemic. This information is contrasted by the findings of a study by Kotwal et al. (2021), which indicate that just over 50% of community dwelling seniors experienced increased loneliness, depression, and anxiety due to the pandemic. More data are needed to confidently determine the effects of the COVID-19 pandemic on senior adults.

## Loneliness

If the COVID-19 pandemic was assigned a slogan, it would likely be "better together," a sentiment that conveyed unity and responsibility to keep one another safe from the novel coronavirus throughout 2020 and 2021. The underpinnings of this slogan, however, are not rooted in optimism or comradery, but rather in loneliness. Shortly after stay-at-home orders were issued around the world, Palgi et al. (2020) dubbed the COVID-19 pandemic the "loneliness pandemic," a title which illuminates the gravity of the public mental health issue.

When viewed as a subjective experience, loneliness is an emotion felt when one's relational expectations are not met in reality; the severity of the loneliness is directly correlated to the amount of discrepancy between expectation and reality (de Jong Gierveld, 1987).

Loneliness is a complex and multi-faceted emotion. Facets of loneliness include attachment (sense of security), social belonging, opportunity for nurturance (being a provider), reassurance of worth (usefulness), reliable alliance (dependability), and guidance (having one to confide in) (Weiss, 1974). Discrepancies that affect the severity of loneliness typically pertain to these

facets in addition to the amount of time one experiences loneliness, and the presence of negative emotions and/or absence of positive emotions (de Jong Gierveld, 1987). Data suggest that loneliness peaks in young adults and declines over the remainder of the lifespan (Nygqvist et al, 2016). These findings are supported by data that indicates more than 60% of adults reported never feeling lonely and less than 10% experienced severe loneliness (Victor et al., 2012); additionally, Williams and Braun (2019) reported that up to 48% of young adults feel severe loneliness.

Loneliness is not just a feeling; its presence in individuals can lead to serious physical and mental health concerns (Hawkley, 2009; Steptoe et al., 2004; Luo et al., 2012; Jaremka et al., 2014; Powell et al, 2021; Theeke, 2009). In a study of 229 adults aged 50 to 68, loneliness was correlated with decreased physical activity and increased the likelihood of discontinued physical activity over time (Hawkley, 2009). This correlation was found to be significant, null of sociodemographic variables. Loneliness has also been linked to higher levels of fibrinogen and decreased natural killer cell responses, which are respectively associated with coronary heart disease and affective disorders (Steptoe et al., 2004). Perhaps most concerning of all, loneliness has been associated with increased mortality risk due to health outcomes such as depression, low self-rated health, and functional limitations and not as a result from health behaviors or social relationships (Luo et al., 2012). Concerning mental health, loneliness has been correlated with the symptom cluster of depression, pain, and fatigue in adult cancer survivors and seniors (Jaremka et al., 2014; Powell et al, 2021). Predictive factors of loneliness in seniors include living alone, marital status, fine and gross motor impairment, self-reported health, and the number of chronic illnesses (Theeke, 2009).

Although loneliness has been correlated with various physiological responses, it is not measured by biological testing methods; instead, loneliness is measured using psychological inventories. One of the most popular inventories used to measure loneliness is the de Jong Gierveld Loneliness Scale. This scale, developed by de Jong Gierveld and Kamphuis (1985), consists of 11 items in which participants rate the frequency of on a Likert scale ranging from "none of the time" to "all of the time". Five items pertain to social belonging and six items pertain to negative emotions like rejection and emptiness (de Jong Gierveld & Kamphuis, 1985). The de Jong Gierveld Loneliness Scale has good internal consistency ( $0.8 \leq \alpha \leq 0.9$ ) when used to evaluate loneliness in seniors (de Jong Gierveld & von Tilburg, 1999). This scale is recommended for use in older adults as a unidimensional measure (Penning et al., 2014; Thomás et al., 2017).

While loneliness is not a psychiatric disorder, research suggests it should be treated seriously (Mushtaq et al., 2014). Mushtaq and associates state that the four most common types of loneliness intervention include self-awareness of maladaptive social cognition, social skill development, social support, and creating opportunities for social interaction (2014); Cattan et al. (2005) also conclude that group activities can be effective in reducing loneliness caused by social isolation in older adults. Meditation and mindfulness-based stress reduction training have also proved promising in reducing loneliness (Creswell et al., 2012; Saini et al., 2021; Lindsay et al., 2019).

## Mindfulness

Considering the negative impacts of the COVID-19 pandemic, it would be negligent to overlook the opportunities that arose from its global impacts. One such opportunity, as noted

by Antonova et al. (2021), is the potential to study resilience and mindfulness. As described simply by Dr. Jon Kabat-Zinn (1994), mindfulness is, "paying attention in a particular way: on purpose, in the present moment, and non-judgmentally". This description of mindfulness perfectly aligns with the operational definition proposed by Bishop et al. (2004), which conceptualizes mindfulness as a two-part phenomenon. According to Bishop et al. (2004), mindfulness is achieved when one maintains attention so that it focuses on the immediate experience in a way that is curious, open, and accepting. Additionally, Bishop et al. (2004) emphasized that thoughts should be noted as observations instead of as distractions that can be catastrophized.

Mindfulness is typically regarded as either a state or a trait. State mindfulness is the intentional practice of achieving and maintaining mindfulness and is exemplified by meditation practice and mindfulness-based stress reduction intervention (Lau et al., 2006). Interventions that utilize state mindfulness have been shown to effectively treat anxiety disorders and manage pain in adults (Kabat-Zinn et al., 1985, 1992). State mindfulness interventions have also shown success in adult and senior cancer populations. A mindfulness-based stress reduction study by Carlson and Garland (2005) resulted in sleep improvement and reductions in stress, mood disturbance, and fatigue in cancer outpatients. Lengacher et al. (2014) found that women with breast cancer who participated in mindfulness-based stress reduction had increased telomerase activity, which has been associated with improvements in mental health, eating behavior, and metabolic health (Daubenmier et al., 2012). As previously discussed, however, decreased telomerase activity also has been associated with psychological stress, poor health, and disease risk (Epel et al., 2009). Therefore, its exact role is unclear. Additionally, state

mindfulness training has been correlated with reducing loneliness and increasing social contact (Lindsay et al., 2019; Creswell et al., 2012; Saini et al., 2021).

Similarly, trait mindfulness, which is the internalization of mindfulness practices that result in positive behaviors and coping mechanisms, has also been associated with promising health outcomes (Murphy et al., 2012). In a study by Brown et al. (2012), individuals with higher trait mindfulness scores had lower cortisol responses, anxiety levels, and negative affect than individuals with lower trait mindfulness scores. Trait mindfulness has also been linked to better sleep quality, healthier eating, and better physical health (Murphy et al., 2012). Lastly, trait mindfulness is likely to increase from repeated state mindfulness practice, which can result in more consistent moods and decrease the likelihood of distressed dispositions (Kiken et al., 2015).

As with loneliness, mindfulness is also measured using psychological inventories. Feldman et al. (2007) developed the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R) based on the operational definition of mindfulness proposed by Bishop et al. (2004). CAMS-R is notable in that its language is simple and that it is brief; additionally, CAMS-R uniquely measures dispositional mindfulness regarding psychological distress and can be used clinically (Bergomi et al., 2013). CAMS-R consists of 12 items that fall evenly into four subscales: attention ("I am easily distracted"), present focus ("I am able to focus on the present moment"), awareness ("I try to notice my thoughts without judging them"), and acceptance ("I can accept things I cannot change"); items are responded to on a Likert-scale ranging from "rarely or not at all" to "almost always" (Feldman et al., 2007). CAMS-R demonstrated an acceptable level of internal consistency ( $0.74 \leq \alpha \leq 0.77$ ) in young adult populations, but related data on older

adults is limited (Feldman et al., 2007). Lenze et al. (2014) utilized CAMS-R to determine changes in dispositional mindfulness before and after a mindfulness-based stress reduction intervention with senior participants; CAMS-R was sensitive enough to capture differences in mindfulness that a separate mindfulness scale did not detect. These researchers postulated that CAMS-R could be a reliable mindfulness scale in senior populations in part due to its simplicity.

## Conclusion

Despite the numerous, negative impacts that the COVID-19 pandemic exerted on society, it has also provided a timely opportunity to examine the infinite ways in which individuals can be resilient. Although it is not fully understood, post-traumatic growth is one of the factors that leads to resilience in cancer survivors; it has been correlated with improved quality of life, lower levels of distress, and better mental health, among other factors such as biological and personal/social factors such as perceived support, value, and feelings of love and their association with the resilience of cancer patients and survivors (Seiler and Jenewein, 2019). Social factors such as these are the antithesis of loneliness, which is the culmination of high relational expectations that are not fulfilled in reality (de Jong Gierveld, 1987). Both gardening and state mindfulness interventions have demonstrated the ability to reduce loneliness in senior populations, however only one refereed study exists that explores the intersection of these topics even though gardening offers unlimited opportunities to practice present-centered, non-judgmental awareness (Creswell et al., 2012; Saini et al., 2021; Lindsay et al., 2019; Stigsdotter et al., 2018). While studies have inversely correlated state mindfulness with loneliness, research has not investigated trait mindfulness as a predictor or correlate of

loneliness (Lindsay et al., 2019; Creswell et al., 2012; Saini et al., 2021). The COVID-19 pandemic has emphasized the need for research that evaluates the relationships of gardening, mindfulness, and loneliness, and begs the question: what better way to explore this convergence than a Harvest for Health sub-study?

## Chapter 3: Methodology

### Study Overview

The purpose of this two-phase study was to investigate various mental states and experiences of Harvest for Health (H4H) participants. Pre-pandemic and mid-pandemic mindfulness and loneliness were retrospectively assessed through an online survey. The online survey and a telephone interview collected data on gardening and H4H participation during the COVID-19 pandemic. Data were collected from October 2020 to January 2021. An initial online survey was performed, which was then followed by in-depth telephone interviews on a subset of survey respondents. Quantitative data from the survey were organized using descriptive statistics and were analyzed for statistical significance. Qualitative data from the interview were recorded with consent then transcribed and imported into a qualitative analysis program where it was analyzed for themes and categories.

### Institutional Review Board (IRB) Approval and Risks

This study received IRB approval from Auburn University (Protocol #20-390EX2008) in August 2020, prior to the study start date; a signed letter of joint support between Auburn University and University of Alabama at Birmingham was also obtained prior to the start date. Additionally, the primary investigator and her graduate thesis committee members completed select Collaborative Institutional Training Initiative modules to ensure all aspects of the study would incur no more than minimal risks to safety, participant discomfort, and confidentiality (Appendix G).

## Recruitment and Sample Description

This study recruited a subset of participants enrolled in the H4H randomized control trial. Data transfer occurred on September 24, 2020, at which time a subsample of 316 potentially eligible participants who had either completed, began, or were waiting to start intervention were included. The subsample did not include decedents nor individuals who either discontinued participation themselves or who were discontinued due to subsequent events that rendered them ineligible for further participation (e.g., development of conditions that warranted skilled nursing, moving to another state) (Table 1). The H4H primary investigator (P.I) introduced the current study to potential participants through email to garner familiarity with the Auburn investigator and the study's purpose and structure on October 2, 2020 (Appendix C).

H4H participants were 60 years or older, resided in 30 counties across Alabama, and had completed primary treatment for at least one of several cancers that have 5-year survival rates of 60% or greater (Demark-Wahnefried, 2021); participants also had a minimum of one physical function limitation as measured by the by the Medical Outcomes Study Short Form-36 Physical Function subscale (Ware & Sherbourne, 1992). Participation was denied to those who tended a year-round, in-ground vegetable garden; ate at least 2.5 cups of produce daily; exercised (moderately to vigorously) for at least 150 minutes weekly); had a medical condition that decreased safety while gardening (e.g., paralysis, dementia, congestive heart failure); had a residence unsuitable for gardening; and/or was unable to communicate in English (Demark-Wahnefried, 2021).

## Instrument: Online Survey

The online survey for this study was developed and primarily distributed through Qualtrics XM (October 2020; Qualtrics, Provo, UT). The hosting university's short URL generator was used to create a simple survey link that was included on mailings and social media posts. Participants were first directed to a landing page that detailed the survey's purpose, confidentiality, voluntary nature, and IRB information (Appendix A).

Participants were then directed to the survey, which consisted of the de Jong Gierveld Loneliness Scale (dJGLS) (de Jong Gierveld and Kamphuis, 1985), the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R) (Feldman et al., 2007), items on gardening and H4H experience, and demographic items.

Pre- and mid-pandemic loneliness and mindfulness were assessed using the dJGLS and CAMS-R, respectively; participants were asked to retrospectively respond to the scales twice, from a pre-pandemic mindset and from their mindset from March through June 2020. dJGLS is an 11-item scale developed by de Jong Gierveld and Kamphuis (1985); five items pertain to social belonging and six items pertain to negative emotions. Each item is rated on a Likert scale (Likert, 1932) that ranges from "none of the time" to "all of the time." Responses are converted to numerical equivalents and totaled; higher scores indicated more intense feelings of loneliness (de Jong Gierveld & Kamphuis, 1985). The dJGLS has good internal consistency ( $0.8 \leq \alpha \leq 0.9$ ) when used to evaluate loneliness in seniors and has been recommended for use in older adults as a unidimensional measure (Penning et al., 2014; Thomás et al., 2017; de Jong Gierveld & von Tilburg, 1999).

CAMS-R is a 12-item scale that consists of four subscales which encompass the Bishop et al. (2004) definition of mindfulness (attention, present focus, awareness, and acceptance) (Feldman et al., 2007). Like the dJGLS, CAMS-R items are rated on a Likert scale (Likert, 1932) and responses are converted to numerical equivalents and totaled; similarly, higher scores indicate a greater presence of mindfulness. CAMS-R demonstrates an acceptable level of internal consistency ( $0.74 \leq \alpha \leq 0.77$ ) in young adult populations, but related data on older adults is limited (Feldman et al., 2007); Lenze et al. (2014) postulated that CAMS-R could be a reliable mindfulness scale in senior populations in part due to its simplicity and sensitivity.

Motivations for participating in H4H were assessed by asking participants to select statements that applied to why they enrolled in H4H; statements encompassed motivating factors such as learning, stress reduction, developing relationships, gaining assets (free gardening supplies and produce), and recreation. Additionally, participants had the option to describe additional factors in a text box.

Participants were asked to assess how the COVID-19 pandemic impacted their interest in gardening; if participants selected, “no change” then they were prompted to describe their typical state of interest in gardening. Participants were asked to select their involvement in H4H between March and June 2020 to determine if they had completed, started, or not yet started meeting with their Master Gardener prior to mid-pandemic times. Following this item, participants were directed to specific sets of items that were relevant based on their experience; this was made possible by designing the survey with skip logic.

Those who had completed or started meeting with their Master Gardener were asked to assess how the pandemic impacted the time they spent gardening compared to the previous

year and were able to indicate if they had not gardened in 2019. This subsample was also asked to rank how important gardening was to them between March and June of 2020 and to describe the state and size of their garden; participants selected if they expanded, maintained, decreased the size of or removed their garden between March and June 2020. Skip logic was also used on this portion of the survey to direct participants to items that pertained to the decision to maintain, remove, or change the size of their garden. These items listed similar motivations to the item assessing motivations to enrolling in H4H and included the option to respond in a text box. Participants who indicated they had not started intervention prior to March and June 2020 were immediately directed to provide comments relating to H4H and the COVID-19 pandemic and then directed to demographic items; other participants were directed to these items following their responses to H4H participation items.

Participants were asked to provide their name for verification purposes; this information was converted to a random participation number to enhance anonymity and reduce potential bias.

#### Instrument: Phone Interview

Pending consent, which was obtained using Otter.ai (Version 2.3.110; Otter.ai, Mountain View, CA), phone interviews were conducted using a free Google Voice (Version 2021.10.18.404440564; Google, Mountain View, CA) phone number and were recorded and transcribed. Participants were reassured that responding was voluntary and anonymous. The interview script had three structured questions and unstructured follow up questions were asked as needed for clarity and depth. Participants who had completed or started the H4H intervention before or during March through June 2020 were asked to describe the role

gardening played in their life during the COVID-19 pandemic. Those who had started intervention prior to the pandemic were asked how their experience had been affected by the pandemic. Participants who had not started intervention before March 2020 were asked if and how the pandemic impacted their interest in participating in H4H (Appendix B).

### Data Collection and Saturation

On October 9, 2020, the Auburn P.I. directly contacted prospective participants by email, which contained information about (and a link to) the online survey, how to schedule an interview, and described how participants could enter to win a gardening-related prize valued up to \$25.00 by submitting a survey response (Appendix C). Participants were incentivized to respond quickly by the opportunity to earn additional entries into the prize drawing and were given information on how to opt out of being contacted again if they did not wish to participate (Appendix F). Participants were reminded to participate in the study by three additional emails sent between later October and early December 2020. During the first week of January 2021, informational postcards were sent to potential participants who had not submitted a survey response or been interviewed; also at this time, informational social media posts were made a private Facebook group of HRH participants to garner additional responses (Appendices D & E).

The online survey was open for four months and closed in early February 2021 when responses dwindled. Phone interviews were conducted between October 2020 and January 2021; interviews concluded when response saturation was reached. Participant demographics were confirmed to be representative of the H4H population prior to data analysis (Table 1).

## Data Analysis: Survey

Survey data was exported to an Excel spreadsheet (Version 2104; Microsoft, Redmond, WA) then cleaned, coded, and imported to SPSS (Version 28; IBM Corp., Armonk, NY).

Descriptive statistics, independent samples t-tests, and Chi-square goodness of fit tests were performed for H4H and gardening experience and demographic items. Pre- and mid- pandemic scores from each scale were compared using paired samples t-tests and were factored by gender and race using independent samples t-tests. One-way analysis of variance (ANOVA) tests were performed to determine if there were significant differences in pre- and mid-pandemic mean scores of each scale by the following categories: stage in H4H from March through June 2020, marital status, educational level, changes in gardening interest caused by the pandemic, impact of the pandemic on time spent gardening, importance of gardening during the COVID-19 pandemic, pandemic-related change in garden size, household size, and employment status. Tukey's Honest Significant Difference post-hoc test was used to determine specific differences in group means. Pearson's product-moment correlation coefficient was used to determine correlations between measures of pre- and mid-pandemic mindfulness and loneliness.

## Data Analysis: Interview

Transcribed interviews were reviewed and edited for accuracy and to remove identifying information. Edited transcripts were imported into NVIVO (Version 940; QSR International, Melbourne, AUS) for qualitative analysis. Transcripts were analyzed for themes, categories, and outliers by the P.I. and the graduate committee chair.

## Chapter 4: Assessing the Impacts of the COVID-19 Pandemic on Gardening and Interventional Experiences of Harvest for Health (H4H) Participants

### Summary

Research on the benefits of gardening on physical and mental health is virtually homogenous; gardening nourishes the human body through physical activity and enhances mood. In older adult populations, the benefits of gardening translate to improved self-care and independence. Harvest for Health is a research trial that is examining the immediate and long-term effects of a gardening intervention on the diet and physical activity of older adults who have survived cancer and have been mentored on how to garden by Alabama Cooperative Extension Systems Master Gardeners. This intervention was conducted prior to and during the COVID-19 pandemic and was modified for safety purposes. The purpose of the current study was to investigate the impacts of the pandemic on the interventional and gardening experiences of past and current Harvest for Health participants. The current study sample was drawn from the Harvest for Health study population. Participants were solicited through email and postcards that contained information about the current study and included a link to an online survey and a phone number to call to participate in a brief phone interview. In total, 120 usable surveys and 56 interviews were collected from the pool of 316 Harvest for Health participants, accounting for a response rate of 38.0% and 17.7% respectively (Table 1). The survey consisted of items pertaining to Harvest for Health experience, gardening, and demographic information along with a mindfulness and loneliness scale which is further detailed in a separate publication. Interview questions were semi-structured and developed to

gain a deeper understanding of gardening and Harvest for Health experience considering the pandemic. Most surveyed participants, 48.4% ( $n=59$ ), had completed the intervention prior to the initial surge of the COVID-19 pandemic and the remainder of participants had either started (but not completed) or had not started intervention in almost equal numbers (Table 1). The pandemic increased the majority of surveyed participants' interest in gardening (48.3%,  $n=58$ ) and increased the time spent gardening by a sizeable proportion of participants (36.0%,  $n=31$ ) (Tables 3 & 6). Most surveyed participants (88.3%,  $n=75$ ) who started or completed intervention prior to the initial surge of the pandemic maintained or expanded the garden that they established during intervention (Table 7); data was also collected to ascertain why participants modified the size of their garden or chose not to. The importance of gardening during the pandemic was rated "moderately important" or higher by the overwhelming majority of the surveyed sample (87.2%,  $n=75$ ) (Table 5); this finding was reflected in sentiments from the interview in which most participants stated that gardening was something they looked forward to. Regarding participation in Harvest for Health, most surveyed participants indicated they were interested in the trial so that they could enhance their gardening skills (57.5%,  $n=69$ ), spend more time outside (59.2%,  $n=71$ ), and to be more physically active (67.5%,  $n=81$ ) (Table 2). Interviews revealed that life events had more of a negative impact on participation than the pandemic. Additional themes from interviews included the dual role of Master Gardeners as mentors and friends and how the Harvest for Health program sparked interest in completing the Master Gardener program.

