Evaluating the Potential Public Health Impact of Community Gardens in a Health Disparate Region: A Case Study Approach

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Abstract

While community gardens (CG) have emerged as a popular public health strategy to improve fruit and vegetable access and consumption, few studies provide evidence-based principles to inform the initiation and maintenance of CG. Grounded in Community-based Participatory Research and guided by the RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework, this mixed methods case study explores the potential public health impact of CG in the DRR. Six CG completed harvest logs during the 2011 season. Following the growing season, CG leader key informant interviews (N=6) and CG participant focus groups were conducted (N=21) using a semi-structured script, guided by RE-AIM dimensions. The five RE-AIM dimensions and associated components were used to develop a coding matrix and identify emerging themes. Three researchers coded the transcribed interviews using a deductive approach, which included coding raw data into meaning units. The six CG yielded 811 pounds of produce. The majority of focus group participants (95%) stated they would continue CG participation. From qualitative analysis, themes emerged such as increased the number of residents participating in CG, increased consumption of produce, key characteristics of successful CG leaders and locations, programs associated with CG, and adequate funding and resources necessary for maintenance. This study provides important insights to promote the potential public health impacts of CG in the DRR. Findings provide best-practice opportunities to promote the successful adoption, implementation, and maintenance of CG in similar communities.

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CHAPTER 1: Literature Review

Community Gardens to increase fruit and vegetable accessibility and consumption

Currently, few Americans eat the recommended number of fruits and vegetables (FV) (32.5%, 26.3% respectively) (CDC, 2009) and 14.5% of households experience food insecurity yearly (U.S. Department of Agriculture, 2011). Related to food and nutrient consumption, the Healthy People (HP) 2020 initiative aims to increase the contribution of FV to the diets of the population aged 2 years and older (0.9, 1.1 cup equivalents per 1,000 calories, respectively). HP 2020 also aims to reduce food insecure households from 14.5% to 6.0% (U.S. Department of Health and Human Services, 2010). High FV consumption increases protective factors against America's top preventable diseases, such as cardiovascular disease and diabetes (National Cancer Institute, 2007a), which are related to the obesity epidemic. Furthermore, low-income individuals report eating less healthy diets and spend less money on FV, than their higher income counterparts (Hayden, Noel, & Dean, 2003). To combat these issues, research efforts are needed to promote the development of public health initiatives, such as community gardens (CG), to improve the availability of fresh FV in areas of low accessibility (Graham & Zidenberg-Cherr, 2005; Kortright & Wakefield, 2011).

The American Community Gardening Association defines CG as "any piece of land gardened by a group of people" (American Community Garden Association, 2012). Historically, CG grew to provide fresh produce during food shortages in the United States during World Wars 1 and 2. In 1944, twenty million "Victory Gardens" produced 40% of the fresh vegetables consumed in the United States (Hanna & Oh, 2000). Throughout time, CG popularity has generally increased with rises in with food prices to provide sustainable agriculture in difficult economic times. The recent 2009 U.S. recession influenced an increase in "Recession Gardens" to offset high food prices and enhance community food systems. CG are a longstanding mechanism for food production, however, health benefits are just beginning to be explored (Draper & Freedman, 2010).

This literature review will first give a brief introduction to CG and its main purposes. Secondly, individual level health outcomes of CG in adults will be examined followed by individual level health outcomes among youth CG participants. Then community level outcomes of CG are explored. This review concentrates on health outcomes and overall conclusions from five CG reviews (Blair, 2009; Draper & Freedman, 2010; McCormack, Laska, Larson, & Story, 2010; Ozer, 2007; Robinson-O'Brien, Story, & Heim, 2009) as well as relevant findings from other recent CG studies not included in the previous reviews. Within the individual and community level settings of literature, quantitative study findings will be followed by qualitative study results. Finally, community-based participatory research (CBPR) approach and the RE-AIM framework will be examined, which will lay the foundation for the current study.

The most recent systematic review (Draper & Freedman, 2010) provides comprehensive and elusive themes emerging from 55 studies in CG literature, including youth gardening programs and projects; health (e.g. dietary, mental, and physical) outcomes; advocates versus land holder conflicts; social capital; and personal motivations and perspectives. Previous reviews examined numerous nutrition implications, intervention programs, and youth gardening programs (Blair, 2009; Ozer, 2007; Robinson-O'Brien, et al., 2009a). Of the studies reviewed by Draper, study designs examined were predominantly intervention studies (45%), followed by case studies (40%). The remaining studies included reviews (11%) and cross sectional designs (4%). The following data collection methods were used across the studies: quantitative (40%), qualitative (49%), and mixed methods (11%). Self-reported dietary changes were most common among intervention studies (96%), but lacked statistical significance. Though several studies found a relationship between CG and various outcomes (e.g., diet, collective efficacy, access to food) within a population, effective food production (i.e., high yield of produce) of the CG was seldom reported.

Individual Level Health Outcomes

Adult Studies

The majority of adult health outcomes have been studied using quantitative methods. Alaimo and colleagues (2008) determined the relationship between household participation in a CG and FV consumption among urban adults (N=766). A cross sectional random telephone survey used a rigorous quota sampling strategy that included all census tracts within Flint, Michigan. The CDC's Behavioral Risk Factor Surveillance System (BRFSS) measure was used to evaluate self-reported FV behavior items. Adults with a household member who participated in a CG were 3.5 times more likely than members of non-gardening households to consume FV at least five times daily (Alaimo, Packnett, Miles, & Kruger, 2008). This suggests that when even one family member participates in a CG, FV consumption of other household members can be positively influenced.

Recently, Litt and colleagues (2011) examined social and psychological factors and influence on health behaviors (i.e., FV consumption) among urban CG settings. A multi-frame sampling design was used to randomly select participants (N=436) from block groups. Self-reported height and weight measures were used to determine participant BMI. Similar to national trends, 21% (n=88) were obese and 30% (n=124) were overweight. As used in a previous CG study (Alaimo, Packnett, Miles, & Kruger, 2008) the CDC's BRFSS measure of FV intake was used to compare community gardeners with home gardeners and non-gardeners. Community gardeners significantly consumed more FV per day than home gardeners and non-gardeners (5.7, 4.6, and 3.9, respectively). They also found that social involvement, neighborhood aesthetics, and CG participation were positively associated with increased FV consumption. Though this study included rigorous statistical procedures, such as multilevel statistical models, findings could be strengthened with longitudinal data analyses (i.e., changes in BMI). Several community level healthy eating strategies were suggested to address social and psychological factors influencing FV consumption including, "weave CG through the fabric

of communities." However, important processes necessary to promote CG adoption and implementation are undefined.

A recent review focused on nutrition-related outcomes in studies involving adult participation in farmers' market programs and CG (McCormack, et al., 2010). These studies (N=16) used mostly quantitative methods, while only two included qualitative methods. Future use of quantitative and qualitative methods is recommended to determine barriers to using CG. Across all studies participants in farmers' markets (n=12) and CG (n=4) planned to maintain participation and consume the produce, based on their positive behaviors and perceptions. This review explored program effectiveness to increase community level FV consumption. Self-reported FV intake improved among CG participants across all four CG studies (Alaimo, et al., 2008; Blair, Giesecke, & Sherman, 1991; Johnson, Beaudoin, Smith, Beresford, & LoGerfo, 2004; Lackey, 1998), though findings were consistent, self-report measures were limited by social desirability and recall bias. All CG studies reviewed were cross-sectional, but longitudinal data would be necessary to determine causal pathways of behavior change from CG in targeted populations (Alaimo, et al., 2008). CG offer important opportunities to partner with public health program efforts aimed to improve an array of nutrition-related outcomes, which include nutrition knowledge, attitudes, and/or dietary intake.

Qualitative studies have revealed less about individual health outcomes and focus more on perceptions of CG outcomes. One study executed by D'Abundo and Carden (2008) conducted focus groups with African American CG participants (N=11) to determine benefits of CG. Participants indicated an improved sense of food sustainability as a result of the CG. Overall benefits of CG included increased personal wellness (physical and mental), relational wellness, and collective wellness (social capital) (D'Abundo & Carden, 2008). Though this study touched on individual health outcomes, the majority of the focus was community level outcomes, which will further be described below with the other community level outcomes. It is important to note that individual level outcomes can be evaluated with community level

outcomes and provide a deeper understanding of the different ecological levels (i.e., individual, family, community, society) effected by CG.

Youth Studies

As highlighted in several reviews (Blair, 2009; McCormack, et al., 2010; Ozer, 2007; Robinson-O'Brien, et al., 2009), individual outcomes among the youth population have been thoroughly studied. Related to individual behavior outcomes specific to youth, a 2009 review of garden-based youth nutrition intervention programs included in-school (n=4), afterschool (n=3), and community-based (n=3) nutrition education programs (Robinson-O'Brien, et al., 2009). The impacts on individual level youth health outcomes, included FV intake, willingness to try fruits and vegetables, preference for FV, self-efficacy, and knowledge were mixed across studies. Inconsistencies across study findings are highlighted, in part, by lack of scientific rigor in study designs and consistent evaluation methods.

The Social Cognitive Theory (SCT) is based on reciprocal determinism among individual, behavioral, and environmental factors (Bandura, 1986; Baranowski, Perry, & Parcel, 2008; Glanz, Rimer, & Lewis, 2008). SCT was the most consistent theory used in garden-based nutrition education programs; however, none of these studies examined impacts on socio-environmental factors or impacts on long-term health outcomes (Robinson-O'Brien, Story, & Heim, 2009b). Since the review by Robinson-O'Brien was performed other studies (Heim, Bauer, Stang, & Ireland, 2011; Heim, Stang, & Ireland, 2009; Parmer, Salisbury-Glennon, Shannon, & Struempler, 2009) have provided evidence to support the use of garden-based nutrition education programs over the use of stand-alone nutrition education curriculum. Among youth garden studies, positive results surfaced for changes in dietary habits, physical activity, and/or academic scores during and after garden participation. In the Draper review, a great proportion of the studies reviewed (N=55) focused on youth gardening activities within a school or after-school settings (n=21) (Draper, 2010); however, few studies targeted youth in CG from a community setting.