## Introduction

Between March 15 and May 31, 2020, 42 United States territories and states issued temporary stay-at-home mandates that impacted 73% of counties (Moreland et al., 2020). While most COVID-19 cases experienced mild, cold-like symptoms, 1.6% of cases in the United States resulted in fatality; severe illness related to COVID-19 has been correlated with the prevalence of lifestyle-mediated diseases including diabetes, obesity, heart disease, chronic kidney disease, and chronic obstructive pulmonary disease (*CDC COVID Data Tracker, 2021*). By July 2020, most states had reversed mandates but enacted other mandates that enforced mask wearing and banned gatherings of various sizes to reduce and slow the transmission of COVID-19 and its variants (*CDC COVID Data Tracker, 2021*).

Due to the pandemic and mandates such as these, at-home activities like gardening saw a resurgence in 2020. An estimated 85% of households in the United States participated in lawn and garden activities either the same amount or more in 2020 compared to 2019; similarly, 82% of older adults (aged 65 and up) participated the same amount or more in from 2019 to 2020 (Whitinger et al., 2021). Research indicates that older adults have much to gain from gardening. Regarding physical health, older gardeners report fewer functional limitations and chronic conditions and have better balance, gait speed, and suffer fewer falls than seniors who do not garden (Chen and Janke, 2012). Likewise, Park et al. (2008) found that older adult gardeners had better physical health, as determined by the Short-Form 36 Health Survey and had more hand strength and pinch force than non-gardening older adults. Senior gardeners are also more likely to improve their health through a well-balanced diet and are more likely to consumer larger quantities of vegetables than seniors who do not garden (Sommerfeld et al., 2010a).

Gardening improves the skills seniors need to safely live independently, including toileting and eating (Brown et al., 2004).

Additionally, gardening has beneficial impacts on wellbeing. Participants of gardening interventions have reported increased feelings of hope, worth, social belonging, guidance, friendship, and general and psychological well-being (Chu et al., 2021; Brown et al., 2004; Heliker et al., 2001). These findings are further illustrated in a study by Heliker et al. (2001) in which older gardeners described how information and stories about gardening had been shared with them for much of their lives and how they took pride in continuing that legacy.

The exact components of gardening that contribute to improvements in physical and mental health are currently unknown, however research suggests that the combination of physical activity, social activity, and being in nature play a significant role (Thompson, 2018); considering the positive impacts gardening has on older adults, additional research is critical for finding solutions to reducing the healthcare needs of this growing population which accounts for more than 60% of American cancer survivors (Bluethmann et al., 2016). Fortunately, the benefits of gardening on physical health are being further investigated through the Harvest for Health (H4H) study, a collaborative effort between the University of Alabama at Birmingham O'Neal Comprehensive Cancer Center and the Alabama Cooperative Extension System Master Gardener volunteer program. H4H was designed to improve the lifestyles of older cancer survivors, who face a higher risk of functional decline and behavior-mediated diseases, by improving diet, physical activity, and physical functioning through gardening (Demark-Wahnefried, 2021; Bluethmann et al., 2016). H4H is a randomized control trial that began in 2016, following three successful pilot studies, and is expected to conclude in 2022 and involve

381 participants. Participants of this study have completed primary treatment for specific cancers and reside in certain Alabama counties; participants also must have at least one physical limitation, have suboptimal physical activity levels, have not gardened in recent years, and do not eat at least 2.5 cups of produce daily (Demark-Wahnefried, 2021). Following enrollment, participants are equipped with gardening supplies and paired with Master Gardeners who mentor them on vegetable gardening, at home, for three growing seasons.

H4H was impacted by the COVID-19 pandemic during year four of the study. At this time, approximately two-thirds of participants had completed intervention, while the remaining one-third of participants were either mid-intervention or waiting to start intervention. Program researchers directed participants and Master Gardeners to communicate online or by phone in lieu of meeting in-person through the spring and summer of 2020. That fall, participants and Master Gardeners were allowed to meet at-home again so long as both parties followed procedures that minimized COVID-19 transmission.

Although H4H overcame obstacles set in place by the COVID-19 pandemic, data on how the participants' program and gardening experiences were affected were unknown. The purpose of this survey study was to determine how the COVID-19 pandemic impacted the gardening and study experiences of H4H participants who had completed participating, started participating, or were waiting to participate between March and June of 2020.

## Materials and Methods

### *Sample*

This study's sample was drawn from 316 participants enrolled in H4H prior to October 2020 and included participants in various stages of intervention. Participants were invited to

take part in the current study by email and postal mail and were reminded to participate by email and on social media. Participation was incentivized by the chance to win a gardening prize valued up to \$25.

### *Instrument*

The online survey for this study was developed and primarily distributed through Qualtrics XM (October 2020; Qualtrics, Provo, UT). The hosting university's short URL generator was used to create a simple survey link that was included on mailings and social media posts. Participants were first directed to a landing page that detailed the survey's purpose, confidentiality, voluntary nature, and IRB information; participant consent was implied in continuation to the survey.

Participants were then directed to the survey, which included items on H4H and gardening experience, and demographic items; this survey also utilized the de Jong Giervled Loneliness Scale (dJGLS) (de Jong Giervled & Kamphuis, 1985) and the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R) (Feldman et al., 2007) to retrospectively assess the pre-pandemic and mid-pandemic loneliness and mindfulness of participants. Both mindfulness and gardening interventions have demonstrated the power to reduce loneliness, a documented mental health pandemic; limited research exists on the culmination of these subjects, despite the notion that gardening offers countless opportunities for one to be aware of the present in a non-judgmental fashion (Creswell et al., 2012; Lindsay et al., 2019; Palgi et al., 2020; Saini et al., 2021; Stigsdotter et al., 2018). Note: findings from the dJGLS and CAMS-R are documented in Chapter 5.

Motivations for participating in H4H were assessed by asking participants to select statements that applied to why they enrolled in H4H; statements encompassed motivating factors such as learning, stress reduction, developing relationships, gaining assets (free gardening supplies and produce), and recreation. Additionally, participants had the option to describe additional factors in a text box.

Participants were asked to assess how the COVID-19 pandemic impacted their interest in gardening; if participants selected, “no change” then they were prompted to describe their typical state of interest in gardening. Participants were asked to select their involvement in H4H between March and June 2020 to determine if they had completed, started, or not yet started meeting with their Master Gardener prior to mid-pandemic times. Following this item, participants were directed to specific sets of items that were relevant based on their experience; this was made possible by embedding the survey with skip logic, a design option that sends participants to future survey items based on how they respond to certain items.

Those who had completed or started meeting with their Master Gardener were asked to assess how the pandemic impacted the time they spent gardening compared to the previous year and were able to indicate if they had not gardened in 2019. This subsample was also asked to rank how important gardening was to them between March and June of 2020 and to describe the state and size of their garden; participants selected if they expanded, maintained, decreased the size of or removed their garden between March and June 2020. Skip logic was also used on this portion of the survey to direct participants to items that pertained to the decision to maintain, remove, or change the size of their garden. These items listed similar

motivations to the item assessing motivations to enrolling in H4H and included the option to respond in a text box.

Participants who indicated they had not started intervention prior to March and June 2020 were immediately directed to provide comments relating to H4H and the COVID-19 pandemic and then directed to demographic items; participants were directed to these items following their responses to H4H participation items. Participants were asked to provide their name for verification purposes; this information was converted to a random participation number to enhance anonymity and reduce potential bias.

All survey participants were asked to indicate their interest in being interviewed about their gardening and H4H experiences by telephone; those who indicated disinterest were not further contacted. Telephone interviews were conducted using a free Google Voice (Version 2021.10.18.404440564; Google, Mountain View, CA) telephone number and were recorded and transcribed, if consent was received, using Otter.ai (Version 2.3.110; Otter.ai, Mountain View, CA). Participants were reassured that responding was voluntary and anonymous. The interview consisted of three structured questions and typically several unstructured questions that were used to clarify or expand the breadth of a response. Participants who had completed and started H4H intervention prior to and during March through June 2020 were asked if gardening played a role in their daily life during the COVID-19 pandemic. Those who had started intervention were asked if the pandemic impacted their experience in H4H and those who had not started intervention prior to March 2020 were asked to describe if and how the pandemic affected their interest in participating in H4H.

#### *Data Collection*

Participants were emailed and sent postcards requesting their participation in the online; study information was also posted to H4H social media pages. Survey participation was incentivized with the chance to win one of several gardening prizes valued up to \$25. Survey participants were asked to indicate interest in being interviewed; those who indicated interest were contacted by phone. Data from the survey and interview were collected simultaneously from October 2020 through January 2021.

#### *Data Analysis: General*

Survey and interview participant demographic data were analyzed to determine reflectiveness of the H4H population via Chi-square goodness of fit tests and independent samples t-tests; Chi-square goodness of fit tests were performed with gender, race, and community type data and independent samples t-tests were performed using age data.

#### *Data Analysis: Survey*

Data collected from the online survey was downloaded into an Excel spreadsheet (Version 2104; Microsoft, Redmond, WA) and were then organized, coded, and imported into SPSS (Version 28; IBM Corp., Armonk, NY). Response frequencies were calculated for each item. All text responses were imported into NVIVO (Version 940; QSR International, Melbourne, AUS) a qualitative analysis software. Responses were reviewed for themes and outliers and were then classified into relevant categories and subcategories.

#### *Data Analysis: Interview*

Transcripts from the telephone interviews were reviewed and transcription software errors were edited for correctness withing Otter.ai (Version 2.3.110; Otter.ai, Mountain View, CA). Transcripts were then downloaded as text files and uploaded to NVIVO (Version 940; QSR

International, Melbourne, AUS) where they were further reviewed for outliers and categorized into themes.

## Results

### *Demographic Representation*

Survey and interview participant demographic data (age, gender, race, and community type) was found to be representative of the H4H population via Chi-square goodness of fit tests and independent samples t-tests with using a 95% confidence interval.

H4H participants eligible for this study had a mean age of 69.76 ( $SD=6.54$ , range 50-95). The sample consisted mostly of females ( $N=218$ , 69.0%; males,  $N=98$ , 31.0%). Most H4H participants were white ( $N=255$ , 80.7%) or black ( $N=59$ , 18.7%) and two H4H participants were of a race other than black or white (<1.0%). More H4H participants lived in a non-rural community ( $N=258$ , 81.6%) than a rural community ( $N=58$ , 18.4%) (Table 1).

A total of 120 usable survey responses were elicited from 316 H4H participants, representing a response rate of 38.0% (Table 1). The majority of survey participants were female ( $n=91$ , 75.8%) and white ( $n=104$ , 86.6%). Almost a quarter of survey participants were male ( $n=29$ , 24.2%) and 11.7% ( $n=14$ ) of respondents were black; a small portion ( $n=2$ , 1.7%) of survey participants represented races other than white or black. The mean age of survey participants was  $68.05 \pm 6.25$  years old and ranged from 55 to 88 years of age. Most survey participants were married ( $n=76$ , 63.3%), while some were widowed ( $n=20$ , 16.7%), or divorced or separated ( $n=18$ , 15.0%); only a small portion of survey participants had never married ( $n=6$ , 5.0%) (Table 1).

More survey participants lived in a non-rural community ( $n=95$ , 79.2%) versus a rural community ( $n=25$ , 20.8%). The majority of survey participants lived either with their spouse or partner ( $n=65$ , 54.2%) or alone ( $n=28$ , 23.2%) and the remaining survey participants lived with others ( $n=27$ , 22.6%) (Table 1).

Most survey participants held a college or vocational degree or certificate ( $n=90$ , 75.0%) and a quarter of survey participants received a high school education or had attended some college without receiving a degree ( $n=30$ , 25%). While most survey participants were retired ( $n=84$ , 70.0%), a sizeable fraction of survey participants were employed ( $n=29$ , 24.1%) and a small percent of survey participants were either unemployed ( $n=2$ , 1.7%) or disabled from an employable standpoint ( $n=5$ , 4.2%) (Table 1).

A total of 56 interview transcripts were elicited from 316 H4H participants, representing a response rate of 17.7% respectively (Table 1). Most interview participants were female ( $n=42$ , 75.0%) and a quarter of participants were male ( $n=14$ , 25.0%). The majority of interviewed participants were white ( $n=45$ , 80.4%) or black ( $n=9$ , 16.0%) and a couple of interviewed participants were of a different race ( $n=2$ , 3.6%). Most interview participants lived in a non-rural community ( $n=45$ , 80.4%) and almost a fifth of interviewed participants lived in a rural community ( $n=11$ , 19.6%) (Table 1).

#### *H4H Participation Between March and June 2020*

When asked to describe ones' involvement with the H4H study between March and June 2020, most survey participants responded that they had completed intervention prior to this time ( $n=59$ , 48.4%). Nearly identical proportions of survey participants had either started

( $n=27$ , 22.1%) or not started ( $n=31$ , 25.4%) intervention between March and June 2020. Three participants (4.1%) did not respond to this item (Table 1).

Approximately half ( $n=24$ , 44.6%) of the interview participants had completed H4H participation between March and June 2020. Almost one third ( $n=15$ , 26.8%) of interview participants had started intervention between those months and the remaining approximate third ( $n=16$ , 28.6%) of interview participants had not started intervention (Table 1).

#### *Motivations to Participate in H4H*

All survey participants responded to the item that asked them to select all the statements that applied to why they wanted to participate in H4H. The most frequently selected statement, “I want more physical activity or recreation,” was chosen by 67.5% of survey participants ( $n=81$ ). The second most selected statement was selected by 59.2 % ( $n=71$ ) of survey participants and stated, “I want to spend more time outside.” The statement “I have gardened before, but I want to learn how to be a better gardener,” was selected by 57.5% ( $n=69$ ) of survey participants. “In general, I want to learn new skills,” was the fourth most common statement and was chosen by 51.7% ( $n=62$ ) of survey participants. The fifth most common statement, “I want to grow extra food so that I can share with others,” was selected by 41.7% ( $n=50$ ) of survey participants (Table 2).

#### *COVID-19 Pandemic’s Impact on Gardening Interest*

All survey participants were asked and responded to “How has the COVID-19 pandemic impacted your interest in gardening?” Almost half of survey participants ( $n=58$ , 48.3%) indicated that the pandemic increased their interest in gardening. However, 16.7% ( $n=20$ ) of survey participants reported that their interest in gardening decreased due to the pandemic.

Just over a third of survey participants ( $n=42$ , 35.0%) indicated the pandemic did not change their interest in gardening (Table 3).

Survey participants who responded that the COVID-19 pandemic did not change their interest in gardening were directed to indicate their typical level of interest in gardening. A little over half of these participants reported they were very or extremely interested in gardening ( $n=23$ , 56.1%). About one third of survey participants were moderately interested in gardening ( $n=12$ , 29.4%). The remainder of survey participants who had no change in gardening interest due to the pandemic stated that they were slightly or not at all interest in gardening ( $n=6$ , 14.2%) (Table 4).

#### *Importance of Gardening During the COVID-19 Pandemic*

Surveyed participants who completed or started H4H intervention prior to or between March and June 2020 were asked to rate how important gardening was to them mid-pandemic. Most participants stated gardening was “moderately-to-very important” ( $n=75$ , 87.2%). The remaining surveyed participants rated gardening as being “slightly important” ( $n=8$ , 9.3%) or “unimportant” ( $n=3$ , 3.5%) (Table 5).

#### *Time Spent Gardening During the COVID-19 Pandemic*

Survey participants who had completed or started H4H participation prior to March 2020 were directed to answer the question, “How had the COVID-19 pandemic impacted the amount of time you spent gardening compared to last year?” Close to one-third of survey participants ( $n=31$ , 36.0%) responded that the pandemic increased the amount of time spent gardening. An additional third of surveyed participants ( $n=29$ , 33.7%) reported the pandemic did not change the amount of time spent gardening. The remaining survey participants

indicated either that the pandemic decreased the amount of time spent gardening ( $n=15$ , 17.5%) or that they did not garden at all in 2019 ( $n=11$ , 12.8%) (Table 6).

A higher frequency of survey participants who had completed intervention prior to March 2020 ( $n=24$ , 40.8%) spent more or significantly more time gardening between March and June 2020 than survey participants who had started but not completed intervention ( $n=7$ , 25.9%) prior to the same time. Almost the same frequency of survey participants who had completed ( $n=20$ , 33.9%) and started intervention ( $n=9$ , 33.3%) indicated that they spent the same amount of time gardening mid-pandemic. A slightly larger proportion of survey participants who had completed intervention ( $n=9$ , 15.2%) indicated that they spent less or significantly less time gardening compared to survey participants who had started but not completed intervention ( $n=5$ , 18.5%). Almost a quarter of survey participants who started intervention ( $n=5$ , 8.4%) and less than one-tenth of those who completed intervention ( $n=6$ , 22.3%) prior to the pandemic did not garden in the previous year (Figure 2).

#### *Garden Size During the COVID-19 Pandemic*

Most survey participants who had started or completed intervention prior to March 2020 either expanded ( $n=33$ , 38.8%) or maintained ( $n=42$ , 49.4%) the size of their garden during the COVID-19 pandemic. A small portion of survey participants decreased ( $n=7$ , 8.2%) or removed ( $n=3$ , 3.5%) their garden at that time (Table 7).

Most survey participants who expanded their garden indicated that they felt more motivated or interested in gardening ( $n=26$ , 78.8%) and that they felt physically well enough to expand their garden ( $n=24$ , 72.7%). Many of these survey participants also reported that they wanted more physical activity or recreation ( $n=20$ , 60.6%) and wanted to spend more time

outside ( $n=18$ , 54.5%). Survey participants in this category also cited that needed supplies were available in store or online ( $n=17$ , 51.5%) (Table 8).

Many survey participants who did not change the size of their garden during March through June of 2020 indicated that they were comfortable maintaining what they had ( $n=37$ , 88.1%) and that they were satisfied with the size of their garden ( $n=30$ , 71.4%). These survey participants indicated they felt physically well enough to maintain what they had ( $n=30$ , 71.4%) and were satisfied with the amount of physical activity or recreation they received while tending their existing garden ( $n=19$ , 45.2%). These survey participants also reported to be satisfied with the amount of food that their garden provided ( $n=16$ , 38.1%) (Table 9).

Survey participants who reduced the size of their garden during the pandemic indicated they did not want or need the amount of food provided by the previous size of their garden ( $n=3$ , 42.9%) and that they felt uncomfortable going out to buy supplies ( $n=2$ , 28.6%) as top reasons for doing so. Two survey participants (28.6%) cited environmental factors, such as extreme weather and pesky insects, that led to their decision to reduce the size of their garden between March and June 2020. The following responses were selected at the same frequency ( $n=1$ , 14.3%) by survey participants: they felt unmotivated or disinterested in gardening, they wanted to spend less time outside, gardening did not help them take their mind off things, they did not have time to maintain the previous size of their garden, nor did they feel physically well enough to do so (Table 10).

All survey participants who removed their garden between March and June 2020 indicated that they felt unmotivated or disinterested in gardening ( $n=3$ , 100%). One participant (33.3%) cited declining health of loved ones caused them to shift their focus from gardening

and one participant (33.3%) noted environmental factors, specifically browsing by deer, led to the removal of their garden (Table 11).