Three studies showed that involvement in garden-based nutrition educational increased youth FV intake, one study showed no increase, while another showed only an increase in boys. Two studies found an increase in willingness to try FV (Cason, 1999; Morris, Neustadter, & Zidenberg-Cherr, 2001); however, one study found no increase (Morris & Zidenberg-Cherr, 2002). Two studies showed an increase in preference for vegetables (Lineberger & Zajicek, 2000; Morris & Zidenberg-Cherr, 2002), while four showed no increase for fruits (Koch, Waliczek, & Zajicek, 2006; Lineberger & Zajicek, 2000; O'Brien & Shoemaker, 2006; Poston, Shoemaker, & Dzewaltowski, 2005) or vegetables (Koch, et al., 2006; Morris, et al., 2001; Morris & Zidenberg-Cherr, 2002; O'Brien & Shoemaker, 2006; Poston, et al., 2005). Findings for self-efficacy to consume FV were also inconsistent as one study showed an increase in self-efficacy (O'Brien & Shoemaker, 2006) and another showed no increase (Poston, et al., 2005). Four studies noted youth garden-based nutrition education led to increased nutrition knowledge (Cason, 1999; Koch, et al., 2006; Morris, et al., 2001; Morris & Zidenberg-Cherr, 2002); however, two studies found no gain in nutrition knowledge among youth participants (O'Brien & Shoemaker, 2006; Poston, et al., 2005).

Other nutrition-related outcomes, such as increased FV preferences and intake are inconclusive across studies. The few studies with positive results were limited by low statistical significance from small sample sizes, absence of long term follow-up data, and lack of survey process data (Heim, et al., 2009; Parmer, et al., 2009). None of the youth garden-based nutrition education interventions performed in the community setting used a control group, which weakened the internal validity of the results found from baseline to post-intervention. Due to these limitations, future research is needed to provide evidence from an intervention and control group design study with rigorous evaluation methods (Graham & Zidenberg-Cherr, 2005). Though the findings show potential for successful garden-based educational programs, there remains a lack of data on the amount of food actually grown in gardens. Furthermore, it is necessary to study the effectiveness of a youth garden-based nutrition education program on

nutrition behaviors in order to examine dietary and weight related outcomes among youth. Literature strongly supports evidence for positive youth health outcomes; however health outcomes among adults are less studied. Also more CG studies should be conducted in the community setting rather school settings, which are abundant throughout youth gardening literature. There are limited FV intake findings but obesity related outcomes (i.e., energy balance, weight outcomes, physical activity levels) have not been thoroughly investigated in CG studies and are only suggested by expert opinion. Future research should include universal dietary assessment methods to compare results across studies (McCormack, et al., 2010), such as valid and reliable food frequency questionnaires. Reliable measures will advance the evidence base of results related to CG influences on energy intake, physical activity, diet, and weight.

Community Level Outcomes

In addition to efforts focused on individual level behaviors, CG are also known to promote community building, civic engagement, social capital, economic development, and social well-being (Alaimo, Reischl, & Allen, 2010; Armstrong, 2000; Blair, et al., 1991; McCormack, et al., 2010; Teig et al., 2009) and other key social processes (e.g. collective efficacy, connection, reciprocity, mutual trust, and social norms) integral to community health promotion efforts (Armstrong, 2000; Maller, Townsend, Pryor, Brown, & St Leger, 2006; Teig, et al., 2009). These community level outcomes can benefit the individuals living within the community. Contrary to the adult and child individual health outcomes found by mostly quantitative measures, the majority of community level outcomes have been explored qualitatively.

Ohmer, Meadowcroft, Freed, and Lewis (2009) used a mixed-methods approach to examine motivation for involvement in CG along with individual, social, and community benefits. This study sampled CG volunteers, funders, and community partners using qualitative interviews (N=48) and mailed surveys (N=459). Quantitative measures included motivation for

CG involvement, conservation ethic, community connectedness, and impact of CG. CG participants in a community conservation program were motivated to give back to community, support conservation of green space, increase CG engagement related to greater motivation, conservation ethic, and local volunteerism. Findings suggested that community practitioners develop three strategies: 1) strengthen CG programs in disadvantaged neighborhoods; 2) strengthen partnerships with agencies and organizations that contribute to gardening initiatives; 3) link programs more strongly to community development strategies. This study further confirms the utility of CG to foster community engagement. Furthermore, the sustainability and expansion of CG and relies on strong relationships with community partners. Community conservation efforts not only provide open space and greenery, but also affordable fruits and vegetables for local communities (Ohmer, Meadowcroft, Freed, & Lewis, 2009).

Community development is another important process piece useful to evaluate the community level success and impact of CG. Saldivar and Krasney (2004) explored community development, neighborhood open space, and civic agricultural outcomes in their case study of CG in a Latino community. Interviews were conducted with community gardeners (N=32) from 20 CG and 12 staff members from agencies supportive of CG. Since CG were used to enhance community development, secure land tenure was a major concern. Results indicated these CG provided a venue for community member gatherings and social functions and promoted the use of CG to enhance a cultural heritage rather than the primary goal of food production (Saldivar-Tanaka & Krasny, 2004). These important social and environment factors are key to understanding and improving the health among low-income populations, yet do not replace the need to understand how these socio-environmental factors impact the availability of FV, food security, or longer term health outcomes (Graham & Zidenberg-Cherr, 2005).

Congruent with the known importance of community level characteristics of interventions, the purposes of a garden can differ by the setting (i.e., rural, urban, home, community, school) and by the motivations of the participants (i.e., food production, gardening

education). School gardens are primarily used for teaching youth; however, home and CG may better reflect the food production motivation. Recently, Kortright and Wakefield (2011) examined home gardens to classify them in five categories (i.e., cook's, teaching, environment, hobby, and aesthetic). In-depth interviews (N=23) and surveys (N=125) revealed why participants in two neighborhoods chose to grow food, who they shared it with, and health changes. Results concluded that sustainable home gardening improved health and well-being, which increased with food production. Barriers to food production included secure access to suitable land to grow food and adequate gardening skills. Interestingly, the individual level impact of home gardening did not contribute to community development. Future studies should determine how community connections can be fostered through food distribution beyond the household level (Kortright & Wakefield, 2011) . Though the findings that individualized home gardening does not contribute to community development is important, further exploration through quantitative measures would help validate this finding. Differing from the home garden environment, the "community" in the CG context is defined by the different groups of people joining together in diverse settings (Draper & Freedman, 2010). Furthermore, CG allow for a diverse spectrum of participants of any age, race, ethnicity, and socioeconomic status to reap a multitude of benefits. CG have been implemented in a variety of settings (i.e., community, schools, churches, residential treatment facilities) (Draper & Freedman, 2010); however, little comparison has been done to determine the most effective setting to adopt a CG to increase FV accessibility. Future research should include how community connectedness is built through the sharing of food and can be encouraged and facilitated to support food security beyond the home garden and broader community food system initiatives.

On a wider scale, CG can progress community supported agriculture programs (Teig, et al., 2009) and positively impact the community food system by improving food security (Dematttia & Denney, 2008). Recently, Corrigan (2011) examined the popular CG movement and perceptions of healthy food to determine the impact of CG on food security. This qualitative

study used in-depth interviews with gardeners (N=5) and a non-profit organization, as well as field observations from food stores and CG. Results supported CG contribution to individual, household, and community food security. Clearly, there is a need to confirm these perceptions with quantitative data on actual FV consumption and food availability in the home. Furthermore, it was suggested that education, policy, and funding are needed to increase food security and promote healthy lifestyles in communities.

A comprehensive review of the community development literature is beyond the scope of this project; however, future studies should examine the integration CG in community food system models to understand the broader level impacts of CG, in addition to individual level outcomes (i.e., increasing availability for increasing FV intake). The American Planning Association's defines a community-based food system as one "in which everyone has financial and physical access to culturally appropriate, affordable, nutritious food that was grown and transported without degrading the natural environment, and in which the general population understands nutrition and the food system in general" (Cassidy & Patterson, 2008). CG can provide more than practical food production; they enhance community involvement and provide experiential education about growing FV, strengthen community ties, and build social capital (Glover, Shinew, & Parry, 2005). While CG participants have an improved perception of social capital, the community must be supported by an infrastructure with the mission to make a positive neighborhood change (Alaimo, et al., 2010; Armstrong, 2000). Thomas Lyson explored the concept of civic agriculture, which promotes sustainable structures, markets, and policies enhancing community food systems (Hinrichs & Lyson, 2007). Civic agriculture has been on the rise since 1994 and includes not only CG, but also community supported agriculture, farmers' markets, organic agriculture, and food cooperatives (Wilkins, Lapp, Tagtow, & Roberts, 2010). Recent approaches recognize the need to broaden the scope of which researchers and nutrition professionals attempt to change individual eating behaviors. Therefore, a multi-level contextual approach is needed to make environment, social, and economic impacts. A shift from the

individual as the primary targeted level of change to a more direct focus on the eating environment, public policy, and other community level approaches is necessary to make a public health impact (Wilkins, 2009).

Community-based Participatory Research for the Promotion of Community Gardens

Overall Approach

Community-based Participatory Research (CBPR) involves an equitable partnership between community and academic personnel to collaborate on research initiatives in the community (Israel, Eng, Schulz, & Parker, 2005). Although there has been success using the CBPR approach in CG, some limitations occur from the lack of standardized methods used (Stacciarini, Shattell, Coady, & Wiens, 2010). The flexibility of the CBPR approach lends itself to adapting measures used in similar populations focused on the broad purpose of empowering communities (Greenwood & Levin, 2007; Israel, et al., 2005), which promotes sustainable interventions and changes in the community. Nine principles of CBPR include the following essential elements: 1) Recognize the community as a unit of identity; 2) Build on strengths and resources in the community; 3) Facilitate collaborative and equitable partnerships in all phases of the research; 4) Promote co-learning and capacity building for all partners; 5) Balance research and action for the mutual benefit of all partners; 6) Emphasize local relevance of public health problems, ecological approaches, and multiple, social determinants of health; 7) Involve systems development in a cyclical and iterative process; 8) Disseminate knowledge and findings to all partners and involve all partners in the dissemination process; and 9) View CBPR as a long term process and a long term commitment (Israel, et al., 2005). Though there is no mandatory checklist for CBPR methodology, it is important to acknowledge these principles in the research process. These principles serve as a guide to a CBPR approach, but adaptation to the principles is expected by partnerships in order to fit the context of the organization's specific mission and vision.