## **Interview Themes**

### *Impact of the Pandemic on Gardening and H4H Experiences and Interest*

The majority of interview participants who had completed or started intervention between March and June 2020 indicated their gardening experience was not affected by the pandemic. Some interview participants stated the pandemic impacted their gardening experience in a positive way, such as it allowed them to spend more time in their garden. Other interview participants stated the pandemic negatively impacted their gardening experience due to supply chain issues.

Most interview participants who received intervention between March and June 2020 indicated that the pandemic had neutral impacts to or did not interrupt their H4H experience, in part because they were confident of their gardening skills and felt that the size of their garden was manageable. Interview participants whose experiences were negatively interrupted by the pandemic primarily cited that virtual mentorship was less effective than in-person mentorship. One interview participant stated, “I would have done better networking with other people and [would have been] more motivated to keep deadlines and so forth;” which emphasized the benefits of Master Gardeners as a companion and mentor, a common sentiment among interviewed participants. Some interviewed participants viewed the pandemic as a positive influence on their H4H experience. One interview participant expressed gratitude simply for the fact that they were able to continue participating. Other

interview participants acknowledged that the pandemic gave them more time to dedicate to gardening in general.

Several interviewed participants indicated that the COVID-19 pandemic did not impact their gardening experience or interest, but that other life events (both positive and negative) did. For example, gardening became less of a priority for one participant because they were helping plan a family member's wedding. A few gardeners indicated that caring for loved ones who had ill health unrelated to the coronavirus took precedence over gardening.

Approximately, equal numbers of interviewed participants stated the pandemic did not impact or positively impacted their interest in gardening. Again, many participants cited additional free time allowed them to learn more and spend more time outside. Several interview participants who had yet to start intervention indicated that the pandemic made them more eager to begin.

#### *Role of Gardening During the Pandemic*

All interviewed participants who had completed or started intervention prior to March through June 2020 indicated gardening was either a neutral or positive activity to participate in during the COVID-19 pandemic. About one-sixth of interviewed participants regarded gardening as being neutral or as not playing a true role in daily life. The majority of interview participants described gardening as being enjoyable and something they looked forward to doing. Many interview participants were eager to garden during the pandemic because it was a way to actively spend abundant free time outside and resulted in fresh produce to share or enjoy. Additionally, many interviewed participants revered gardening for its therapeutic effects. One participant discussed having several physical health issues and that the pandemic caused them

to have “a lot of depression and stuff like that, mental health issues,” and found that gardening “kind of helped me feel better about myself like I was able to create something.” Most interview participants did not go into this much detail, but instead described gardening as being uplifting, refreshing, and productive.

### *The Impact of Master Gardeners and Program Gratitude*

Approximately two-thirds of interviewed participants who started or completed the intervention discussed, without prompt, the positive role played by their Master Gardener. As previously mentioned, many interview participants viewed Master Gardener as a companion and a mentor who facilitated accountability. Several interview participants indicated that being in H4H and having a Master Gardener inspired them to take the Master Gardener training course so that they could learn more and give back in some way. One participant gushed about H4H and their mentors saying, “they accepted me right away and I just loved it, and I met some really good friends in there... I learned a lot just being around them and that's why I really wanted to become a master gardener because I saw that there was so much more to learn.” Another interview participant contrasted the comforting warm nature of their Master Gardeners to the colder nature of the medical staff they encountered over the course of their cancer diagnosis and treatment.

All interviewed participants who discussed the impact of H4H on their life seized the opportunity to express sincere gratitude for being enrolled in the program. Several participants called H4H a “blessing” and described how participation improved their mental and physical wellbeing by encouraging them to eat better, be more physically active, by having a “human” aspect, and by teaching them new skills that serve as a strong foundation for learning more.

While expressing gratitude, most interview participants were also empathetic in hoping that the H4H was as beneficial to others as it was to them. One interview participant stated, “It is a fantastic program...it's a program that could be an administrative program that's available to seniors and to people with disabilities or illness severe illnesses.”

## Discussion

To the researchers' knowledge, this is one of the first studies to document changes in home gardening as a response to COVID-19 and is the only one conducted exclusively in cancer survivors.

The majority of participants indicated that the COVID-19 pandemic did not negatively impact their gardening or H4H experience and that the pandemic increased their interest in gardening; additionally, the majority of participants who indicated that the pandemic did not change their interest in gardening had a moderate-to-extreme interest in gardening. Additionally, most interviewed participants whose intervention was modified due to the pandemic reported that their experience was not negatively impacted by the COVID-19 pandemic.

Of survey participants who had started or completed H4H intervention ( $n=75$ ) in the previous year, 41.3% ( $n=31$ ) indicated spending more-to-significantly-more time gardening, 38.7% ( $n=29$ ) indicated spending the same amount of time gardening, and 20.0% ( $n=15$ ) indicated spending less-to-significantly-less time gardening (Table 6). This is contrasted by findings from the 2021 National Gardening Survey (21NGS) in which only 20% of gardeners aged 65 years and older gardened more due to the pandemic; differences are also noted in that 67% of older gardeners indicated that the pandemic did not impact the amount of time spent

gardening and 11% of older gardeners gardened less due to the pandemic (Whitinger et al., 2021).

The differences in proportions of time spent gardening by survey participants and 21NGS participants could, in part, be explained by the mentorship and companionship of Master Gardeners. Of older gardeners who participated in the 21NGS, 15% reported that they often experienced problems while participating in lawn and garden activities due to a lack of knowledge and 35% reported that they would participate more if they knew more about gardening; additionally, 23% of older gardeners indicated that they would participate in lawn and garden activities more if they had someone to participate with (Whitinger et al., 2021). Master Gardeners equipped H4H participants with lasting companionship and gardening knowledge and solutions, eradicating the aforementioned barriers that reduce the amount of time spent gardening by older gardeners and possibly contributing to higher H4H retention rates and program satisfaction of participants.

Additionally, the differences in proportions of H4H participants and 21NGS older gardeners who spent more time gardening due to the COVID-19 pandemic could likely be attributed to motivational factors. The majority of surveyed H4H participants indicated the interest in learning new skills and the interest in wanting to learn how to be a better gardener as motivations for participating in H4H; 18% of 21NGS older gardeners who stopped participating in lawn and garden activities in 2020 did so due to loss of interest and 5% did so due to lack of knowledge (Whitinger et al., 2021).

Likewise, the motivation of joining H4H in order to receive more physical activity or recreation likely, in part, explains the larger proportion of time spent gardening during the

pandemic compared to older gardeners. Most H4H participants indicated that they participated in H4H to receive more physical activity or recreation and that two of the inclusionary factors to participate in H4H were 1) having suboptimal levels of physical activity and 2) the possession of at least one physical limitation. One of the top three causes for older 21NGS gardeners to stop participating in lawn and garden activities is the presence of physical limitations (Whitinger et al., 2021). It is noteworthy that H2H participants, who are resilient cancer survivors, were more empowered by a motivation that can be a barrier for others.

The vast majority of survey participants ( $n=54$ , 91.5%) who completed H4H intervention prior to the initial surge of the pandemic continued to garden post-intervention (Figure 2); this aligns with survey data from a H4H pilot study in which 86% of participants still gardened two years after intervention (Bail et al., 2018). The sustainability of H4H despite a global pandemic speaks volumes of its efficacy and the use of Master Gardeners, who are a part of every land-grant extension program, as mentors ensures a replicable program design that could greatly benefit older cancer survivors who represent over 60% of cancer survivors in America (Bluethmann et al., 2016).

Perhaps the greatest limitation to this study is its retrospective research design. While it is assumed that participants accurately recalled their experiences, a similar study with a prospective research design could assert so more confidently. An additional limitation of this study is the potential for Type 2 errors due to sampling and random error; a larger sample size with larger subsamples would help reduce the likelihood of this type of error. One strength of this study is the detailed and in-depth data that was generated; such data serves as a starting point for future research on the motivational factors to and rewards of gardening which can be

used to increase the benefits gained from gardening interventions and programs. Data from this survey has further illuminated is the longevity of H4H's efficacy via post-enrollment gardening; additional data on H4H's efficacy could demonstrate the value of the program and aid in developing similar programs across the country.

## Chapter 5: Assessing the Impacts of the COVID-19 Pandemic on the Mindfulness and Loneliness of Older Gardeners

### Summary

The purpose of this study was to investigate the impacts of the COVID-19 pandemic on the mindfulness and loneliness of older cancer survivors who were enrolled in Harvest for Health (H4H), a gardening intervention. Participants were contacted and informed of the current study by email and postcards, both of which contained a link to an online survey and a telephone number to call if interested in being interviewed. These methods garnered 120 useable surveys and 62 interviews which had response rates of 38.0% and 19.6%; H4H consisted of 316 participants at the time of the current study. The online survey assessed the impact of the pandemic on mindfulness, loneliness, and the H4H and gardening experiences of participants and collected demographic information. The telephone interview consisted of three structured questions and multiple follow-up questions to further assess the impact of the pandemic on participants' experience. Data from the online survey indicated that the pandemic negatively impacted the mindfulness and loneliness of H4H participants. The mindfulness of participants who had not started intervention prior to March 2020 had lower pre-pandemic and mid-pandemic loneliness scores compared to participants who had completed or started intervention prior to or between March and June 2020. Significant differences were not identified in the loneliness scores grouped by participation stage. When analyzed by marital status, differences were approaching significance among pre-pandemic loneliness scores in general and between the mid-pandemic loneliness scores of participants who were widowed and never married, suggesting that participants who had never married were lonelier than

those who were widowed during the pandemic. Mid-pandemic loneliness scores of participants whose interest in gardening slightly decreased during the pandemic were higher than those whose interest did not change. The majority of participants whose gardening interest did not change during the pandemic reported being moderately to extremely interested in gardening. Additionally, this study aimed to assess if correlations exist between mindfulness and loneliness; data indicated that the two mental states were negatively correlated before and during the COVID-19 pandemic. Qualitative analysis revealed participant themes of the social aspects of the H4H and mentions of mindfulness themes when discussing their gardening experiences.

## Introduction

H4H was an interventional study that aimed to improve the diet, physical health, and physical functioning of older cancer survivors. Older survivors of cancer represent the fastest growing and largest population of cancer survivors, who are at an increased risk of developing behavior-mediated diseases and are at higher risk of functional decline (de Moor et al., 2013; Bluethmann et al., 2016). Participants of this intervention were mentored to grow vegetables at home with the guidance of a Master Gardener, who contacted them twice a month to help plan and maintain a garden for three growing seasons (Demark-Wahnefried, 2021). In addition to having completed primary treatment for at least one of several types of cancer, eligible participants had to live in Alabama, be physically inactive, be physically limited in at least one way as defined by the Medical Outcomes Study Short Form-36 Physical Function subscale (Ware & Sherbourne, 1992), did not maintain a vegetable garden in recent years nor eat a minimum of 2.5 cups of produce per day (Demark-Wahnefried, 2021). Employing a location-

based rolling recruitment plan, participants were enrolled in cohorts and then randomly assigned into an immediate or one-year delayed intervention group. Program efficacy was assessed by self-reported diet, physical activity and physical functioning, objective measures (i.e., accelerometry), fitness batteries, and assessment of biomarkers; most of the collected data pertained to physical health and functioning and increased produce intake. Some psychologic data were collected using the Medical Outcomes Study Short Form-36 Mental Health subscale which consists of items assessing vitality, social functioning, role-limitations due to emotional distress, and mental health (Ware & Sherbourne, 1992).

Most participants had completed the intervention prior to the COVID-19 pandemic, however many participants had started or were waiting to begin the intervention when stay-at-home orders were issued throughout the United States in March 2020 (Moreland et al., 2020). At this time, the study protocol was revised to reduce person-to-person contact; participants and their Master Gardener partners communicated by telephone and email until the fall of 2020 when in-person meetings resumed with masking and social distancing.

In part due to stay-at-home orders and social distancing, the COVID-19 pandemic was coined “the loneliness pandemic” by Palgi et al (2020) to emphasize the negative impacts of isolation on mental health. Loneliness occurs when relational expectations are misaligned with reality; the intensity of loneliness is directly correlated with the amount of discrepancy between expectation and reality (de Jong Gierveld, 1987). Loneliness is correlated with the symptom cluster of depression, pain, and fatigue in adult cancer survivors and seniors and has been associated with low self-rated health and functional limitations (Luo et al., 2012; Jaremka et al., 2014; Powell et al, 2021).

Fortunately, loneliness can be combatted by being socially active, improving social skills, receiving support from others, and by being self-aware (Mushtaq et al., 2014). Gardening is an activity that encompasses these factors; Maas et al. (2009) proposed that green spaces encourage social interaction and that there is an inverse relationship between the amount of green space and feelings of loneliness and perceived lack of social support - both of which influence the overall quality of life. This proposal is supported by research by Brown et al. (2004) which found that seniors in a gardening intervention study had increased scores among 4 facets of socialization including social belonging and guidance. Additionally, findings by Heliker et al. (2001) detailed how many older gardeners take pride in the activity because they find it a way to live out and continue a legacy of information and stories collected over the lifetime.

In addition to improving mental well-being, gardening has also been documented as a successful way for seniors to attain the recommended amount of moderate- to high-intensity physical activity and improve physical health and performance (Park et al., 2008, 2014, 2016). Senior gardeners are more likely to improve their health through a well-balanced diet and are more likely to consume larger quantities of vegetables than non-gardeners and report better balance, gait speed, and fewer falls than seniors who do not garden; gardeners in this study also reported fewer functional limitations and chronic conditions than their counterparts (Sommerfeld et al., 2010a; Chen and Janke, 2012).

One of the most popular theories attributed to the restorative benefits of gardening is Kaplan's (1995) Attention Restoration Theory, which proposes that nature immersion leads to mental and emotional restoration by improving concentration, reducing mental fatigue, and

inspiring interest and reflection. This theory aligns with the operational definition of mindfulness, which is described as maintaining attention so that it focuses on the immediate experience in a way that is curious, open, and accepting (Bishop et al., 2004); this definition also emphasizes thoughts should be noted as observations instead of as distractions that can be catastrophized. Mindfulness-based stress reduction (MBSR), which consists of clinical meditation training, has been correlated with reduced loneliness and increased social contact, but research has not investigated the relationship between dispositional mindfulness and loneliness (Lindsay et al., 2019; Creswell et al., 2012; Saini et al., 2021). Only one refereed study exists that explores the intersection of these topics even though gardening offers unlimited opportunities to practice present-centered, non-judgmental awareness (Creswell et al., 2012; Saini et al., 2021; Lindsay et al., 2019; Stigsdotter et al., 2018).

The purpose of this study was to expand the breadth and width of mental health data collected from H4H participants by assessing their mindfulness and loneliness prior to the pandemic and mid-pandemic, March through June 2020. This study also sought to investigate the relationships of gardening, mindfulness, and loneliness.

## Materials and Methods

### *Sample*

The sample of this study consisted of 316 H4H participants who enrolled prior to October 2020; at this time, there were participants who had completed, started, and were waiting to begin intervention. Participants were solicited via email and mail and were reminded of the survey and interview opportunities through email and social media. Participants were

incentivized to complete the survey by the opportunity to win a gardening prize valued at up to \$25.

#### *Instrument*

The study's online survey was developed and mostly distributed through Qualtrics XM (October 2020; Qualtrics, Provo, UT). A short URL to the survey, that was created using the hosting university's online link generator, was used in mailings and social media posts. From this link, H4H participants were sent to the survey's landing page which had information about the survey's purpose, voluntary nature, and information on confidentiality and the hosting university's IRB; continuing to the survey implied participant consent. The survey consisted of the de Jong Gierveld Loneliness Scale (dJGLS) (de Jong Gierveld & Kamphuis, 1985), the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R) (Feldman et al., 2007), items on gardening and H4H experience, and demographic items.

Pre- and mid-pandemic loneliness and mindfulness were assessed using the dJGLS and CAMS-R, respectively; participants were asked to retrospectively respond to the scales twice, from a pre-pandemic mindset and from their mindset from March through June 2020. dJGLS is an 11-item scale developed by de Jong Gierveld & Kamphuis (1985); five items pertain to social belonging and six items pertain to negative emotions. Each item is rated on a Likert scale (Likert, 1932) that ranges from "none of the time" to "all of the time." Responses are converted to numerical equivalents and totaled; higher scores indicated more intense feelings of loneliness (de Jong Gierveld & Kamphuis, 1985). The dJGLS has good internal consistency ( $0.8 \leq \alpha \leq 0.9$ ) when used to evaluate loneliness in seniors and has been recommended for use in older adults as a unidimensional measure (Penning et al., 2014; Thomás et al., 2017; de Jong Gierveld & von Tilburg, 1999). CAMS-R is a 12-item scale that consists of four subscales which

encompass the Bishop et al. (2004) definition of mindfulness (attention, present focus, awareness, and acceptance) (Feldman et al., 2007). Like the dJGLS, CAMS-R items are rated on a Likert scale (Likert, 1932) and responses are converted to numerical equivalents and totaled; similarly, higher scores indicate a greater presence of mindfulness. CAMS-R demonstrated an acceptable level of internal consistency ( $0.74 \leq \alpha \leq 0.77$ ) in young adult populations, but related data on older adults is limited (Feldman et al., 2007); Lenze et al. (2014) postulated that CAMS-R could be a reliable mindfulness scale in senior populations in part due to its simplicity and sensitivity.

Gardening and H4H experience items were included to gain insight on motivations to enroll in H4H and participant experiences considering the pandemic. Items were multiple choice or multiple response, which allowed participants to select all responses that applied and included a text response option. Most items from this category were not relevant to this study and are detailed in a separate publication. Relevant items from this section of the online survey include intervention stage prior to March 2020 (completed, started, and waiting to begin) and changes in participant interest in gardening due to the COVID-19 pandemic.

Collected demographic data included age, gender, race, marital status, household composition, education, and employment status. Additionally, participants were asked to complete a text field with their full name for verification purposes; names were omitted from data analysis.

Telephone interviews took place over a free Google Voice (Version 2021.10.18.404440564; Google, Mountain View, CA) phone number and were recorded and transcribed, with participant consent, using Otter.ai (Version 2.3.110; Otter.ai, Mountain View,

CA). The interview script had three structured questions and unstructured follow up questions were asked as needed for clarity and depth. Participants who had completed or started H4H intervention before or during March through June 2020 were asked to describe the role gardening played in their life during the COVID-19 pandemic. Those who had started intervention prior to the pandemic were asked how their experience had been affected by the pandemic. Participants who had not started intervention before March 2020 were asked if and how the pandemic impacted their interest in participating in H4H. Transcribed interviews were reviewed and edited for accuracy and then imported into NVIVO (Version 940; QSR International, Melbourne, AUS) for qualitative analysis.

#### *Data Analysis*

Survey data was exported to an Excel spreadsheet (Version 2104; Microsoft, Redmond, WA) then organized, coded, and imported to SPSS (Version 28; IBM Corp., Armonk, NY). Frequencies were calculated for H4H and gardening experience and demographic items. Chi-square goodness of fit tests and independent samples t-test assessed if the survey and interview participants represented the H4H population regarding gender, race, community dwelling type, and age.

Pre- and mid- pandemic scores from each scale were compared using paired samples t-tests and were factored by gender and race using independent sample t-tests. One-way analysis of variance (ANOVA) tests were performed to determine if there were significant differences in pre- and mid- pandemic mean scores of each scale by the following categories: stage in H4H from March through June 2020, marital status, education level, changes in gardening interest cause by the pandemic, impact of the pandemic on time spent gardening, importance of

gardening during the COVID-19 pandemic, pandemic-related change in garden size, household size, and employment status. Tukey's Honest Significant Difference post-hoc test was used to determine specific differences in group means. Pearson's product-moment correlation coefficient was used to determine correlations between measures of pre- and mid-pandemic mindfulness and loneliness. Significance for all statistical testing was assessed at the 95% confidence interval.

Text responses and interview transcripts were reviewed for correctness then imported into NVIVO (Version 940; QSR International, Melbourne, AUS) and analyzed for themes and outliers by two reviewers.

## Results

### *Demographic Representation*

Of the 316 H4H participants eligible for this study, the majority were female ( $N=218$ , 69.0%; males,  $N=98$ , 31.0%) and had a mean age of 69.76 ( $SD=6.54$ , range 50-95). Most H4H participants were white ( $N=80.7%$ ) or black ( $N=59$ , 18.7%); two H4H participants were of a race other than black or white (<1.0%). More H4H participants lived in a non-rural community ( $N=258$ , 81.6%) than a rural community ( $N=58$ , 18.4%). Solicitations resulted in 120 usable survey responses (38.0%) and 62 interview transcripts (17.7%) from 316 H4H participants (Table 1).