CBPR and Community Gardens

Recent literature reviews support the use of CBPR principles for CG intervention planning (Robinson-O'Brien, et al., 2009) and the adoption of CG by community-based practitioners (Draper & Freedman, 2010) has progressed over the past few years. Wakefield and colleagues (2007) used a CBPR approach to determine participants perceived health benefits from CG. Focus groups (N=55) and interviews (N=13) (Wakefield, Yeudall, Taron, Reynolds, & Skinner, 2007) were conducted using the same script. Each focus group ranged from three to nine participants from each CG. Major emerging themes included perceived health benefits (i.e., nutrition, physical activity, food accessibility, and mental health) along with barriers to maintaining the garden (i.e., lack of resources from decision makers and funding). They note that quantitative measures can further validate the findings to begin to understand the potential public health impact of urban CG.

Cyzman, Wierenga, and Sielawa (2009) used a community based approach to improve the food environment in Michigan. The Activate West Michigan coalition's mission is to increase FV consumption for people in low income, minority, and urban communities. They utilized a multi-level approach to consider social determinants of health, plan the implementation and evaluation of CG and farmers' markets. The organization helped initiate nine gardens and five farmers' markets to primarily improve the food environment and also to increase community ownership, pride, and economic opportunities. Two academic institutions were involved in small health initiatives secondary to the project (i.e., blood pressure screenings), but were not major contributors to the overall planning and execution of the research. Though not a pure CBPR approach, it is important to note that prior CG literature includes community partnerships and seems to be moving towards a CBPR approach. Lessons learned from these two earlier studies using partnerships to build successful community-based programs (Cyzman, Wierenga, & Sielawa, 2009). Overall, academic partnerships could provide community organizations with beneficial resources to promote evidence-based health behavior interventions.

Recently, Hale and colleagues (2011) examined CG through a CBPR initiative focused on the relationship between community designs and neighborhood health. To promote collective decision making regarding research instrument development, community partners were involved in interview question formation. Interviews with participants (n=67) from urban gardens (n=28) examined CG experiences across several ecological levels. Physical and social qualities of CG participants were enhanced (learning, affirming, expressive experiences) and supported the positive health-related behaviors and overall health (Hale et al., 2011). Though several academic and community partners were involved in the project, they were not engaged in all phases of research and no means of dissemination was discussed.

Also in 2011, Carney and colleagues used a CBPR approach to support Hispanic farm worker families (N=42 families) with volunteer support, resources, and a social network to improve food security. Mixed methods data collection measures included a pre-post gardening survey (food security and FV frequency), key informant interviews with a family member and observations at CBPR coalition meetings. Findings included the frequency of adult vegetable intake of ‘‘several time a day’’ significantly increased from 18.2% to 84.8%, (P<0.001). A major contribution to the literature here were the statistically significant results of increased youth vegetable consumption “several times a day” (24.0% to 64.0%), (P = 0.003), though limited by self-reported measures. Previously, many studies only found positive trends in youth FV behaviors as a result of CG and lacked statistical significance. The sum of frequencies of “sometimes” and “frequently” worrying in the past month that food would run out before money was available to buy more was 31.2% and the sum of these frequencies dropped to 3.1% during the post garden period, (P=0.006). Consistent with CBPR principles (Israel, et al., 2005) this study provided valuable learned experiences of mutual respect between research and community partners. A limitation of these findings is the food security questionnaire used was not previously validated, even though reliable food security measures have been validated from the United Stated Department of Agriculture and Community Food Security Coalition. Though it

is important to identify outcomes from specific CG experiences, this selected population of farm workers likely possessed a gardening skillset more advanced than the general population, which limits the generalizability of the results from this CG study.

Despite many studies performed on CG, there is still a need to determine the best practices for forming and sustaining CG with diverse populations in diverse settings. Future research should aim to fill the gap of literature on the public health impact of CG (Draper & Freedman, 2010) with the innovative use of an appropriate evaluation framework to guide rigorous research methods. Furthermore, there is a need to integrate individual level outcomes with community level outcomes within studies (Robinson-O'Brien, et al., 2009), as both are necessary for sustained change and to determine the public health impact (Glasgow, Vogt, & Boles, 1999).

RE-AIM, a framework to evaluate the public health impact

Overall Framework

As originally defined by Glasgow and colleagues (1999), the RE-AIM (Reach, Effectiveness, Adoption, Implementation, Maintenance) framework includes five dimensions on which an intervention or public health program can be thoroughly evaluated. RE-AIM expands on the previous definition of public health impact (Reach X Efficacy) (Abrams et al., 1996) by adding setting level dimensions (Adoption, Implementation, Maintenance). The overall public health impact can be conceptualized as the multiplicative combination of the five dimensions. The reach dimension determines the proportion of the target population affected by the intervention. Effectiveness defines the successes of an intervention and considers positive, negative, and/or unanticipated outcomes. The adoption dimension defines the proportion of settings that agree to adopt an intervention, as well as the practices and plans necessary to initiate a program. Implementation refers to the extent to which the intervention is successful if implemented in real world settings. Maintenance examines the likelihood of a program's sustainability over time. Originally, individual level dimensions included reach and effectiveness,

organization level dimensions included adoption and implementation, and maintenance was evaluated at both individual and organizational levels (Glasgow, Klesges, Dzewaltowski, Bull, & Estabrooks, 2004; Glasgow, et al., 1999). Over time, individual level evaluations have also been added to the adoption and implementation dimension evaluations (Dzewaltowski, Estabrooks, Klesges, Bull, & Glasgow, 2004).

To advance the scientific evidence-base for CG and begin to understand the potential public health impact, concerted efforts are needed to use a structured evaluation model (Robinson-O'Brien, et al., 2009). Accordingly, the RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework has proven to be an effective measure to evaluate the public health impact of health promotion interventions (Glasgow, et al., 1999). RE-AIM has been shown to be a comprehensive model to determine the impact of programs and interventions on multiple levels and dimensions of public health (Glasgow, Klesges, Dzewaltowski, Estabrooks, & Vogt, 2006). RE-AIM has been used in a multitude of settings (i.e., real-world and clinical) and contexts (i.e., physical activity, dietary change, and smoking cessation interventions), although no studies have used the model to evaluate CG.

RE-AIM: rigorous evaluation strategy for CG

Though no studies have used the RE-AIM framework to evaluate CG, King, Glasgow, and Leeman-Castillo (2010) recently used the RE-AIM framework in a mixed methods approach to evaluate the built environment. The community-academic coalition involved in this study implemented a farmer's market as a public health initiative to target obesity in a low income area. Quantitative data collected included the number of vendors and variety of FV. Qualitative data was collected through a focus group with community members, observational, and survey data pre and post farmer's market installation. Key findings included definitions, challenges, and metrics of the RE-AIM application to built environment evaluations and presented the need to adapt the framework when necessary to match the context of the research. Overall, findings revealed that future research involving the RE-AIM framework could expand to CG studies, as

they have similar roles to farmer's markets (i.e., food accessibility) and involve aspects of the built environment in the community food system. Since CG include a different scope of participation, adaptations to the framework will likely be necessary, as they were in this study (King, Glasgow, & Leeman-Castillo, 2010). Furthermore, one approach to incorporate RE-AIM into CG study could be a mixed-methods study design.

RE-AIM and Mixed Methods

Mixed methods evaluation allows for the triangulation of data and a useful strategy for identifying best practices; however, it is seldom used with RE-AIM framework, which was largely founded on quantitative methodology and criterion. Recently, studies that include the RE-AIM framework have begun to venture into qualitative methods. RE-AIM experts have created a coding checklist that includes the "use of qualitative methods to assess" for each measure of the framework (National Cancer Institute, 2007b). Furthermore, the founders of RE-AIM (Glasgow & Emmons, 2007) recommend Centers for Disease Control and Prevention's (CDC) WISEWOMAN (Well Integrated Screening and Evaluation for Women Across the Nation) project as a creditable mixed methods study that first derived quantitative estimates of the factors in the RE-AIM model to identify high versus low performing program sites among RE-AIM dimensions. The purpose of this mixed methods study was to evaluate and identify best practices for the WISEWOMAN cardiovascular disease screening program. Qualitative interviews, observations, and focus groups were then conducted at sites that earned a strong or weak score across RE-AIM dimensions in order to better understand the site performance level and included suggestions to improve the program (Besculides, Zaveri, Farris, Will, 2006). Future studies should consider using focus groups with program participants to validate information from program delivery agents and better inform strategies to promote program sustainability.

Another notable study used mixed-methods and applied the RE-AIM framework (Glasgow & Emmons, 2007) in the process evaluation executed by Linnan and colleagues (2005). This study used the CBPR approach and cosmetologists were trained to relay positive

health messages to their customers. True to CBPR principles the community was actively involved in the shared decision making process of the research study. For example, the community advisory board strongly guided the development of intervention components. Customers increased their readiness to change post program and the majority (55%) initiated self-reported behavior changes at a one year follow-up. Furthermore, the trained cosmetologists were committed to deliver health messages post-program implementation (Linnan et al., 2005). CBPR can be a valuable asset to a community behavioral intervention, as it allows the community to share insider knowledge to properly address culturally specific and relevant program components. Future research should focus on process evaluation pieces, rather than health behavior changes, which would involve a longitudinal study. A mixed methods design is appropriate because it incorporates the strengths of both qualitative and quantitative research and data triangulation for further validation of the findings. Furthermore, a mixed-methods approach can reveal barriers to implementing CG such as, participant accessibility, and incentives to increase participation (Armstrong, 2000; McCormack, et al., 2010).