Most survey participants were female ( $n=91$ , 75.8%), however almost a quarter of participants were male ( $n=19$ , 24.2%). The races of survey participants included black ( $n=14$ , 11.7%), white ( $n=104$ , 86.7%), and undisclosed race ( $n=2$ , 1.7%). Survey participants were  $68.05 \pm 6.25$  years old. The majority of these participants were married ( $n=76$ , 63.3%), widowed ( $n=20$ ,

16.7%), or divorced or separated ( $n=18$ , 15.0%), however some had never married ( $n=6$ , 5.0%) (Table 1).

Most survey participants lived in a non-rural community ( $n=95$ , 79.2%) and approximately one-fifth of participants lived in a rural area ( $n=25$ , 20.8%). Survey participants either lived with their spouse or partner ( $n=65$ , 54.2%), alone ( $n=28$ , 23.2%), or with others ( $n=27$ , 22.6%) (Table 1).

The majority of survey participants attended higher education or held a vocational degree or certificate ( $n=90$ , 75.0%) and one quarter of these participants had a higher education or had attended college but did not receive a degree ( $n=30$ , 25%). Most survey participants were retired ( $n=84$ , 70.0%), however a sizeable number of participants were employed ( $n=23$ , 19.1%); few survey participants were unemployed, had a disability that prevented them from working, or were both retired and had a disability that prevented employment ( $n=7$ , 5.9%) (Table 1).

Most survey participants had completed H4H intervention prior to March 2020 ( $n=59$ , 48.4%); close to one-third of participants had started participating during the pandemic ( $n=27$ , 22.1%) or were waiting to begin intervention ( $n=31$ , 25.4%). Three survey participants (4.1%) did not respond to the item regarding participation status between March and June 2020 (Table 1).

Most interviewed participants were female ( $n=42$ , 75.0%) and one-fourth of participants were male ( $n=14$ , 25.0%). Most interview participants were black ( $n=9$ , 16.0%) or white ( $n=45$ , 80.4%) while two participants were of an undisclosed race ( $n=2$ , 3.6%). The majority of

participants who were interviewed lived in a non-rural community ( $n= 45, 80.4\%$ ) compared to a rural community ( $n=11, 19.6\%$ ) (Table 1).

### *Participant Mindfulness*

The mean mindfulness score of H4H participants was lower between March and June 2020 ( $M=36.94, SD= 6.32$ ) than it was pre-pandemic ( $M=39.29, SD=5.05$ ). This statistically significant decrease in score [ $t(113)=6.79, p<.001$ ] represents a decrease in dispositional mindfulness (Table 12).

Pre-pandemic mindfulness scores significantly varied between groups based on the stage of involvement in H4H from March through June 2020 at the  $p < .05$  level [ $F(2,109)=4.03, p=.02$ ] (Figure 3). Tukey's HSD post hoc comparison test indicated the mean pre-pandemic group score of participants who had not started the intervention prior to March 2020 ( $M=37.19, SD=5.68$ ) was significantly lower than the mean group scores of participants who had completed the intervention ( $M=40.22, SD=4.95$ ) and participants who had started, but not completed intervention ( $M=39.96, SD=3.75$ ) before March 2020. Additionally, mid-pandemic scores varied significantly between the same groups at the  $p<.05$  level [ $F(2,109)=4.55, p=.01$ ]. Tukey's HSD post hoc comparison test indicated the mean mid-pandemic group score of participants who had not started intervention prior to March 2020 ( $M=34.23, SD=6.67$ ) was significantly lower than the mean group scores of participants who had completed intervention ( $M=37.84, SD=6.52$ ) and participants who had started but not completed intervention ( $M=38.62, SD=4.47$ ) before March 2020 (Figure 3).

### *Participant Loneliness*

The mean loneliness score of H4H participants increased from pre-pandemic ( $M=3.75$ ,  $SD=3.10$ ) to mid-pandemic ( $M= 5.21$ ,  $SD= 3.25$ ). This increase in score [ $t(115)=-7.71$ ,  $p<.001$ ] suggests that participants were lonelier during the pandemic than before the pandemic. Both the pre- and mid-pandemic mean loneliness scores were categorized as “moderately lonely” in the dJGLS manual (de Jong Gierveld & van Tilburg, 1999) (Table 12).

Differences were trending between the pre-pandemic group loneliness scores of participants of various marital status at the  $p\leq.10$  level [ $F(3,114)=2.17$ ,  $p=.10$ ]. Tukey’s HSD post hoc did not indicate differences between specific groups. Differences between the post-pandemic group loneliness scores of participants of various marital status were also trending at the  $p\leq.10$  level [ $F(3,114)=2.57$ ,  $p=.06$ ]. Tukey’s HSD post hoc indicated widowed participants ( $M=3.90$ ,  $SD=2.61$ ) had a significantly lower mean loneliness score than participants who had never married ( $M=7.50$ ,  $SD=3.21$ ); each group mean fell into the “moderately lonely” category (Figure 4).

Differences were also found between mean mid-pandemic loneliness scores of participants whose gardening interest was impacted differently by the COVID-19 pandemic at the  $p<.05$  level [ $F(4,113)=2.76$ ,  $p=.03$ ]. Tukey’s HSD post hoc comparison test indicated mean loneliness score of those whose interest in gardening was not impacted ( $M=4.32$ ,  $SD=3.26$ ) by the pandemic was less than those whose interest in gardening was slightly decreased ( $M=6.79$ ,  $SD=2.83$ ) due to the pandemic; these group means were also categorized as “moderately lonely” (Table 20). Most participants whose interest in gardening did not change due to the pandemic were moderately to extremely interested ( $n=35$ , 85.4%) in gardening during the

pandemic and a portion of participants were either slightly ( $n=4$ , 9.8%) or not at all interested ( $n=2$ , 4.8%) in gardening during the pandemic (Table 13).

#### *Correlation of Mindfulness and Loneliness*

Pre- and mid-pandemic mindfulness and loneliness mean scores were found to have moderate negative correlations. Pre-pandemic mindfulness mean scores had moderate negative correlations with both pre-pandemic ( $r=-0.57$ ,  $n=113$ ,  $p=.000$ ) and mid-pandemic ( $r=-0.52$ ,  $n=112$ ,  $p=.000$ ) loneliness mean scores. Mid-pandemic mindfulness scores were also moderately, negatively correlated with pre-pandemic loneliness scores ( $r=-0.48$ ,  $n=113$ ,  $p=.000$ ) and mid-pandemic loneliness scores ( $r=-0.61$ ,  $n=112$ ,  $p=.000$ ) (Table 14).

#### *Interview Themes*

Many participants discussed the social aspects of gardening and H4H participation, including loneliness and mindfulness, even though structured interview questions did not mention either of these topics. In discussions pertaining to social loneliness, participants typically specified that they missed their Master Gardener or being active in the community. Some participants who were able to physically meet with their Master Gardener while following safety protocols in the fall of 2020 indicated that they enjoyed the social interaction. One participant remarked, “We talk on the phone, and so having the gardener, having the garden, meeting the master gardener, it has helped with the isolation that we've experienced with the pandemic.”

The social nature of gardening was also indicated by participants who discussed sharing seeds, produce, recipes, and techniques. Several participants mentioned how they had become mentors to loved ones and neighbors of all ages. One participant stated that they “even got my two youngest grandkids into [gardening].”

Many participants also reflected on childhood memories of helping their family members garden. Pastime gardening experiences greatly varied; one participant attributed their interest in gardening to their mother's passion for it, while another participant explained how they had never intended to garden because they disliked it as a child but that they became interested in it once they became a homeowner.

Conversations with participants also yielded aspects of mindfulness while gardening, both explicitly and indirectly. Many participants used mindfulness-related language when discussing gardening. One participant identified themselves as an "old 70s [person]" and that they gardened for "centering and [to] do the Zen stuff" because it "helps you kind of get back to a balance." Another participant stated that gardening is "kind of like meditation"; the same participant explained that they found gardening "calming and soothing."

Some participants described gardening in ways that align the practice with components of the operational definition of mindfulness (Bishop et al., 2004). For example, many participants discussed gardening tasks that involve being present focus, such as inspecting plants for insects or ripe produce; additionally, participants noted how gardening involves bodily senses, like sight, touch (feeling a breeze or warm soil), hearing (the song of birds and buzzing of insects). Participants also demonstrated having an attitude of curiosity by indicating their continued interest in learning and by making statements such as, "there is always something of interest [when gardening]." Situational acceptance was exhibited by many participants who discussed how they continued to pursue gardening despite setbacks caused by weather, pest, and disease; there were also participants who gave up gardening because of these hindrances. Participants who continued H4H participation virtually, when interrupted by

the dangers of the pandemic, also demonstrated acceptance and openness; openness was also exhibited by many participants who described planting and eating vegetables that were new to them; however, several participants stated that they planted and ate only what was familiar.

## Discussion

This study is novel in correlating mindfulness with gardening and adds to the bodies of literature that negatively correlate mindfulness and loneliness and that cite the benefits of gardening on mental health. In addition to reaffirming the aforementioned differences in the mindfulness scores of participants in varying stages of H4H involvement indicates a connection between gardening and mindfulness that indicates the necessity for future research.

Participants who had started or completed the intervention between March and June 2020 had higher mindfulness scores and smaller differences in mean scores than participants who had yet to start intervention. When interviewed, unprompted participants described gardening activities and benefits that aligned with components of mindfulness. These findings, which are both supported by and support the Attention Restoration Theory (Kaplan, 1995), provide evidence that mindfulness could be an underlying component that contributes to the physical and mental benefits of gardening. The mid-pandemic decrease in participant mindfulness supports the underlying assumption of CAMS-R: mindfulness is stable but modifiable by life experiences (Feldman et al., 2006). This finding is also aligned with Kumar et al. (2005) finding that the un-revised CAMS-R was sensitive to change.

The increase in the surveyed sample's mean loneliness scores indicates that H4H participants became lonelier during the pandemic. This data compares to findings by van Tilburg et al. (2021) who collected loneliness data on 1,679 community-dwelling older adults in

the fall of 2019 and in May 2020; mean loneliness scores almost doubled between the time. ANOVA results identified differences in mean loneliness scores of survey participants grouped by marital status both pre-pandemic and between March and June 2020. Post hoc testing did not uncover differences among pre-pandemic group means but did detect differences in the means of survey participants who were widowed and never married; Widowed participants were lonelier than survey participants who had never married.

Differences were also found among mid-pandemic loneliness scores of participants whose interest in gardening remained the same and whose interest slightly decreased due to the COVID-19 pandemic. Participants who had a slight decrease in gardening were lonelier than participants whose interest did not change. Most participants whose interest in gardening stayed the same indicated that they were moderately, very, or extremely interested in gardening, however no differences were found in loneliness scores grouped by gardening interest.

The loneliness and mindfulness scores of H4H participants were negatively correlated with one another before and during the COVID-19 pandemic; these findings compare to those of Creswell et al. (2012) who found mindfulness and loneliness scores to be negatively correlated in older adults who participated in mindfulness-based stress reduction practices. Perhaps this phenomenon could be explained by reviewing the definitions of mindfulness and loneliness; mindfulness is driven by being accepting, open to, curious, and somewhat objective of experiences; loneliness is caused by discrepancies between social expectations and reality. The more accepting and non-judgmental (mindful) one is of experiences, which are the

culmination of expectations and realities, the less room there is for discrepancies that result in unpleasant feelings like loneliness.

Results of this study serve as a starting point for future research on the intersections of gardening, mindfulness, and loneliness. An additional strength of this study is that detailed, in-depth data was collected relatively quickly and inexpensively. The primary limitation of this study, retrospective data collection, illuminates the potential for prospective research; mindfulness and loneliness scales could be incorporated into data collection plans and materials of gardening interventions. Additionally, the subsample sizes found in this study increase the likelihood of Type 2 error due to sampling and random error and could be addressed in future studies by having a larger sample. Considering the implications of mindfulness and loneliness on the physical and mental health of older adults, future research in this area is warranted.

## Chapter 6: Observations and Conclusions

The following observations and conclusions are based on the subjective experiences held by the Auburn P.I. at various points of research.

### **Data Collection**

#### *Survey*

The Auburn P.I. was impressed with the survey response rate in part due to its repetitive nature and relatively long length. Upon reviewing survey submissions, the Auburn P.I. realized that blank surveys were submitted, likely by bots (automated software that performs specific tasks), which artificially boosted the response rate before being filtered out.

#### *Interview*

While saturation was quickly reached with interview responses, the Auburn P.I. delighted in learning about each participant's experience. Some participants were hard of hearing or had thick southern accents, which made conversations and transcribing interviews tricky at times. Additionally, the recording software failed to capture several participants' responses. This could be due to low speaking volumes that were not picked up by the microphone, hardware (microphone or computer) issues, and/or software (Otter.ai) issues. Fortunately, the Auburn P.I. made notes during each call and was able to review summaries of the missing conversations.

## **Harvest for Health**

### *Overall*

Harvest for Health intervention contributes to participant quality of life by improving physical health and ability, increasing produce consumption, encouraging social interaction, and by nurturing the pursuit of knowledge through curiosity.

### *Participants*

Participants were more receptive to technology than the Auburn P.I. assumed; this was apparent by the impressive number of survey responses and in interviews when participants discussed online activities related to gardening (shopping and research) and the various technologies they use to communicate with others (e.g., FaceTime, Marco Polo, texting). Most participants were excited to share their gardening and Harvest for Health experiences and were willing to be vulnerable by discussing difficult topics such as pandemic-inflicted declines in mental health. Additionally, many participants discussed how Harvest for Health made them receptive to trying new vegetables and cooking techniques; one participant mentioned that they actively search for new produce to try at the grocery store.

## References

- Alabama Cooperative Extension System. (2021, November 3). *Alabama extension Master Gardeners Volunteer Program*. Retrieved December 25, 2021, from <https://www.aces.edu/blog/topics/lawn-garden/alabama-extension-master-gardeners-volunteer-program/?cn-reloaded=1>
- Antonova, E., Schlosser, K., Pandey, R., & Kumari, V. (2021). Coping with COVID-19: mindfulness-based approaches for mitigating mental health crisis. *Frontiers in Psychiatry*, 12, 563417. <https://doi.org/10.3389/fpsyt.2021.563417>
- Bail, J. R., Frugé, A. D., Cases, M. G., De Los Santos, J. F., Locher, J. L., Smith, K. P., Cantor, A.B., Cohen, H., & Demark-Wahnefried, W. (2018). A home-based mentored vegetable gardening intervention demonstrates feasibility and improvements in physical activity and performance among breast cancer survivors. *Cancer*, 124(16), 3427-3435.
- Bergomi, C., Tschacher, W., & Kupper, Z. (2013). The assessment of mindfulness with self-report measures: Existing scales and open issues. *Mindfulness*, 4(3), 191-202.
- Berg-Weger, M., & Morley, J. E. (2020). Loneliness and social isolation in older adults during the Covid-19 pandemic: Implications for gerontological social work. *J Nutr Health Aging* 24, 456–458 (2020). <https://doi.org/10.1007/s12603-020-1366-8>
- Berto, R. (2014). The role of nature in coping with psycho-physiological stress: a literature review on restorativeness. *Behavioral Sciences*, 4(4), 394-409.
- Bishop, S. R. (2002). What do we really know about mindfulness-based stress reduction?. *Psychosomatic medicine*, 64(1), 71-83.

- Bishop, S. R., Lau, M., Shapiro, S., Carlson, L., Anderson, N. D., Carmody, J., ... & Devins, G. (2004). Mindfulness: a proposed operational definition. *Clinical Psychology: Science and Practice*, 11(3), 230.
- Blair, C. K., Madan-Swain, A., Locher, J. L., Desmond, R. A., de Los Santos, J., Affuso, O., Glover, T., Smith, K., Carley, J., Lipsitz, M., Sharma, A., Krontiras, H., Cantor, A., & Demark-Wahnefried, W. (2013). Harvest for health gardening intervention feasibility study in cancer survivors. *Acta Oncologica*, 52(6), 1110-1118.
- Bluethmann, S. M., Mariotto, A. B., & Rowland, J. H. (2016). Anticipating the “silver tsunami”: prevalence trajectories and comorbidity burden among older cancer survivors in the United States. *Cancer Epidemiology, Biomarkers & Prevention*, 25(7), 1029–1036. <https://doi.org/10.1158/1055-9965.EPI-16-0133>
- Brown, V. M., Allen, A. C., Dwozan, M., Mercer, I., & Warren, K. (2004). Indoor gardening and older adults: Effects on socialization, activities of daily living, and loneliness. *Journal of Gerontological Nursing*, 30(10), 34–42. <https://doi.org/10.3928/0098-9134-20041001-10>
- Brown, K. W., Weinstein, N., & Creswell, J. D. (2012). Trait mindfulness modulates neuroendocrine and affective responses to social evaluative threat. *Psychoneuroendocrinology*, 37(12), 2037-2041.
- Bruine de Bruin, W. (2021). Age differences in COVID-19 risk perceptions and mental health: Evidence from a national US survey conducted in March 2020. *The Journals of Gerontology: Series B*, 76(2), e24-e29.
- Carlson, L. E., & Garland, S. N. (2005). Impact of mindfulness-based stress reduction (MBSR) on

- sleep, mood, stress and fatigue symptoms in cancer outpatients. *International Journal of Behavioral Medicine*, 12(4), 278-285.
- Cattan, M., White, M., Bond, J., & Learmouth, A. (2005). Preventing social isolation and loneliness among older people: A systematic review of health promotion interventions. *Ageing & Society*, 25(1), 41-67. <https://doi:10.1017/S0144686X04002594>.
- Centers for Disease Control and Prevention. (2021, September 16). CDC COVID data tracker. Centers for Disease Control and Prevention. Retrieved September 17, 2021, from [https://covid.cdc.gov/covid-data-tracker/#cases\\_casesper100k](https://covid.cdc.gov/covid-data-tracker/#cases_casesper100k).
- Centers for Disease Control and Prevention. (2015, January 15). Chronic disease indicators: Older adults. Centers for Disease Control and Prevention. Retrieved December 5, 2021, from <https://www.cdc.gov/cdi/definitions/older-adults.html>.
- Chalmin-Pui, L. S., Griffiths, A., Roe, J., Heaton, T., & Cameron, R. (2021). Why garden?—Attitudes and the perceived health benefits of home gardening. *Cities*, 112, 103118.
- Chen, T. Y., & Janke, M. C. (2012). Gardening as a potential activity to reduce falls in older adults. *Journal of Aging and Physical Activity*, 20(1), 15-31.
- Chu, H. Y., Chan, H. S., & Chen, M. F. (2021). Effects of horticultural activities on attitudes toward aging, sense of hope and hand–eye coordination in older adults in residential care facilities. *International Journal of Environmental Research and Public Health*, 18(12), 6555.
- Clatworthy, J., Hinds, J. and M. Camic, P. (2013), "Gardening as a mental health intervention: A review", *Mental Health Review Journal*, Vol. 18 No. 4, pp. 214-225. <https://doi.org/10.1108/MHRJ-02-2013-0007>

- Corazon, S. S., Sidenius, U., Poulsen, D. V., Gramkow, M. C., & Stigsdotter, U. K. (2019). Psycho-physiological stress recovery in outdoor nature-based interventions: A systematic review of the past eight years of research. *International Journal of Environmental Research and Public Health*, 16(10), 1711.
- Creswell, J. D., Irwin, M. R., Burklund, L. J., Lieberman, M. D., Arevalo, J. M., Ma, J., Crabb-Breen, E., & Cole, S. W. (2012). Mindfulness-based stress reduction training reduces loneliness and pro-inflammatory gene expression in older adults: a small randomized controlled trial. *Brain, Behavior, and Immunity*, 26(7), 1095-1101.
- Cucinotta, D., & Vanelli, M. (2020). WHO Declares COVID-19 a Pandemic. *Acta Biomedica*, 91(1), 157–160. <https://doi.org/10.23750/abm.v91i1.9397>
- Daubenmier, J., Lin, J., Blackburn, E., Hecht, F. M., Kristeller, J., Maninger, N., ... & Epel, E. (2012). Changes in stress, eating, and metabolic factors are related to changes in telomerase activity in a randomized mindfulness intervention pilot study. *Psychoneuroendocrinology*, 37(7), 917-928.
- de Jong-Gierveld, J. (1987). Developing and testing a model of loneliness. *Journal of personality and Social Psychology*, 53(1), 119.
- de Jong-Gierveld, J., & Kamphuis, F. (1985). The development of a Rasch-type loneliness scale. *Applied Psychological Measurement*, 9(3), 289-299.
- de Jong Gierveld, J., & Van Tilburg, T. (1999). Manual of the loneliness scale 1999. Department of Social Research Methodology, Vrije Universiteit Amsterdam, Amsterdam (updated version 1801 02).
- Demark-Wahnefried, W. (2021). Harvest for health in older cancer survivors. Retrieved from

<https://clinicaltrials.gov/ct2> (Identification Number NCT02985411).

- Demark-Wahnefried, W., Cases, M. G., Cantor, A. B., Frugé, A. D., Smith, K. P., Locher, J., Cohen, H., Tsuruta, Y., Daniel, M., Kala, R., & De Los Santos, J. F. (2018). Pilot randomized controlled trial of a home vegetable gardening intervention among older cancer survivors shows feasibility, satisfaction, and promise in improving vegetable and fruit consumption, reassurance of worth, and the trajectory of central adiposity. *Journal of the Academy of Nutrition and Dietetics*, 118(4), 689-704.
- De Moor, J. S., Mariotto, A. B., Parry, C., Alfano, C. M., Padgett, L., Kent, E. E., Forsythe, L., Scoppa, S., Hachey, M., & Rowland, J. H. (2013). Cancer survivors in the United States: prevalence across the survivorship trajectory and implications for care. *Cancer Epidemiology and Prevention Biomarkers*, 22(4), 561-570.
- Drew, C.J., Hardman, M.L., & Hosp, J.L. (2008). *Designing and conducting research in education*. Sage Publication. <https://dx.doi.org/10.4135/9781483385648>
- Epel, E., Daubenmier, J., Moskowitz, J.T., Folkman, S., & Blackburn, E. (2009). Can meditation slow rate of cellular aging? Cognitive stress, mindfulness, and telomeres. *Annals of the New York Academy of Sciences*, 1172,34.
- Feldman, G., Hayes, A., Kumar, S., Greeson, J., & Laurenceau, J. P. (2007). Mindfulness and emotion regulation: The development and initial validation of the Cognitive and Affective Mindfulness Scale-Revised (CAMS-R). *Journal of Psychopathology and Behavioral Assessment*, 29(3), 177-190.
- Hawkley, L. C., Thisted, R. A., & Cacioppo, J. T. (2009). Loneliness predicts reduced physical activity: cross-sectional & longitudinal analyses. *Health Psychology*, 28(3), 354.

- Heliker, D., Chadwick, A., & O'Connell, T. (2001). The meaning of gardening and the effects on perceived well being of a gardening project on diverse populations of elders. *Activities, Adaptation & Aging, 24*(3), 35-56.
- Jaremka, L. M., Andridge, R. R., Fagundes, C. P., Alfano, C. M., Pivoski, S. P., Lipari, A. M., ... & Kiecolt-Glaser, J. K. (2014). Pain, depression, and fatigue: Loneliness as a longitudinal risk factor. *Health Psychology, 33*(9), 948.
- Kabat-Zinn, J. (1994). *Wherever you go, there you are: mindfulness meditation in everyday life* (p.4). Hyperion.
- Kabat-Zinn, J., Lipworth, L., & Burney, R. (1985). The clinical use of mindfulness meditation for the self-regulation of chronic pain. *Journal of Behavioral Medicine, 8*(2), 163-190.
- Kabat-Zinn, J., Massion, A. O., Kristeller, J., Peterson, L.G., Fletcher, K., Pbert, L., Lenderking, W.R., & Santorelli, S.F. (1992). Effectiveness of a meditation-based stress reduction program in the treatment of anxiety disorders. *Am J Psychiatry, 149*(7), 936-943.
- Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology, 15*(3), 169-182.
- Kiken, L. G., Garland, E. L., Bluth, K., Palsson, O. S., & Gaylord, S. A. (2015). From a state to a trait: Trajectories of state mindfulness in meditation during intervention predict changes in trait mindfulness. *Personality and Individual Differences, 81*, 41-46.
- Kotwal, A. A., Holt-Lunstad, J., Newmark, R. L., Cenzer, I., Smith, A. K., Covinsky, K. E., ... & Perissinotto, C. M. (2021). Social isolation and loneliness among San Francisco Bay Area older adults during the COVID-19 shelter-in-place orders. *Journal of the American Geriatrics Society, 69*(1), 20-29.

- Lau, M. A., Bishop, S. R., Segal, Z. V., Buis, T., Anderson, N. D., Carlson, L., Shapiro, S., & Carmody, J. (2006). The Toronto mindfulness scale: Development and validation. *Journal of Clinical Psychology, 62*(12), 1445-1467.
- Lee, Y., & Kim, S. (2008). Effects of indoor gardening on sleep, agitation, and cognition in dementia patients—a pilot study. *International Journal of Geriatric Psychiatry, 23*(5), 485-489.
- Leigh-Hunt, N., Bagguley, D., Bash, K., Turner, V., Turnbull, S., Valtorta, N., & Caan, W. (2017). An overview of systematic reviews on the public health consequences of social isolation and loneliness. *Public Health, 152*, 157-171.
- Lengacher, C. A., Reich, R. R., Kip, K. E., Barta, M., Ramesar, S., Paterson, C. L., ... & Park, J. Y. (2014). Influence of mindfulness-based stress reduction (MBSR) on telomerase activity in women with breast cancer (BC). *Biological Research for Nursing, 16*(4), 438-447.
- Lenze, E. J., Hickman, S., Hershey, T., Wendleton, L., Ly, K., Dixon, D., ... & Wetherell, J. L. (2014). Mindfulness-based stress reduction for older adults with worry symptoms and co-occurring cognitive dysfunction. *International Journal of Geriatric Psychiatry, 29*(10), 991-1000.
- Likert, R. (1932). A technique for the measurement of attitudes. *Archives of psychology*.
- Lindsay, E. K., Young, S., Brown, K. W., Smyth, J. M., & Creswell, J. D. (2019). Mindfulness training reduces loneliness and increases social contact in a randomized controlled trial. *Proceedings of the National Academy of Sciences, 116*(9), 3488-3493.
- Luo, Y., Hawkey, L. C., Waite, L. J., & Cacioppo, J. T. (2012). Loneliness, health, and mortality in old age: A national longitudinal study. *Social Science & Medicine, 74*(6), 907-914.

- Maas, J., Van Dillen, S. M., Verheij, R. A., & Groenewegen, P. P. (2009). Social contacts as a possible mechanism behind the relation between green space and health. *Health & Place*, 15(2), 586-595.
- Martinsen, E. W. (1990). Benefits of exercise for the treatment of depression. *Sports Medicine*, 9(6), 380-389.
- Moreland, A., Herlihy, C., Tynan, M. A., Sunshine, G., McCord, R. F., Hilton, C., Poovey, J., Werner, A. K., Jones, C. D., Fulmer, E. B., Gundlapalli, A. V., Strosnider, H., Potvien, A., Garcia, M. C., Honeycutt, S., Baldwin, G., & Howard-Williams, M. (2020). Timing of state and territorial COVID-19 stay-at-home orders and changes in population movement—United States, March 1–May 31, 2020. *Morbidity and Mortality Weekly Report*, 69(35), 1198.
- Murphy, M. J., Mermelstein, L. C., Edwards, K. M., & Gidycz, C. A. (2012). The benefits of dispositional mindfulness in physical health: A longitudinal study of female college students. *Journal of American College Health*, 60(5), 341-348.
- Mushtaq, R., Shoib, S., Shah, T., & Mushtaq, S. (2014). Relationship between loneliness, psychiatric disorders and physical health? A review on the psychological aspects of loneliness. *Journal of Clinical and Diagnostic Research*, 8(9), WE01.
- Nyqvist, F., Victor, C. R., Forsman, A. K., & Cattan, M. (2016). The association between social capital and loneliness in different age groups: a population-based study in Western Finland. *BMC Public Health*, 16(1), 1-8.
- Ohly, H., White, M. P., Wheeler, B. W., Bethel, A., Ukoumunne, O.C., Nikolaou, V., & Garside,

- R. (2016). Attention Restoration Theory: A systematic review of the attention restoration potential of exposure to natural environments. *Journal of Toxicology and Environmental Health, Part B*, 19(7), 305-343.
- Ornish, D., Lin, J., Chan, J. M., Epel, E., Kemp, C., Weidner, G., Marlin, R., Frenda, S.J., Magbanua, M. J., Daubenmier, J., Estay, I., Hills, N., Chainani-Wu, N., Carroll, P., & Blackburn, E. H. (2013). Effect of comprehensive lifestyle changes on telomerase activity and telomere length in men with biopsy-proven low-risk prostate cancer: 5-year follow-up of a descriptive pilot study. *The Lancet Oncology*, 14(11), 1112-1120.
- Palgi, Y., Shrira, A., Ring, L., Bodner, E., Avidor, S., Bergman, Y., Cohen-Fridel, S., Keisari, S., & Hoffman, Y. (2020). The loneliness pandemic: Loneliness and other concomitants of depression, anxiety and their comorbidity during the COVID-19 outbreak. *Journal of Affective Disorders*, 275, 109.
- Park, S. A., Lee, A. Y., Lee, K. S., & Son, K. C. (2014). Gardening tasks performed by adults are moderate-to high-intensity physical activities. *HortTechnology*, 24(1), 58-63.
- Park, S. A., Lee, A. Y., Son, K. C., Lee, W. L., & Kim, D. S. (2016). Gardening intervention for physical and psychological health benefits in elderly women at community centers. *HortTechnology*, 26(4), 474-483.
- Park, S. A., Shoemaker, C., & Haub, M. (2008). Can older gardeners meet the physical activity recommendation through gardening?. *HortTechnology*, 18(4), 639-643.
- Penning, M. J., Liu, G., & Chou, P. H. B. (2014). Measuring loneliness among middle-aged and older adults: The UCLA and de Jong Gierveld loneliness scales. *Social Indicators Research*, 118(3), 1147-1166.

- Powell, V. D., Abedini, N. C., Galecki, A. T., Kabeto, M., Kumar, N., & Silveira, M. J. (2021). Unwelcome Companions: Loneliness associates with the cluster of pain, fatigue, and depression in older adults. *Gerontology and Geriatric Medicine*, 7, 2333721421997620.
- Saini, G. K., Haseeb, S. B., Taghi-Zada, Z., & Ng, J. Y. (2021). The effects of meditation on individuals facing loneliness: A scoping review. *BMC Psychology*, 9(1), 1-30.
- Seiler, A., & Jenewein, J. (2019). Resilience in cancer patients. *Frontiers In Psychiatry*, 10, 208.
- Smith, M. L., Steinman, L. E., & Casey, E. A. (2020). Combatting social isolation among older adults in a time of physical distancing: The COVID-19 social connectivity paradox. *Frontiers In Public Health*, 8, 403.
- Soga, M., Gaston, K. J., & Yamaura, Y. (2017). Gardening is beneficial for health: A meta-analysis. *Preventive Medicine Reports*, 5, 92-99.
- Sommerfeld, A. J., McFarland, A. L., Waliczek, T. M., & Zajicek, J. M. (2010a). Growing minds: Evaluating the relationship between gardening and fruit and vegetable consumption in older adults. *HortTechnology*, 20(4), 711-717.
- Sommerfeld, A. J., Waliczek, T. M., & Zajicek, J. M. (2010b). Growing minds: Evaluating the effect of gardening on quality of life and physical activity level of older adults. *HortTechnology*, 20(4), 705-710.
- Stigsdotter, U. K., Corazon, S. S., Sidenius, U., Nyed, P. K., Larsen, H. B., & Fjorback, L. O. (2018). Efficacy of nature-based therapy for individuals with stress-related illnesses: Randomised controlled trial. *The British Journal of Psychiatry*, 213(1), 404-411. <https://doi.org/10.1192/bjp.2018.2>
- Stephoe, A., Owen, N., Kunz-Ebrecht, S. R., & Brydon, L. (2004). Loneliness and neuroendocrine,

- cardiovascular, and inflammatory stress responses in middle-aged men and women. *Psychoneuroendocrinology*, 29(5), 593-611.
- Thompson, R. (2018). Gardening for health: A regular dose of gardening. *Clinical Medicine*, 18(3), 201.
- Theeke L. A. (2009). Predictors of loneliness in U.S. adults over age sixty-five. *Archives of Psychiatric Nursing*, 23(5), 387–396. <https://doi.org/10.1016/j.apnu.2008.11.002>
- Tomás, J. M., Pinazo-Hernandis, S., Donio-Bellegarde, M., & Hontangas, P. M. (2017). Validity of the de Jong Gierveld Loneliness Scale in Spanish older population: Competitive structural models and item response theory. *European Journal of Ageing*, 14(4), 429-437.
- Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, 11(3), 201-230.
- Van Tilburg, T. G., Steinmetz, S., Stolte, E., van der Roest, H., & de Vries, D. H. (2021). Loneliness and mental health during the COVID-19 pandemic: A study among Dutch older adults. *The Journals of Gerontology: Series B*, 76(7), e249-e255.
- Victor, C. R., & Bowling, A. (2012). A longitudinal analysis of loneliness among older people in Great Britain. *The Journal of Psychology*, 146(3), 313-331.
- Waliczek, T. M., Zajicek, J. M., & Lineberger, R. D. (2005). The influence of gardening activities on consumer perceptions of life satisfaction. *HortScience*, 40(5), 13.
- Walters, S. J., Munro, J. F., & Brazier, J. E. (2001). Using the SF-36 with older adults: A cross-sectional community-based survey. *Age and Ageing*, 30(4), 337-343.

- Ware Jr, J. E. (1987). Standards for validating health measures: definition and content. *Journal of chronic diseases, 40*(6), 473-480.
- Ware Jr, J. E., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Medical Care, 473-483*.
- Weiss, R. S. (1974). The provisions of social relationships. In: Rubin, Z., Ed., *Doing unto others*, Prentice Hall, 17-26.
- West, M. A. (1987). *The psychology of meditation*. Clarendon Press/Oxford University Press.
- Whitinger, D., Cohen, P., McKinley, S., & Feinson, J. (2021). *National Gardening Survey 2021- The definitive guide to lawn & garden business trends, analysis, and understanding*.
- Williams, S. E., & Braun, B. (2019). Loneliness and social isolation-A private problem, a public issue. *Journal of Family and Consumer Sciences, 111*(1), 7-14.
- World Health Organization. *Promoting mental health: concepts, emerging evidence, practice (Summary Report)* Geneva: World Health Organization; 2004.
- Xu, Z., Elomri, A., Kerbache, L., & El Omri, A. (2020). Impacts of COVID-19 on global supply chains: facts and perspectives. *IEEE Engineering Management Review, 48*(3), 153-166.

## Tables

Table 1. Demographic information of participants enrolled in H4H prior to October 2020 who participated in the MLOG and GIEH studies.

Category	Sub-Category	H4H Participants	Survey Participants	Interview Participants
N		316	120	56
% of H4H participants represented		100%	38.0%	17.7%
Age [mean±SD], range of years <sup>a</sup>		69.76±6.54, 50-95	68.05±6.25, 55-88	67.21±5.62, 50-87
Gender <sup>b</sup>	Male	98 (31.0%)	29 (24.2%)	14 (25.0%)
	Female	218 (69.0%)	91 (75.8%)	42 (75.0%)
Education level	High school or equivalent	-	7 (5.8%)	2 (3.6%)
	Vocational degree or certificate	-	5 (4.2%)	2 (3.6%)
	Some college, no degree	-	23 (19.2%)	8 (14.3%)
	Associate	-	11 (9.2%)	4 (7.1%)
	Bachelor	-	35 (29.2%)	21 (37.5%)
	Graduate	-	39 (32.4%)	19 (33.9%)
Race <sup>b</sup>	Black	59 (18.7%)	14 (11.7%)	9 (16.0%)
	White	255 (80.7%)	104 (86.6%)	45 (80.4%)
	Other	2 (<1.0%)	2 (1.7%)	2 (3.6%)
Marital status	Married	-	76 (63.3%)	32 (57.1%)
	Widowed	-	20 (16.7%)	10 (17.9%)
	Never married	-	6 (5.0%)	5 (8.9%)
	Divorced or separated	-	18 (15.0%)	9 (16.1%)
Household composition	Just me	-	28 (23.2%)	13 (23.2%)
	Spouse or partner	-	65 (54.2%)	28 (50.0%)
	Family member(s) other than spouse or partner	-	17 (14.2%)	9 (16.1%)
	Spouse or partner, family member(s) other than spouse or partner	-	5 (4.2%)	1 (1.8%)
	Other	-	5 (4.2%)	5 (8.9%)
Community <sup>b</sup>	Rural	58 (18.4%)	25 (20.8%)	11 (19.6%)
	Non-rural	258 (81.6%)	95 (79.2%)	45 (80.4%)
Employment	Retired	-	84 (70.0%)	38 (67.9%)
	Disabled	-	2 (1.7%)	1 (1.8%)
	Employed ≤19 hours weekly	-	6 (5.0%)	4 (7.1%)
	Employed ≥ 20 hours weekly	-	17 (14.1%)	5 (8.9%)
	Retired, disabled	-	3 (2.5%)	1 (1.8%)
	Retired, employed ≤19 hours weekly	-	3 (2.5%)	3 (5.4%)
	Retired, employed ≥ 20 hours weekly	-	3 (2.5%)	3 (5.4%)
	Unemployed	-	2 (1.7%)	1 (1.8%)
	Completed	-	59 (48.4%)	25 (44.6%)

Stage in H4H intervention between March and June 2020 <sup>c</sup>	Started	-	27 (22.1%)	15 (26.8%)
	Not started	-	31 (25.4%)	16 (28.6%)
	No response	-	3 (4.1%)	0

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. MLOG and GIEH data was collected through an online survey and telephone interview.

<sup>a</sup> Independent t-tests were performed to determine if there is statistical significance between the mean ages of H4H participants and survey participants and H4H participants and interview participants at the 95% confidence interval. significance was not achieved.

<sup>b</sup> Chi-square goodness of fit tests were performed to determine if the subsamples (survey and interview participants) represented the sample (H4H participants) regarding gender, race, and community proportions. Chi-square goodness of fit test results lacked significance at the 95% confidence interval, indicating that the survey and interview gender, race, and community data is representative of the H4H sample.

<sup>c</sup> Participants who selected "completed" were no longer receiving intervention between March and June 2020; those who selected "started" had begun, but not completed intervention; participants who selected "not started" were waiting to begin intervention between March and June 2020.

Table 2. Most frequently selected statements by MLOG and GIEH participants when asked to identify motivations to participate in H4H.

Statement Selected	N (%)
I want more physical activity or recreation.	81 (67.5%)
I want to spend more time outside.	71 (59.2%)
I have gardened before, but I want to learn how to be a better gardener.	69 (57.5%)
In general, I want to learn new skills.	62 (51.7%)
I want to grow extra food so that I can share with others.	50 (41.7%)

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic.

Table 3. Response frequencies of MLOG and GIEH participants when asked to identify how the COVID-19 pandemic affected their interest in gardening.

Impact on Interest	N (%)
Greatly increased	30 (25.0%)
Slightly increased	28 (23.3%)
No change	42 (35.0%)
Slightly decreased	14 (11.7%)
Greatly decreased	6 (5.0%)
Total	120 (100.0%)

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic.

Table 4. Response frequencies of MLOG and GIEH participants when asked to identify their typical state of gardening interest after previously indicating that the COVID-19 pandemic did not affect their interest in gardening.

Typical State of Interest	N (%)
Extremely interested	5 (12.2%)
Very interested	18 (43.9%)
Moderately interested	12 (29.3%)
Slightly interested	4 (9.8%)
Not at all interested	2 (4.8%)
<b>Total</b>	<b>41 (100%)</b>

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. Forty-two MLOG and GIEH participants indicated the COVID-19 did not impact their interest in gardening and were asked to state their typical level of gardening interest; one participant did not respond.