Target Population

This case study examines the Dan River Region (DRR), which includes the city of Danville and Pittsylvania and Caswell counties. The DRR is a medically underserved area with high poverty, low educational attainment, and multiple health disparities (U.S. Department of Health and Human Services Health Resources and Services Administration, 2012). Furthermore, low socioeconomic status, rural, and African American populations in Virginia consistently experience higher mortality rates and poorer health status across a variety of outcomes (e.g. heart disease, cancer, infant mortality, diabetes mellitus) when compared to higher SES, urban, and non-black Virginians (Virginia Department of Health, 2008). To address these disparities and regional obesity problems, the community-based participatory research (CBPR) approach was used to initiate the Dan River Partnership for a Healthy Community (DRPHC) in 2009. With stakeholder input, CG surfaced as a priority intervention to increase the

accessibility of fresh fruits and vegetables (Zoellner et al., 2012). DRPHC efforts to pursue CG in the region include: 1) Ongoing nutrition subcommittee monthly meetings; 2) Summer 2010 - a pilot study to examine factors that influence home and CG intentions, which revealed strong CG interest among participants in the DRR (Zoellner, Zanko, Price, Bonner, & Hill, 2011, in press); and 3) Yearly CG forums to investigate measures, outcomes, and evaluations of established and potential CG in the DRR (Bozick, 2011; Bozick, 2012). The short term goal of the DRPHC is to determine the best practices for CG to increase availability of fruits and vegetables and a long term goal to explore the CG impact to increase fruit and vegetable intake among residents.

Specific Aims

To expand the scientific evidence-base for CG and to begin to understand the potential public health impact, concerted efforts are needed to integrate an evaluation model in CG studies (Robinson-O'Brien, et al., 2009). Accordingly, the RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework has been used as a comprehensive model to determine the public health impact of programs and interventions. Both individual (Reach, Effectiveness, Maintenance) and organizational (Adoption, Implementation, Maintenance) level components are evaluated together to thoroughly characterize the public health impact (Glasgow, et al., 2006; Glasgow, et al., 1999). Since the individual unit, the community case of the DRR, is being examined, a traditional case study approach will be used, as previously done in many other CG studies (Draper & Freedman, 2010). In a case study approach, a small sample size is adequate and power statistics are not necessary. Also, process evaluation can help in learning more about the public health intervention successes and failures (Linnan & Steckler, 2002). In the developmental stages of CG, it is important to identify challenges and success to sustain the life of a CG program. This process evaluation will use the RE-AIM framework as a guide to determine the best practices to promote organization adoption, implementation, and maintenance of CG in diverse populations and settings within the DRR.

Guided by the RE-AIM framework, the overarching goal of this case study is to explore the potential public health impact of CG in the DRR.

Three primary specific aims of this sequential mixed-methods case study are to:

1. Quantitatively determine the reach (i.e., participation) and effectiveness (i.e., weight and distribution of produce) of six CG in the DRR
2. Qualitatively explore RE-AIM dimensions through interviews with CG leaders
3. Qualitatively explore RE-AIM dimensions through focus groups with CG participants

Best practices for CG in the DRR will be determined from RE-AIM dimension results and will provide insight on the sustainability of current CG as well as promote implementation of future CG efforts.

CHAPTER 2: Evaluating the Potential Public Health Impact of Community Gardens in a Health Disparate Region

Abstract While community gardens (CG) have emerged as a popular public health strategy to improve fruit and vegetable access and consumption, few studies provide evidence-based principles to inform the initiation and maintenance of CG. Grounded in Community-based Participatory Research and guided by the RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework, this mixed methods case study explores the potential public health impact of CG in the DRR. Six CG completed harvest logs during the 2011 season. Following the growing season, CG leader key informant interviews (N=6) and CG participant focus groups were conducted (N=21) using a semi-structured script, guided by RE-AIM dimensions. The five RE-AIM dimensions and associated components were used to develop a coding matrix and identify emerging themes. Three researchers coded the transcribed interviews using a deductive approach, which included coding raw data into meaning units. The six CG yielded 811 pounds of produce. The majority of focus group participants (95%) stated they would continue CG participation. From qualitative analysis, themes emerged such as increased the number of residents participating in CG, increased consumption of produce, key characteristics of successful CG leaders and locations, programs associated with CG, and adequate funding and resources necessary for maintenance. This study provides important insights to promote the potential public health impacts of CG in the DRR. Findings provide best-practice opportunities to promote the successful adoption, implementation, and maintenance of CG in similar communities.

Key Words: Community gardens, mixed-methods research, RE-AIM, Community-based Participatory Research (CBPR)

Introduction

Currently, few Americans eat the recommended number of fruits and vegetables (FV) (32.5%, 26.3% respectively) (CDC, 2009) and 14.5% of households experience food insecurity in yearly (U.S. Department of Agriculture, 2011). Related to food and nutrient consumption, the Healthy People (HP) 2020 initiative aims to increase the contribution of FV to the diets of the adult population (0.9, 1.1 cup equivalents per 1,000 calories, respectively). HP 2020 also aims to reduce food insecure households from 14.5% to 6.0% (U.S. Department of Health and Human Services, 2010). High FV consumption increases protective factors against America's top preventable diseases, such as cardiovascular disease and diabetes (National Cancer Institute, 2007a) related to the obesity epidemic. Furthermore, low-income individuals report eating less healthy diets and spend less money on FV, than their higher income counterparts (Hayden, et al., 2003). To combat these issues, research efforts are needed to promote the development of public health programs, such as community gardens (CG), to improve the availability of fresh FV in areas of low accessibility (Graham & Zidenberg-Cherr, 2005; Kortright & Wakefield, 2011).