Table 5. Frequencies of the gardening importance between March and June 2020 as selected by MLOG and GIEH participants who had completed or started H4H intervention prior to or between March and June 2020.

Importance of Gardening	N (%)
Very important	25 (29.1%)
Important	26 (30.2%)
Moderately important	24 (27.9%)
Slightly important	8 (9.3%)
Unimportant	3 (3.5%)
<b>Total</b>	<b>86 (100.0%)</b>

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. Eighty-six MLOG and GIEH participants indicated they had completed or started H4H intervention prior to or between March and June 2020 and assessed the importance of gardening during that time.

Table 6. Frequencies of the how the COVID-19 pandemic impacted the time spent gardening by MLOG and GIEH participants who had completed or started H4H intervention prior to or between March and June 2020.

Change in Time Gardening	N (%)
Significantly more time	10 (11.6%)
More time	21 (24.4%)
Same amount of time	29 (33.7%)
Less time	11 (12.8%)
Significantly less time	4 (4.7%)
I did not garden last year	11 (12.8%)
Total	86 (100.0%)

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. Eighty-six MLOG and GIEH participants indicated they had completed or started H4H intervention prior to or between March and June 2020 and assessed how the COVID-19 pandemic impacted their time spent gardening.

Table 7. Frequencies of garden size manipulation between March and June 2020 by MLOG and GIEH participants who had completed or started H4H intervention between March and June 2020.

Change in Garden Size	N (%)
Expanded	33 (38.8%)
Maintained	42 (49.4%)
Decreased	7 (8.2%)
Removed	3 (3.5%)
Total	85 (100.0%)

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. Eighty-six MLOG and GIEH participants indicated they had completed or started H4H intervention prior to or between March and June 2020 and 85 assessed how they manipulated the size of their garden during this time.

Table 8. Most frequently selected statements by MLOG and GIEH participants when asked to identify motivations for increasing their garden size between March and June 2020.

Statement Selected	N (%)
I felt more motivated or interested in gardening.	26 (78.8%)
I felt physically well enough to expand my garden.	24 (72.7%)
I wanted more physical activity or recreation.	20 (60.6%)
I wanted to spend more time outside.	18 (54.4%)
The supplies I needed were available in stores or online.	17 (51.5%)

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. Thirty-three MLOG and GIEH participants indicated they increased the size of their garden between March and June 2020 and indicated motivations for increasing their garden size at this time.

Table 9. Most frequently selected statements by MLOG and GIEH participants when asked to identify motivations for maintaining their garden size between March and June 2020.

Statement Selected	N (%)
I felt comfortable maintaining what I had.	37 (88.1%)
I was satisfied with the size of my garden.	30 (71.4%)
I felt physically well enough to maintain my garden.	30 (71.4%)
I was satisfied with the physical activity/recreation I received from the current size of my garden.	19 (45.2%)
I was satisfied with the amount of food provided by the current size of my garden.	16 (38.1%)

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. Forty-two MLOG and GIEH participants indicated they maintained the size of their garden between March and June 2020 and indicated motivations for maintaining their garden size at this time.

Table 10. Most frequently selected statements by MLOG and GIEH participants when asked to identify motivations for decreasing their garden size between March and June 2020.

Statement Selected	N (%)
I did not want or need the amount of food provided by the previous size of my garden.	3 (42.9%)
I felt uncomfortable going out to buy supplies.	2 (28.6%)
Environmental factors (weather, insects).	2 (28.6%)
I felt unmotivated or disinterested in gardening.	1 (14.3%)
I wanted to spend less time outside.	1 (14.3%)
Gardening did not help take my mind off things.	1 (14.3%)
I did not have time to maintain the previous size of my garden.	1 (14.3%)
I did not feel physically well enough to maintain the previous size of my garden.	1 (14.3%)

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. Seven MLOG and GIEH participants indicated they decreased the size of their garden between March and June 2020 and indicated motivations for decreasing their garden size at this time.

Table 11. Most frequently selected statements by MLOG and GIEH participants when asked to identify motivations for removing their garden between March and June 2020.

Statement Selected	N (%)
I felt unmotivated or disinterested in gardening	3 (100%)
Environmental factors (deer)	1 (33.3%)
Decline in loved one's health	1 (33.3%)

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. Three MLOG and GIEH participants indicated they removed their garden between March and June 2020 and indicated motivations for removing their garden at this time.

Table 12. Paired samples t-test results of pre-pandemic and mid-pandemic CAMS-R and dJGLS group mean scores of MLOG and GIEH participants.

Scale	Time	N	Mean Score	Mean Diff.	SD	SE	t	df	Sig. (2-tailed)
CAMS-R (Mindfulness)	Pre-pandemic	114	39.29	2.351	5.051	0.473	6.791	113	<0.001***
	March-June 2020		36.94		6.321	0.592			
dJGLS (Loneliness)	Pre-pandemic	116	3.75	-1.457	3.098	0.288	-7.706	115	<0.001***
	March-June 2020		5.21		3.245	0.301			

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. The Cognitive and Affective Mindfulness Scale-Revised (CAMS-R) (Feldman et al., 2007) assess trait mindfulness of individuals; scores range for 4 to 48, higher scores indicate higher levels of mindfulness. The de Jong Gierveld Loneliness Scale (de Jong Gierveld and van Tilburg, 2006) assess the emotional and social loneliness of individuals; scores range from 0 to 11; higher scores indicate greater intensities of loneliness.

\*\*\*  $p \leq 0.001$

Table 13. ANOVA comparing the pre- and mid-COVID-19 pandemic dJGLS group loneliness means of MLOG and GIEH participants by the pandemic's impact on gardening interest.

dJGLS	Pandemic Impact on Gardening Interest	N	Mean Score <sup>a</sup>	SD	df	F	Sig.
	Greatly increased	30	4.67	3.40			
	Slightly increased	27	5.56	2.87			
March-June 2020	No change <sup>a</sup>	41	4.32	3.26	4	2.76	<b>.031**</b>
	Slightly decreased <sup>a</sup>	14	6.79	2.83			
	Greatly decreased	6	7.50	3.27			

*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. The de Jong Gierveld Loneliness Scale (de Jong Gierveld and van Tilburg, 2006) assess the emotional and social loneliness of individuals; scores range from 0 to 11; higher scores indicate greater intensities of loneliness.

<sup>a</sup> Difference in paired group means

\*\*  $p \leq 0.05$

Table 14. Correlation of pre- and mid-pandemic CAMS-R and dJGLS mean scores of MLOG and GIEH participants.

Time	Scale	N	Mean Score	SD	Pre-Pandemic		March-June 2020	
					CAMS-R	dJGLS	CAMS-R	dJGLS
Pre-Pandemic	CAMS-R	114	39.29	5.051	—			
	dJGLS	118	3.79	3.096	<b>-0.569***</b>	—		
March-June 2020	CAMS-R	114	36.94	6.321	<b>0.811***</b>	<b>-0.482***</b>	—	
	dJGLS	118	5.14	3.259	<b>-0.520***</b>	<b>0.795***</b>	<b>-0.607***</b>	—

Note. Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. The Cognitive and Affective Mindfulness Scale-Revised (CAMS-R) (Feldman et al., 2007) assess trait mindfulness of individuals; scores range for 4 to 48, higher scores indicate higher levels of mindfulness. The de Jong Gierveld Loneliness Scale (de Jong Gierveld and van Tilburg, 2006) assess the emotional and social loneliness of individuals; scores range from 0 to 11; higher scores indicate greater intensities of loneliness.

\*\*\*  $p \leq 0.00$

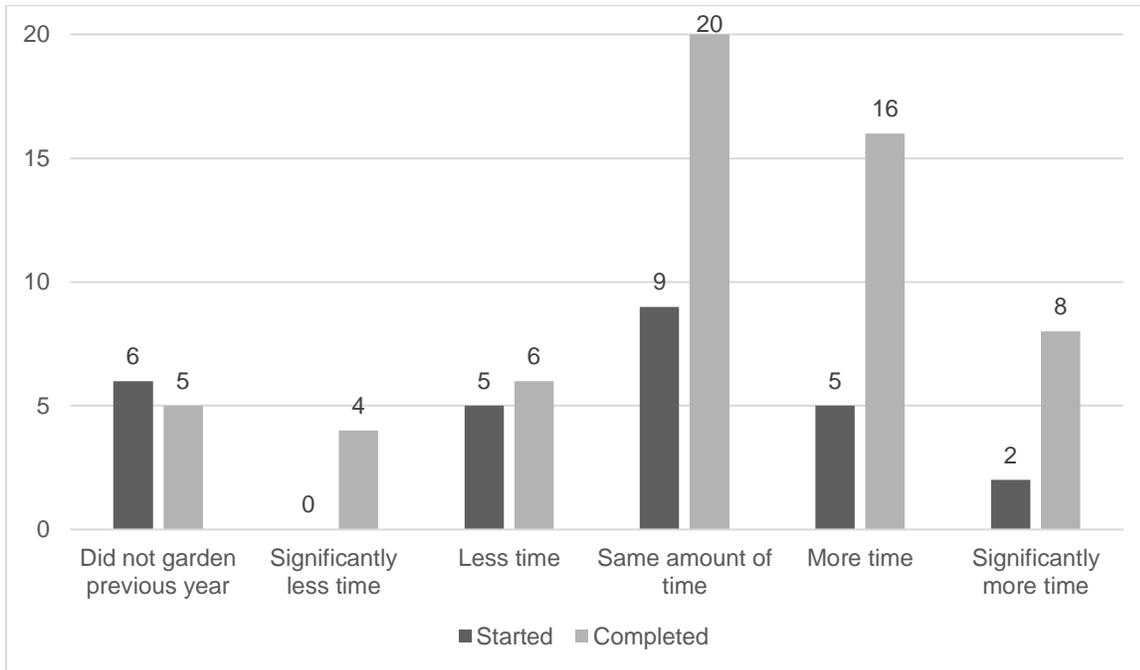
# Figures

Figure 1: Data collection timeline of the MLOG and GIEH studies.

Oct-20				Nov-20				Dec-21				Jan-21				Feb-21	Mar-21
W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2	W3	W4	W1	W1
Eligible participants introduced to study by H4H P.I. email																	
Online survey open for data collection																	
Phone interviews conducted																	
247 H4H participants sent study information by email		187 H4H participants reminded to participate by email		158 H4H participants reminded to participate by email		152 H4H participants reminded to participate by email											
														212 H4H participants reminded to participate by postcard			
														Participation reminder posted on private Facebook group			
																Prize winners notified	

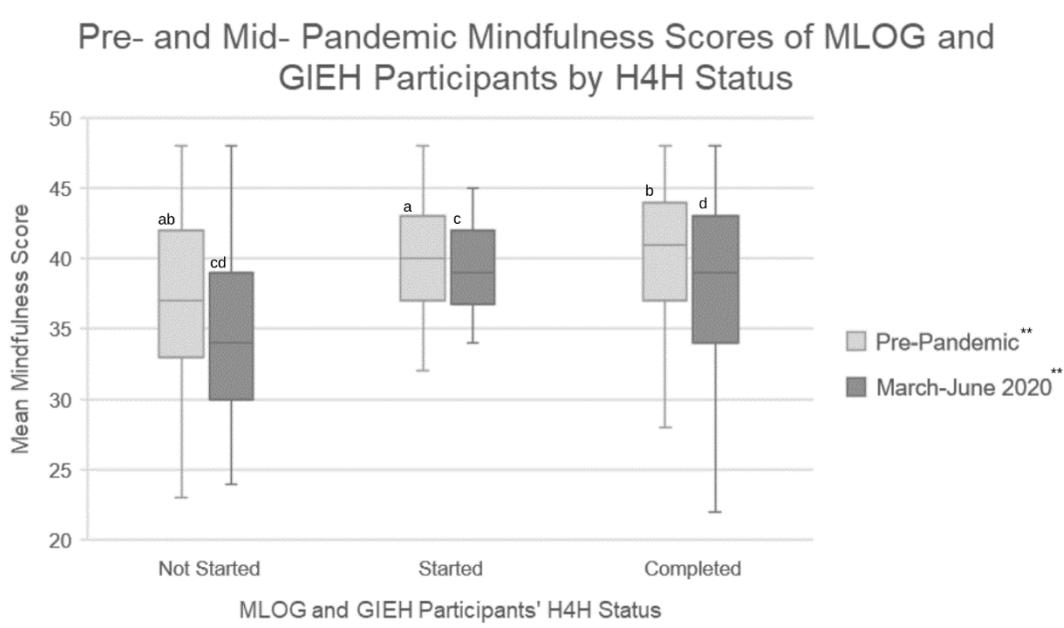
*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study Gardening and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. Data collection instruments consisted of an online survey and telephone interview, both of which were solicited through email, postcards, and social media posts.

Figure 2. Frequencies of how the COVID-19 pandemic impacted the time spent gardening by MLOG and GIEH participants, organized by H4H intervention status between March and June 2020.



*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. Eighty-six MLOG and GIEH participants indicated they had completed or started H4H intervention prior to or between March and June 2020 and assessed how the COVID-19 pandemic impacted their time spent gardening.

Figure 3. Box-and-whiskers plot comparing the pre- and mid-COVID-19 pandemic CAMS-R group mindfulness means of MLOG and GIEH participants.

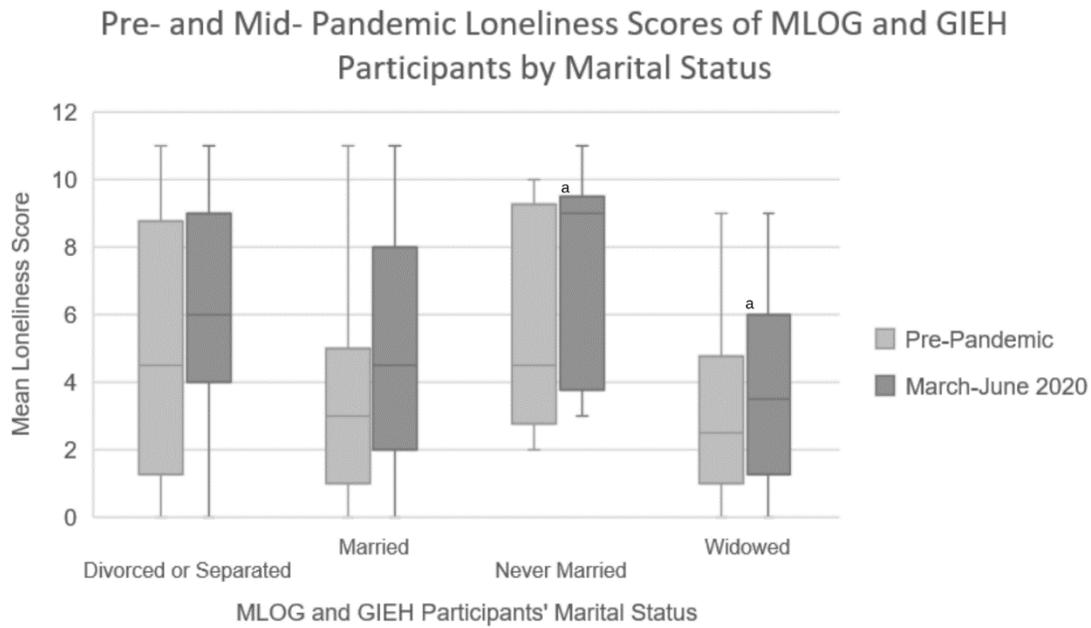


Note. Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants' gardening and interventional experiences were affected by the COVID-19 pandemic. The Cognitive and Affective Mindfulness Scale-Revised (CAMS-R) (Feldman et al., 2007) assess trait mindfulness of individuals; scores range for 4 to 48, higher scores indicate higher levels of mindfulness.

a,b,c,d Differences in paired group means

\*\* Significance less than or equal to 0.05

Figure 4. Box-and-whiskers plot comparing the pre- and mid-COVID-19 pandemic dJGLS group loneliness means of MLOG and GIEH participants by marital status.



*Note.* Participants of the Mindfulness and Loneliness of Older Gardeners (MLOG) study and the Interventional Experiences of Harvest for Health Participants (GIEH) were recruited from Harvest for Health (H4H), a research trial that assessed the effects of gardening on the diet, physical health and physical activity of older cancer survivors. MLOG assessed the impacts of the COVID-19 pandemic on the mindfulness and loneliness of H4H participants and GIEH assessed how these participants’ gardening and interventional experiences were affected by the COVID-19 pandemic. The de Jong Gierveld Loneliness Scale (de Jong Gierveld and van Tilburg, 2006) assess the emotional and social loneliness of individuals; scores range from 0 to 11; higher scores indicate greater intensities of loneliness.

<sup>a</sup> Difference in paired group means

## Appendices

### Appendix A- Online Survey

## Harvest for Health COVID-19 Gardening Survey

**This Qualtrics survey consists of 38 questions and will take 10 to 15 minutes to complete.** Within this survey, you will be able to indicate your interest in participating in a brief telephone interview. Additionally, you can enter to win a gardening prize valued at up to \$25! (Survey must be submitted by December 4, 2020 for you to be entered to win.)

**Your responses will be confidential and coded for anonymity.** Any personal information included on this survey, such as name or telephone number, will only be used to contact you for the purposes described and will not be shared with other parties.

**This survey was designed as part of a master's research project by Autumn Shay Busbee in the Department of Horticulture at Auburn University in Auburn, Alabama.** She may be reached at [asb0084@auburn.edu](mailto:asb0084@auburn.edu). Questions may also be directed to her faculty advisor, Dr. Carolyn W. Robinson at [cwr0001@auburn.edu](mailto:cwr0001@auburn.edu). The final results will be available to participants upon request to Dr. Robinson.

- No identifiable information will be stored for this research project.
- There are no costs or associated benefits to completing this survey.
- There are no risks or discomforts foreseen in participating in this survey.
- Participation in the survey is on a voluntary basis, and you may exit the survey at any point.
- If you have any questions you may contact the Auburn University Institutional Review Board (IRB) at [irbadmin@auburn.edu](mailto:irbadmin@auburn.edu), or at (334) 844-5966.

**By clicking the arrow below you are entering the survey. Thank you for your participation!**

**The purpose of this survey is to assess the impact of COVID-19 on your experience as a Harvest for Health participant. Findings from the survey and interview will be used to contribute to the body of knowledge surrounding the Harvest for Health program, COVID-19 pandemic, and the general effects of gardening.**

### **Gardener Experiences During the COVID-19 Pandemic Survey**

#### **NOTES:**

- Survey will be administered using Qualtrics.

- <GREEN TEXT IN ANGLE BRACKETS WILL NOT APPEAR IN THE ACTUAL SURVEY>
- **Yellow highlighted prompts** indicate that Qualtrics will take the participant to a question that does not immediately follow. This text will also not appear in the final version of the survey.

**Section 1 – State of Mind**

*Please rate the following statements in relation to how much you agreed with them both a) before the COVID-19 pandemic and b) from March through June, 2020 (the height of the COVID-19 pandemic).*

<BEGIN ITEMS FROM THE MINDFULNESS ASSESSMENT USING THE COGNITIVE AND AFFECTIVE MINDFULNESS SCALE-REVISED>

**1) It is easy for me to concentrate on what I am doing.**

**1a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**1b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

**2) I am preoccupied by the future.**

**2a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**2b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

**3) I can tolerate emotional pain.**

**3a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**3b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

**4) I can accept things I cannot change.**

**4a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**4b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

**5) I can usually describe how I feel at the moment in considerable detail.**

**5a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**5b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

**6) I am easily distracted.**

**6a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**6b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

**7) I am preoccupied by the past.**

**7a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**7b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

**8) It's easy for me to keep track of my thoughts and feelings.**

**8a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**8b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

**9) I try to notice my thoughts without judging them.**

**9a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**9b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

**10) I am able to accept the thoughts and feelings I have.**

**10a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**10b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

**11) I am able to focus on the present moment.**

**11a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**11b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

**12) I am able to pay close attention to one thing for a long period of time.**

**12a) Pre-Pandemic**

Rarely/Not at all     Sometimes     Often     Almost Always

**12b) March - June 2020**

Rarely/Not at all     Sometimes     Often     Almost Always

<BEGIN ITEMS FROM THE LONELINESS ASSESSMENT USING THE DE JONG GIERVELD LONELIENESS SCALE>

**13) There is always someone I can talk to about my day-to-day problems.**

**13a) Pre-Pandemic**

Yes!     Yes     More or less     No     No!

**13b) March - June 2020**

Yes!     Yes     More or less     No     No!

**14) I miss having a really close friend.**

**14a) Pre-Pandemic**

Yes!    Yes    More or less    No    No!

**14b) March - June 2020**

Yes!    Yes    More or less    No    No!

**15) I experience a general sense of emptiness.**

**15a) Pre-Pandemic**

Yes!    Yes    More or less    No    No!

**15b) March - June 2020**

Yes!    Yes    More or less    No    No!

**16) There are plenty of people I can lean on when I have problems.**

**16a) Pre-Pandemic**

Yes!    Yes    More or less    No    No!

**16b) March - June 2020**

Yes!    Yes    More or less    No    No!

**17) I miss the pleasure of the company of others.**

**17a) Pre-Pandemic**

Yes!    Yes    More or less    No    No!

**17b) March - June 2020**

Yes!    Yes    More or less    No    No!

**18) I find my circle of friends and acquaintances too limited.**

**18a) Pre-Pandemic**

Yes!    Yes    More or less    No    No!

**18b) March - June 2020**

Yes!    Yes    More or less    No    No!

**19) There are many people I can trust completely.**

**19a) Pre-Pandemic**

Yes!    Yes    More or less    No    No!

**19b) March - June 2020**

Yes!    Yes    More or less    No    No!

**20) There are enough people I feel close to.**

**20a) Pre-Pandemic**

Yes!    Yes    More or less    No    No!

**20b) March - June 2020**

Yes!    Yes    More or less    No    No!

**21) I miss having people around.**

**21a) Pre-Pandemic**

Yes!    Yes    More or less    No    No!

**21b) March - June 2020**

Yes!    Yes    More or less    No    No!

**22) I often feel rejected.**

**22a) Pre-Pandemic**

Yes!    Yes    More or less    No    No!

**22b) March - June 2020**

Yes!    Yes    More or less    No    No!

**23) I can call on my friends whenever I need them.**

**23a) Pre-Pandemic**

Yes!    Yes    More or less    No    No!

**23b) March - June 2020**

Yes!    Yes    More or less    No    No!

**Section 2 – Gardening Activity**

***Please complete the following questions regarding your gardening activities and the COVID-19 pandemic.***

**24a) How has the COVID-19 pandemic impacted your interest in gardening?**

- Greatly Increased
- Slightly Increased
- No Change
- Slightly Decreased
- Greatly Decreased

**24b) Since you selected “no change” in 24a, please describe your typical state of interest in gardening. (REMINDER: This transition will be automated in Qualtrics.)**

- Extremely Interested
- Very Interested
- Moderately Interested
- Slightly Interested
- Not at all Interested

**25) Please select the statements that apply to your participation in Harvest for Health. Select all that apply.**

- I am interested in meeting someone new with similar interests.
- In general, want to learn new skills.
- I have never gardened before and I want to learn how.
- I have gardened before, but I want to learn how to be a better gardener.
- I look forward to receiving all gardening supplies free of cost.
- I am excited to receive all the supplies I need to garden without having to go to the store.
- I received encouragement or support from others to participate in Harvest for Health.
- I want or need additional food that my garden could provide.
- I want to grow extra food so that I can share with others.
- I want to spend more time outside.
- I want more physical activity or recreation.
- I think gardening will help reduce the stress that I feel.
- I think gardening will help to take my mind off things.

- I have free time that I would like to occupy.
- Other (Please describe):

**26) Describe your involvement with the Harvest for Health study between March and June 2020.**

- I completed meetings with my Master Gardener prior to March.  
**(Continue to Question 27, automated in Qualtrics.)**
- I started meeting with my Master Gardener prior to March and was unable to meet with them during these months due to stay at home precautions.  
**(Continue to Question 27, automated in Qualtrics.)**
- I had not started meeting with my Master Gardener during this time.  
**(Skip to Question 34, automated in Qualtrics.)**

**27) How has the COVID-19 pandemic impacted the amount of time you spend gardening compared to last year?**

- Significantly More Time
- More Time
- Same amount of Time
- Less Time
- Significantly Less Time
- I did not garden last year

**28) How important was gardening to you between March and June 2020?**

- Very Important
- Important
- Moderately Important
- Slightly Important

- Unimportant

**29) Did you expand, maintain, decrease, the size of OR remove your garden between March and June 2020?**

- Expanded **Go to Question 30.**
- Maintained **Skip to Question 31.**
- Decreased **Skip to Question 32.**
- Removed **Skip to Question 33.**

**30) Please select the statements that apply to the expansion of your garden between March and June 2020. *Select all that apply.***

***Skip to Question 34, automated in Qualtrics.***

- I felt more motivated or interested in gardening.
- I felt confident in my gardening skills.
- I received encouragement or support others.
- I wanted or needed additional food that my garden could provide.
- I wanted to grow extra food so that I could share with others.
- I wanted to spend more time outside.
- I wanted more physical activity or recreation.
- I wanted to relieve stress.
- I wanted to take my mind off things.
- I could afford the supplies needed to increase the size of my garden.
- I had access to transportation to get the supplies I needed.
- The supplies I needed were available in stores or online.
- I felt comfortable going out to buy supplies.
- I had more free time to spend.
- I felt physically well enough to expand my garden.

Other (please describe): \_\_\_\_\_

**31) Please select the statements that apply to maintaining the size of your garden (did not increase or decrease size from previous garden) between March and June 2020. Select all that apply. Skip to Question 34, automated in Qualtrics.**

- I was satisfied with the size of my garden.
- I felt comfortable maintaining what I had.
- My motivation or interest in gardening did not increase or decrease.
- I did not feel confident enough in my gardening skills to increase the size of my garden.
- Was not encouraged or discouraged from someone to change the size of my garden.
- I was satisfied with the amount of food provided by the current size of my garden.
- I wanted to grow enough food to share with others and was able to do so with the current size of my garden.
- I was satisfied with the amount of time spent outside based on the current size of my garden.
- I was satisfied with the physical activity/recreation I received from the current size of my garden.
- I was able to feel less stressed when working in the current size of my garden.
- I was able to take my mind off things when working in the current size of my garden.
- I could not afford the supplies needed to increase the size of my garden.

- I lacked access to transportation to get the supplies I would need to increase the size of my garden.
- The supplies I needed were unavailable in stores or online.
- I felt uncomfortable going out to buy supplies.
- I did not have time to spend maintaining a larger garden.
- I feel physically well enough to maintain my garden.
- Other please describe): \_\_\_\_\_

**32) Please select the statements that apply to the reduction of your garden between March and June 2020. Select all that apply. Skip to Question 34, automated in Qualtrics.**

- I felt unmotivated or disinterested in gardening.
- I felt unsure of how to garden without assistance.
- I received discouragement or lack of support from others.
- I did not want or need the amount of food provided by the previous size of my garden.
- I wanted to spend less time outside.
- Gardening added to the stress I felt.
- Gardening did not help take my mind off things.
- I could not afford the supplies needed to garden.
- I lacked access to transportation to get supplies.
- The supplies I needed were unavailable in stores or online.
- I felt uncomfortable going out to buy supplies.
- I did not have time to maintain the previous size of my garden
- I did not feel physically well enough to maintain the previous size of my garden.

Other (please describe):

**33) Please select the statements that apply to the removal of your garden between March and June 2020. Select all that apply. Continue to Question 34, automated in Qualtrics.**

- I felt unmotivated or disinterested in gardening.
- I felt unsure of how to garden without assistance.
- I received discouragement or lack of enough support from others.
- I did not want or need the food provided by my previous garden.
- I wanted to spend less time outside.
- Gardening added to the stress I felt.
- Gardening did not help take my mind off things.
- I could not afford the supplies needed to garden.
- I lacked access to transportation to get supplies.
- The supplies I needed were unavailable in stores or online.
- I felt uncomfortable going out to buy supplies.
- I did not have time to maintain of my garden at all.
- I did not feel physically well enough to garden at all.
- Other (please describe):

**34) Please use this space for any additional comments:**

---

---

---

**35) If you would like to be entered to win a small gardening-related prize valued at up to \$25, please enter your address here so that we can mail you the prize if your name is drawn. (Prize drawing will take place once the survey has been closed on <INSERT DATE>.) \_\_\_\_\_**

36) We would like to ask you a couple of questions that would allow us to learn more about your experiences. If we may call you for a brief phone interview, please enter your phone number with the area code here. \_\_\_\_\_

### **Section 3**

***Please complete the following demographic questions.***

<THIS INFORMATION (WITH THE EXCEPTION OF #37) IS NECESSARY TO VALIDATE THE LONELINESS SCALE. #37 IS NEEDED TO CONFIRM PARTICIPATION IN HARVEST FOR HEALTH FOR THOSE WHO ARE PROMPTED TO TAKE THE SURVEY BY THE POSTCARD.>

37) First and Last Name: \_\_\_\_\_

38) Age: \_\_\_\_\_

39) Official marital status

- Never married
- Married
- Divorced or separated
- Widowed

40) Describe your household composition. *Please select all that apply.*

- Just me
- Spouse or partner
- Family member(s) other than spouse or partner
- Unrelated person(s)
- Other

41) Current employment status:

- No employment history
- Employed,  $\geq 20$  hours a week
- Employed,  $\leq 19$  hours a week
- Disabled
- Retired
- Other non-employed

42) Highest level of education:

- Less than high school degree
- High school degree or equivalent (e.g., GED)
- Vocational degree or certificate
- Some college but no degree
- Associate degree
- Bachelor degree
- Graduate degree

## Appendix B- Phone Interview Script

Hello <MR./MS. LAST NAME>,

This is Autumn Busbee from Auburn University.

I'm calling to thank you for taking the survey about gardening experiences during the COVID-19 pandemic. On that survey, you indicated that you were interested in participating in a brief, voluntary interview.

Might now be a good time for you to participate over the phone? It will only take 5 to 10 minutes and I am eager to learn about your experience!

<IF TIMING IS BAD>

When might be a better date and time for you? My schedule is very flexible. <DISCUSS DATE AND TIME OPTIONS BASED ON RESPONSE AND PLACE CONFIRMED DATE ON CALENDAR.> May I please have the best phone number to contact you at, if this is not it? <TYPE PHONE NUMBER INTO CONTACT LIST> Thank you for scheduling a time to discuss your gardening experience during COVID-19. Please be on the lookout for a call from me on <DATE> at <TIME> Thanks again, goodbye.

<IF UNWILLING TO PARTICIPATE>

Thank you for your consideration, I will make note that you are not interested in participating. Goodbye.

Do I have your consent to record this conversation to ensure that I accurately capture its themes and tones? Once our conversation has been transcribed, the recording will be deleted, identifiable information will be stripped from the transcripts, and pseudonyms will be used in the place of names.

We will now begin the interview. Your responses are completely voluntary and will be kept anonymous.

(Harvest for Health participants who received intervention prior to and during March through June 2020 will only be asked Questions 1 and 2. Due to the semi-structured nature of this interview, pertinent follow up questions might also be asked.)

1) What role has gardening played in your day-to-day life during the COVID-19 pandemic?

2) How has the COVID-19 pandemic impacted your experience in the Harvest for Health study?

(Harvest for Health participants who had not received intervention as of March 2020 will only be asked Question 3. Due to the semi-structured nature of this interview, pertinent follow up questions might also be asked.)

3. Please describe how the COVID-19 pandemic affected your interest in participating in Harvest for Health.

That concludes the telephone interview. Do you have any questions or comments for me? Thank you for participating! I appreciate you sharing information about your experience with me. Thank you again. Goodbye.

## Appendix C- Recruitment Emails

### 1. Study introduction email sent from H4H P.I. on October 2, 2020

Dear Harvest for Health Participant,

The Harvest for Health team would like to virtually introduce you to Autumn Shay Busbee, who is a Public Horticulture Graduate Student at Auburn University! Autumn is partnering with the Harvest for Health team for her master's degree research project.

For her project, Autumn will survey and interview Harvest for Health participants (YOU!) to assess the impacts of the COVID-19 pandemic on gardening experiences. Autumn will soon send you an email with information on participating. Autumn will also call you to confirm you've received her email and to say, "Hello!"

While participation is optional, we hope you will consider taking the survey. As an incentive, those who participate can enter to win a gardening-related prize valued at up to \$25!

If you have any questions or concerns, feel free to contact Autumn directly at [asb0084@auburn.edu](mailto:asb0084@auburn.edu) or by phone at (334) 232-9451.

Happy gardening!

Sincerely,

## 2. Email invitation to study from Auburn P.I. sent on October 9, 2020

Dear Participant,

My name is Autumn Shay Busbee and I am a Public Horticulture Graduate Student at Auburn University. I am interested in learning about YOUR experience as a Harvest for Health participant during the COVID-19 pandemic as part of my master's degree research project!

To best learn about your experience, I have created a brief survey that can be taken online or by phone. Additionally, I would like to interview you by phone to gain more insight on your perspective. By participating in this survey, you will be entered to win a gardening prize valued at up to \$25! If you submit your survey responses by Friday, October 23, 2020, you will earn 3 entries into the prize drawing!

Click this sentence to be taken to the survey; likewise, you can type the following into your internet browser:  
[aub.ie/h4h](http://aub.ie/h4h).

If you have any questions or would like to take the survey by phone instead of online, please respond to this email or call (334) 232-9451 and leave a message with your name and phone number so that we can schedule a time that works best for you to participate.

I realize your time is valuable and hope you will take 15 to 20 minutes to complete this survey and interview. While your responses will be confidential and coded for anonymity, they will contribute to the body of knowledge surrounding the effects of gardening on wellbeing and the COVID-19 pandemic.

Lastly, please be on the lookout for a phone call from me! I'll be calling you soon to say, "Hello," and to confirm that you've received this message.

I look forward to hearing from you and speaking to you. Thank you for your participation, in advance.

Sincerely,

Autumn Shay Busbee | She/Her/Hers  
Public Horticulture Graduate Assistant  
(334) 232-9451

Follow this link to the Survey:  
\${!://SurveyLink?d=Take the Survey}

Or copy and paste the URL below into your internet browser:  
[aub.ie/h4h](http://aub.ie/h4h)

Follow the link to opt out of future emails:  
\${!://OptOutLink?d=Click here to unsubscribe}

### 3. Reminder email sent on October 27, 2020

Dear Harvest for Health Participant,

Autumn Shay Busbee, Auburn University Public Horticulture Graduate Student, here again!

I wanted to quickly thank those who have participated in the survey and interview regarding gardening experiences during the COVID-19 pandemic.

Don't forget, participants can enter to win a gardening prize valued at up to \$25! If you submit your survey response before November 17, 2020, then you will receive 2 entries into the prize drawing!

If you have not yet participated, you can take the survey online by clicking here. Be sure to include your phone number in your response if you would like to be interviewed by phone.

If you prefer to take this survey by phone, or have any questions, please respond to this email or call (334) 232-9451 and leave a message with your name and phone number so that we can schedule a time that works best for you.

I realize your time is valuable and hope you will take 15 to 20 minutes to complete this survey and interview. While your responses will be confidential and coded for anonymity, they will contribute to the body of knowledge surrounding the effects of gardening on wellbeing and the COVID-19 pandemic. I look forward to hearing from you and speaking to you. Thank you for your participation, in advance.

Sincerely,

Autumn Shay Busbee | She/Her/Hers  
Public Horticulture Graduate Assistant  
(334) 232-9451

Follow this link to the Survey:  
\${!://SurveyLink?d=Take the Survey}

Or copy and paste the URL below into your internet browser:  
aub.ie/h4h

Follow the link to opt out of future emails:  
\${!://OptOutLink?d=Click here to unsubscribe}

#### 4. Reminder email sent on November 21, 2021

Dear Harvest for Health Participant,

Autumn Shay Busbee, Auburn University Public Horticulture Graduate Student, here again!

We are extending the deadline to receive 2 entries into the prize drawing! Be sure to submit your survey responses by December 1, 2020 to get two entries into the gardening prize drawing. (Prize valued up to \$25!)

If you have not yet participated, you can take the survey online by clicking here. Be sure to include your phone number in your response if you would like to be interviewed by phone.

If you prefer to take this survey by phone, or have any questions, please respond to this email or call (334) 232-9451 and leave a message with your name and phone number so that we can schedule a time that works best for you.

I realize your time is valuable and hope you will take 15 to 20 minutes to complete this survey and interview. While your responses will be confidential and coded for anonymity, they will contribute to the body of knowledge surrounding the effects of gardening on wellbeing and the COVID-19 pandemic. I look forward to hearing from you and speaking to you. Thank you for your participation, in advance.

Sincerely,

Autumn Shay Busbee | She/Her/Hers  
Public Horticulture Graduate Assistant  
(334) 232-9451

Follow this link to the Survey:

[\\${!://SurveyLink?d=Take the Survey}](#)

Or copy and paste the URL below into your internet browser:

[aub.ie/h4h](http://aub.ie/h4h)

Follow the link to opt out of future emails:

[\\${!://OptOutLink?d=Click here to unsubscribe}](#)

5. Reminder email sent on December 2, 2020

Dear Harvest for Health Participant,

Autumn Shay Busbee, Auburn University Public Horticulture Graduate Student, here again! I hope that you will take the 15- minute "Gardener Experiences during the COVID-19 Pandemic" survey for my thesis project before the survey closes on January 15, 2021.

You can still be entered to win a gardening prize (valued at up to \$25) if you submit your responses before the deadline!

Take the survey online by clicking here. Be sure to include your phone number in your response if you would like to be interviewed by phone.

If you prefer to take this survey by phone, or have any questions, please respond to this email or call (334) 232-9451 and leave a message with your name and phone number so that we can schedule a time that works best for you.

Your responses will be confidential and coded for anonymity and will contribute to the body of knowledge surrounding the effects of the COVID-19 pandemic on gardening on wellbeing.

I look forward to hearing from you and speaking to you. Thank you for your participation, in advance.

Sincerely,

Autumn Shay Busbee | She/Her/Hers  
Public Horticulture Graduate Assistant  
(334) 232-9451

Follow this link to the Survey:  
\${!://SurveyLink?d=Take the Survey}

Or copy and paste the URL below into your internet browser:  
aub.ie/h4h

Follow the link to opt out of future emails:  
\${!://OptOutLink?d=Click here to unsubscribe}

Appendix D- Social Media Post

**HI, I'M AUTUMN!  
CHECK YOUR MAILBOX  
FOR A POSTCARD  
FROM ME!**

**PAST & CURRENT H4H PARTICIPANTS**

If you haven't already, please **help me with my graduate research** by taking a **15-minute survey** about gardening during the COVID-19 pandemic at [www.aub.ie/h4h](http://www.aub.ie/h4h).

**Take the survey by 1/18/21 to get three entries into a gardening prize giveaway!**

Only have **5 minutes**? **Call me at 334-232-9451** and leave a message to schedule an **interview**.

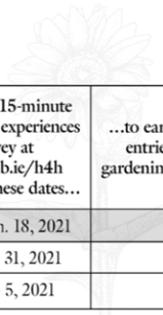
Appendix E- Recruitment Postcard





COLLEGE OF AGRICULTURE  
*Department of Horticulture*

101 Funchess Hall • Auburn, AL 36849



Take the 15-minute gardening experiences survey at <a href="http://www.aub.ie/h4h">www.aub.ie/h4h</a> between these dates...	...to earn this many entries into the gardening prize raffle!
Now - Jan. 18, 2021	3
Jan. 19 - 31, 2021	2
Feb. 1 - 5, 2021	1

## Appendix F- Announcement Letter for Prize Winners

<INSERT DATE>

Dear <MR./MS. LAST NAME>,

Congratulations!

You were randomly selected as one of the winners of a gardening-related prize for participating in the Gardener Experiences During the COVID-19 Pandemic survey!

Enclosed, you will find high quality seeds that were generously donated by Floret and Baker Creek Heirloom Seeds. The seeds you received might not be familiar to you, but I hope you will enjoy trying something new!

Thank you again for participating in the survey. Sincerely,

Autumn Shay Busbee  
Public Horticulture Graduate Student Department of Horticulture  
Auburn University

Floret Floretflowers.com

Baker Creek Heirloom Seeds Rareseeds.com

Appendix G- IRB Approval and Documentation

**Auburn University Human Research Protection Program  
EXEMPTION REVIEW APPLICATION**

For information or help completing this form, contact: **THE OFFICE OF RESEARCH COMPLIANCE**, Location: 115  
Ramsay Hall Phone: 334-844-5966 Email: [IRBAdmin@auburn.edu](mailto:IRBAdmin@auburn.edu)

Submit completed application and supporting material as one attachment to [IRBsubmit@auburn.edu](mailto:IRBsubmit@auburn.edu).

**PROJECT IDENTIFICATION** Today's Date 08/10/2020  
**Project Title** Gardener Experiences During the COVID-19 Pandemic

**Principal Investigator** Autumn Shay Busbee Degree(s) Master's Candidate  
Rank/Title Graduate Research Assistant Department/School Department of Horticulture, College of Agriculture  
Phone Number 803-341-5042 AU Email asb0084@auburn.edu

**Faculty Principal Investigator (required if PI is a student)** Dr Carolyn Robinson  
Title Associate Professor Department/School Department of Horticulture, College of Agriculture  
Phone Number 334-844-3031 AU Email cwr0001@auburn.edu

**Dept Head** Dr Desmond Layne Department/School Department of Horticulture, College of Agriculture  
Phone Number 334-844-4906 AU Email dri0021@auburn.edu

**Project Personnel** (other PI) – Identify all individuals who will be involved with the conduct of the research and include their role on the project. Role may include design, recruitment, consent process, data collection, data analysis, and reporting. Attach a table if needed for additional personnel.

**Personnel Name** \_\_\_\_\_ Degree (s) \_\_\_\_\_ Rank/Title \_\_\_\_\_ Department/School \_\_\_\_\_  
Role \_\_\_\_\_ AU affiliated? YES NO If no, name of home institution \_\_\_\_\_  
Plan for IRB approval for non-AU affiliated personnel? \_\_\_\_\_

**Personnel Name** \_\_\_\_\_ Degree (s) \_\_\_\_\_ Rank/Title \_\_\_\_\_ Department/School \_\_\_\_\_  
Role  AU affiliated? YES NO If no, name of home institution \_\_\_\_\_  
Plan for IRB approval for non-AU affiliated personnel? \_\_\_\_\_

**Personnel Name** \_\_\_\_\_ Degree (s) \_\_\_\_\_ Rank/Title \_\_\_\_\_ Department/School \_\_\_\_\_  
Role  AU affiliated? YES NO If no, name of home institution \_\_\_\_\_  
Plan for IRB approval for non-AU affiliated personnel? \_\_\_\_\_

**Training** – Have all Key Personnel completed CITI human subjects training (including elective modules related to this research) within the last 3 years? YES  NO



Version Date (date document created): 08/10

**Funding source** – Is this project funded by the investigator(s)? YES NO    
Is this project funded by AU?  YES  NO If YES, identify source

Is this project funded by an external sponsor?  YES  NO If YES, provide the name of the sponsor, type of sponsor (governmental, non-profit, corporate, other), and an identification number for the award.  
Name\_\_Type\_\_Grant #\_\_\_\_\_  
List other IRBs associated with this research and submit a copy of their approval and/or protocol.

**Mark the category or categories below that describe the proposed research:**

Research  conducted in established or commonly accepted educational settings, involving normal educational practices. The research is not likely to adversely impact students' opportunity to learn or assessment of educators providing instruction. 104(d)(1)

Research  only includes interactions involving educational tests, surveys, interviews, public observation if at least ONE of the following criteria. (The research includes data collection only; may include visual or auditory recording; may NOT include intervention and only includes interactions). **Mark the applicable sub-category below (i, ii, or iii).** 104(d)(2)

Recorded  information cannot readily identify the participant (directly or indirectly/linked);  
**OR**  
surveys and interviews: no children;  
educational tests or observation of public behavior: can only include children when investigators do not participate in activities being observed.

Any disclosure of responses outside would not reasonably place participant at risk; **OR**

Information  is recorded with identifiers or code linked to identifiers and IRB conducts limited review; no children. **Requires limited review by the IRB.\***

Research  involving Benign Behavioral Interventions (BBI)\*\* through verbal, written responses (including data entry or audiovisual recording) from adult subjects who prospectively agree and ONE of the following criteria is met. (This research does not include children and does not include medical interventions. Research cannot have deception unless the participant prospectively agrees that they will be unaware of or misled regarding the nature and purpose of the research)

**Mark the applicable sub-category below (A, B, or C).** 104(d)(3)(i)  
Recorded  information cannot readily identify the subject (directly or indirectly/linked); **OR**

Any disclosure of responses outside of the research would not reasonably place subject at risk; **OR**

Information  is recorded with identifiers and cannot have deception unless participant prospectively agrees. **Requires limited review by the IRB.\***

Secondary  research for which consent is not required: use of identifiable information or identifiable bio-specimen that have been or will be collected for some other 'primary' or 'initial' activity, if one of the following criteria is met. Allows retrospective and prospective secondary use. **Mark the applicable sub-category below (I, ii, iii, or iv).** 104(d)(4)

Bio-specimens or information are publically available;

Information  recorded so subject cannot readily be identified, directly or indirectly/linked; investigator does not contact subjects and will not re-identify the subjects; **OR**





Collection and analysis involving investigators use of identifiable health information when use is regulated by HIPAA “health care operations” or “research or “public health activities and purposes” (does not include biospecimens (only PHI and requires federal guidance on how to apply); OR

Research information collected by or on behalf of federal government using government generated or collected information obtained for non-research activities.

Research and demonstration projects which are supported by a federal agency/department AND designed to study and which are designed to study, evaluate, or otherwise examine: (i) public benefit or service programs; (ii) procedures for obtaining benefits or services under those programs; (iii) possible changes in or alternatives to those programs or procedures; or (iv) possible changes in methods or levels of payment for benefits or services under those programs. (must be posted on a federal web site). 104(d)(5) (must be posted on a federal web site)

Taste and food quality evaluation and consumer acceptance studies, (i) if wholesome foods without additives are consumed or (ii) if a food is consumed that contains a food ingredient at or below the level and for a use found to be safe, or agricultural chemical or environmental contaminant at or below the level found to be safe, by the Food and Drug Administration or approved by the Environmental Protection Agency or the Food Safety and Inspection Service of the U.S. Department of Agriculture. The research does not involve prisoners as participants. 104(d)(6)

**New exemption categories 7 and 8: Both categories 7 and 8 require Broad Consent.** (Broad consent is a new type of informed consent provided under the Revised Common Rule pertaining to storage, maintenance, and secondary research with identifiable private information or identifiable biospecimens. Secondary research refers to research use of materials that are collected for either research studies distinct from the current secondary research proposal, or for materials that are collected for non-research purposes, such as materials that are left over from routine clinical diagnosis or treatments. Broad consent does not apply to research that collects information or biospecimens from individuals through direct interaction or intervention specifically for the purpose of the research.) **The Auburn University IRB has determined that as currently interpreted, Broad Consent is not feasible at Auburn and these 2 categories WILL NOT BE IMPLEMENTED at this time.**

**\*Limited IRB review – the IRB Chairs or designated IRB reviewer reviews the protocol to ensure adequate provisions are in place to protect privacy and confidentiality.**

**\*\*Category 3 – Benign Behavioral Interventions (BBI) must be brief in duration, painless/harmless, not physically invasive, not likely to have a significant adverse lasting impact on participants, and it is unlikely participants will find the interventions offensive or embarrassing.**

**PROJECT SUMMARY**

**Does the study target any special populations? (Mark applicable)**

- |  |                              |  |
|--|------------------------------|--|
| Minors (under 18 years of age)   | YES <input type="checkbox"/> | NO <input checked="" type="checkbox"/> |
| Pregnant women, fetuses, or any products of conception                   | YES <input type="checkbox"/> | NO <input checked="" type="checkbox"/> |
| Prisoners or wards (unless incidental, not allowed for Exempt research)  | YES <input type="checkbox"/> | NO <input checked="" type="checkbox"/> |
| Temporarily or permanently impaired                                      | YES <input type="checkbox"/> | NO <input checked="" type="checkbox"/> |
| <b>b. Does the research pose more than minimal risk to participants?</b> | YES <input type="checkbox"/> | NO <input checked="" type="checkbox"/> |

*Minimal risk means that the probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encountered in daily life or during the performance of routine physical or psychological examinations or test. 42 CFR 46.102(i)*

**c. Does the study involve any of the following?**

Procedures subject to FDA regulations (drugs, devices, etc.)

YES NO

Use of school records of identifiable students or information from instructors about specific students.

YES NO

Protected health or medical information when there is a direct or indirect link which could identify the participant.

YES NO

Collection of sensitive aspects of the participant's own behavior, such as illegal conduct, drug use, sexual behavior or alcohol use. Deception of participants

YES NO

YES NO

**Briefly describe the proposed research, including purpose, participant population, recruitment process, consent process, research procedures and methodology.**

Purpose: To assess the impacts of the COVID-19 pandemic on participants' perceived loneliness, mindfulness, and gardening intervention through the Harvest for Health study, which is conducted in a partnership between the University of Alabama at Birmingham at the Alabama Cooperative Extension System. Data will be collected through a survey and a semi-structured telephone interview (survey and interview script attached). The survey will include items from the de Jong Gierveld Loneliness Scale, the Cognitive Affective Mindfulness Scale, and unique questions that pertain to gardening. The phone interview will ask questions to gain more depth into the participants' gardening experiences during the COVID-19 pandemic.

Participant Population: Participants will consist of male and female Alabama residents who a) are 65 years or older and b) survivors of cancer. Participants will be recruited from the aforementioned Harvest for Health study.

Recruitment: Participant contact information from the Harvest for Health study will be shared with the P.I., who will email prospective participants and call participants who indicate interest in

**Waivers**

**Check any waivers that apply and describe how the project meets the criteria for the waiver. Provide the rationale for the waiver request.**

**Waiver of Consent (Including existing de-identified data)**

**Waiver of Documentation of Consent (Use of Information Letter) Waiver of Parental Permission**

**All retrospective information will be de-identified.**

Surveys will be completed on-line or over the phone. Both methods will allow participants the choice to participate or not in the survey after the explanation of the survey via the information letter. No written documents or signatures will be collected.

**Describe how participants/data/specimens will be selected. If applicable, include gender, race, and ethnicity of the participant population.**

The participant pool will be acquired from the Harvest for Health research team. All Harvest for Health participants will be invited to participate in this study. Harvest for Health participants are older adults (aged 65 or older) who have survived cancer, both male and female, and are residents of Alabama. They are of various races and ethnicities.

**Does the research involve deception?**

**YES**

**NO If YES, please provide the rationale for**

**deception and describe the debriefing process.**



**Describe why none of the research procedures would cause a participant either physical or psychological discomfort or be perceived as discomfort above and beyond what the person would experience in daily life.**

All cautions have been and will be taken to prevent any degree of discomfort above and beyond what the participant would experience in daily life. The P.I. recognizes that thinking and speaking about the COVID-19 pandemic could cause some distress for the participants and will notify the appropriate bodies if a participant discloses said distress.

**Describe the provisions to maintain confidentiality of data, including collection, transmission, and storage.**

The P.I. will take all necessary precautions to maintain the confidentiality of participants and received data. Emails will be sent to participants using encryption. Paper documents with sensitive information will be kept for a limited time in a locked file cabinet, within a locked office after which the documents will be destroyed. Phone interviews will take place in a private setting. Identifiable information will be separated from collected data prior to analysis. Identifiable information will not be shared, except with the Harvest for Health research team. The P.I. is aware that, despite taking all necessary precautions, that there is still the potential of a data breach occurring; however, the data collected poses little to no risk.



**Describe the provisions included in the research to protect the privacy interests of participants (e.g., others will not overhear conversations with potential participants, individuals will not be publicly identified or embarrassed).**

As previously stated, phone interviews will take place in a private area to prevent conversations from being overheard. Additionally, pseudonyms will be used in the place of participants' names in the event data is described in a non-aggregated manner. Identifiable information will be deleted from data prior to analysis. Electronic data will not be stored or reviewed on a public computer.

**Will the research involve interacting (communication or direct involvement) with participants? YES NO If YES, describe the consent process and information to be presented to subjects.**

**This includes identifying that the activities involve research; that participation is voluntary; describing the procedures to be performed; and the PI name and contact information.**

Participants will self-select participation at all stages of the study. Participants will be given information on consent at several stages of the study, including: in the introductory email from the Harvest for Health team, in the email with the survey link, in the survey (prior to beginning), in the survey (when being asked about participating in the telephone interview), and at the beginning of the telephone interview. Additionally, participants are not required to answer any or all questions prior to submitting their responses.



**Additional Information and/or attachments.**

**In the space below, provide any additional information you believe may help the IRB review of the proposed research. If attachments are included, list the attachments below. Attachments may include recruitment materials, consent documents, site permissions, IRB approvals from other institutions, etc.**

- Letter of Support between University of Alabama at Birmingham and Auburn University
- CITI Training Certificates for Autumn Shay Busbee
- CITI Training Certificates for Dr. Carolyn Robinson
- Pre-Survey Language
- Survey
- Introductory Email from the Harvest for Health Team
- Initial Survey Email (with linked survey)
- Follow Up Email
- Postcard
- Final Email
- Phone Script for Interview
- Phone Script for Survey and Interview
- Letter for Prize Winner(s)

---

Principal Investigator's Signature \_\_\_\_\_ Date Autumn Busbee 08/10/2020

**If PI is a student,** Carolyn W.  
Faculty Principal Investigator's Signature Robinson 8/10/2020  
Date

Digitally signed by Carolyn W. Robinson DN: cn=Carolyn W. Robinson, o=Auburn University, ou=Department of Horticulture, email=cw0001@auburn.edu, c=US Date: 2020.08.10 09:31:32 -0500

Department Head's Signature \_\_\_\_\_ Date \_\_\_\_\_  
Date: 2020.08.10 10:09:09 -05'00'

AU ExemptionForm  
Version 06.29.2020

Version Date (date document created): 8/10/2020

page 8 of 5 

July 31, 2020

RE: Agreement for Autumn Shay Busbee's Research Project with Harvest for Health Study To: Auburn University IRB

We are aware of and approve that Autumn Shay Busbee, Graduate Research Assistant, Department of Horticulture, Auburn University will be completing a sub-study with the Harvest for Health study participants. The Harvest for Health study has an IRB Approved Protocol through UAB with a UAB PI and an Auburn University Co-PI.

I have included my contact information below. Please do not hesitate to contact me for questions or concerns. Sincerely,



Wendy Demark-Wahnefried, PhD, RD  
Principal Investigator of Harvest for Health  
Professor and Webb Endowed Chair of Nutrition Sciences University of Alabama at Birmingham  
Associate Director of Cancer Prevention and Control, O'Neal Comprehensive Cancer Center at UAB American Cancer Society  
Clinical Research Professor  
Physical Address: 1675 University Boulevard, Webb Nutrition Sciences Bldg, Room 650 Birmingham, AL 35294-3360  
Telephone: 205.975.4022  
Fax: 205.975.2592  
Email: [demark@uab.edu](mailto:demark@uab.edu) Cell: 205.504.3382



Kerry P. Smith, M.S.,  
Co-Investigator of Harvest for Health Administrator III, Outreach Programs 167A Funchess Hall  
Auburn University, AL 36849-3334-844-3036  
[smithkp@auburn.edu](mailto:smithkp@auburn.edu)

A.S. Busbee CITI Training Documentation

COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)  
COMPLETION REPORT - PART 1 OF 2 COURSEWORK REQUIREMENTS\*

NOTE: Scores on this Requirements Report reflect quiz completions at the time all requirements for the course were met. See list below for details. See separate Transcript Report for more recent quiz scores, including those on optional supplemental course elements.

**Name:** Autumn Busbee : 87 4  
**Institution Affiliation:** Auburn University : 9 4  
**Institution mail:** asb\_84@auburn.edu  
**Institution nit:** Horticulture  
**Phone:** 8 334 42

**Curriculum Group:** Responsible Conduct of Research for Social and Behavioral  
**Course Learner Group:** Social, Behavioral and Education Sciences RCR  
**Stage:** Stage - RCR

**Description:** This course is for investigators, staff and students with an interest or focus in **Social and Behavioral** research. This course contains text, embedded case studies AND quizzes.

**Record ID:** 3483 8  
**Completion Date:** - an-2 2  
**Expiration Date:** 3- an-2 2  
**Minimum Passing:** 8  
**Reported Score\*:**

R	IR	C	I	S	C	P	SCR
Authorship	RCR-Basic	:	97		3-	an-2 2 /	
Collaborative Research	RCR-Basic	:	98		3-	an-2 2 /	
Conflicts of Interest	RCR-Basic	:	99		3-	an-2 2 /	
Data Management	RCR-Basic	:			3-	an-2 2 /	
Entering	RCR-Basic	:	2	4-	an-2 2 /		
Peer Review	RCR-Basic	:	3		4-	an-2 2 /	
Research Misconduct	RCR-Basic	:	4		-	an-2 2 /	
Plagiarism	RCR-Basic	:			-	an-2 2 /	
Research Involving Human Subjects	RCR-Basic	:	3		-	an-2 2 /	

For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent learner.

**Verify at:** [www.citiprogram.org/verify/?k227ea9-3a3-472f-a23b-e98487bcfa-34838](http://www.citiprogram.org/verify/?k227ea9-3a3-472f-a23b-e98487bcfa-34838)

**Collaborative Institutional Training Initiative (CITI Program)**

**Email:** [support@citiprogram.org](mailto:support@citiprogram.org)  
**Phone:** 888- 29- 929  
**Web:** <https://www.citiprogram.org>



**COLLABORATIVE INSTITUTIONAL TRAINING INITIATIVE (CITI PROGRAM)  
COMPLETION REPORT - PART 2 OF 2 COURSEWORK TRANSCRIPT\*\***

\*\* NOTE: Scores on this Transcript Report reflect the most current quiz completions, including quizzes on optional supplemental elements of the course. See list below for details. See separate Requirements Report for the reported scores at the time all requirements for the course were met.

**Name:** Autumn Busbee : 87 4  
**Institution Affiliation:** Auburn University : 9 4  
**Institution mail:** asb\_84@auburn.edu  
**Institution nit:** Horticulture  
**Phone:** 8 334 42

**Curriculum Group:** Responsible Conduct of Research for Social and Behavioral

**Course earner Group:** Social, Behavioral and Education Sciences RCR

**Stage:** Stage - RCR

**Description:** This course is for investigators, staff and students with an interest or focus in **Social and Behavioral** research. This course contains text, embedded case studies AND quizzes.

**Record ID:** 3483 8

**Report Date:** 8- un-2 2

**Current Score\*\*:**

R	IR	CI	S	PP	S	S	RC	SCR
Research involving Human Subjects RCR-Basic	:	3	-	an-2 2 /				
Plagiarism RCR-Basic	:		-	an-2 2 /				
Authorship RCR-Basic	:	97		3- an-2 2 /				
Collaborative Research RCR-Basic	:	98		3- an-2 2 /				
Conflicts of Interest RCR-Basic	:	99		3- an-2 2 /				
Data Management RCR-Basic	:			3- an-2 2 /				
Peer Review RCR-Basic	:	2	4-	an-2 2 /				
Peer Review RCR-Basic	:	3		4- an-2 2 /				
Research Misconduct RCR-Basic	:	4		- an-2 2 /				

**For this Report to be valid, the learner identified above must have had a valid affiliation with the CITI Program subscribing institution identified above or have been a paid Independent learner.**

**Verify at:** [www.citiprogram.org/verify/?k227ea9-3a3-472f-a23b-e98487bcfa-34838](http://www.citiprogram.org/verify/?k227ea9-3a3-472f-a23b-e98487bcfa-34838)

**Collaborative Institutional Training Initiative (CITI Program)**

Email: [support@citiprogram.org](mailto:support@citiprogram.org)

Phone: 888- 29- 929

Web: <https://www.citiprogram.org>

**Dr. C. Robinson CITI Training Documentation**

Completion Date 07-Aug-2020 Expiration Date 07-Aug-2023 Record ID 23250090

This is to certify that:

**Carolyn Robinson**

Has completed the following CITI Program course:

Not valid for renewal of certification through CME. Do not use for TransCelerate mutual recognition (see Completion Report).

**IRB Additional Modules** (Curriculum Group) **HIPAA and Human Subjects Research** (Course Learner Group) **1 - Basic Course** (Stage)

Under requirements set by:

**Auburn University**