CG have emerged as a popular public health strategy to improve FV access and consumption (CDC, 2010), yet few studies provide evidence-based principles to inform the initiation and maintenance of CG. While the majority of reviews showcase positive results among youth (Blair, 2009; McCormack, et al., 2010; Ozer, 2007; Robinson-O'Brien, et al., 2009), most are limited to short-term individual level outcomes (i.e., nutrition knowledge and FV behaviors). Some studies suggest that CG can be more appropriately evaluated as a community strategy to increase social capital, collective efficacy, and community development (Draper & Freedman, 2010; McCormack, et al., 2010; Teig, et al., 2009). Still, evidence is lacking to show the degree that CG can achieve any of these community-level outcomes. Furthermore, the long-term health outcomes and the potential public health impact of CG remain unclear. Therefore, future research should aim to determine the best practices for CG

formation and maintenance in understudied diverse populations and settings (Draper & Freedman, 2010).

Community-based Participatory Research (CBPR) is a powerful way to engage local communities in the identification of culturally specific and complex health problems and help guide appropriate interventions. Recent literature reviews support the use of CBPR methods in CG development, implementation, and evaluation (Robinson-O'Brien, et al., 2009) because CG can easily be adopted by a wide variety of community-based practitioners for different public health initiatives (Draper & Freedman, 2010). Furthermore, the CBPR approach promotes a collective decision making among partners regarding program implementation and evaluation efforts to foster community support and enhance the sustainability of public health programs (Greenwood & Levin, 2007; Israel, et al., 2005).

To advance the scientific evidence-base for CG and to begin to understand the potential public health impact, this process evaluation used the RE-AIM (Reach, Effectiveness, Adoption, Implementation, and Maintenance) framework. RE-AIM has been a successful, comprehensive model to determine the impact of health promotion programs and interventions on multiple levels and dimensions of public health (Glasgow, et al., 2006; Glasgow, et al., 1999).

Grounded in CBPR and guided by the RE-AIM, this case study explored the potential public health impact of CG in the health disparate Dan River Region (DRR). The specific aims of this case study were to: 1) Quantitatively determine the reach (i.e., participation) and effectiveness (i.e., weight and distribution of produce) of six CG in the DRR; 2) Qualitatively explore RE-AIM dimensions through interviews with CG leaders; and 3) Qualitatively explore RE-AIM through focus groups with CG participants. Since the majority of the DRR CG are in the formative stages it is important to conduct a process evaluation and compare the CG in this case study. Furthermore, process evaluations can help in learning more about public health intervention successes and failures (Linnan & Steckler, 2002). In the early developmental stages of these CG, it is important to identify strengths and overcome weaknesses to sustain

the life of each CG. Overall, this case study will determine best practice strategies to guide future planning and longitudinal evaluation of CG in the diverse populations and settings within the DRR.

Methods

The Community/Academic Partnership

The DRR, which includes the city of Danville and Pittsylvania and Caswell counties, is a medically underserved area with high poverty, low educational opportunities, and multiple health disparities (U.S. Department of Health and Human Services Health Resources and Services Administration, 2012). About one-third (32.3%) of Danville and Pittsylvania County residents are overweight or obese (Virginia Department of Health, 2008) and around half (52%) of the residents in Danville have access to healthy foods (Robert Wood Johnson Foundation & University of Wisconsin Population Health Institute, 2011). To address the regional obesity epidemic a community-academic partnership, Dan River Partnership for a Healthy Community (DRPHC), was initiated in November 2009. In April 2010, CBPR constructs guided a two-day Community Participatory Planning and Evaluation workshop to promote coalition capacity building (Israel, et al., 2005). CG surfaced as a priority intervention to increase the accessibility of fresh and local FV (Zoellner, et al., 2011, in press). DRPHC efforts to implement CG interventions include: 1) Ongoing nutrition subcommittee monthly meetings to foster equitable decisions regarding CG research initiatives; 2) A pilot study to examine factors that influence CG intentions, which revealed strong CG interest among participants in the DRR; 3) Yearly CG forums to promote the collaboration between local community interest and CG research efforts.

Implementation

In January 2011, the DPRHC hosted the first regional annual CG forum to investigate measures, outcomes, and evaluations of established and potential CG in the DRR. This sparked local interest of CG efforts and five gardens were initiated in the 2011 growing season. Several nutrition subcommittee meetings took place to discuss the proposed CG evaluation process.

Furthermore, feedback was sought from CG leaders on data collection instruments and methods throughout the planning phases of this project.

Quantitative Data Collection and Data Analysis

To address aim one, harvest logs were collected from six CG sites to evaluate the reach (i.e. number of participants) and effectiveness of the CG (i.e., pounds of produce harvested and distributed). Inclusion criteria required that the CG was located in the DRR or that the CG leader was involved with the DRPHC. A scale (CAS SW1S – simple weighing scale) and binder with instructions and blank harvest logs was conveniently placed at each CG site and allowed participants to weigh and record each crop harvested. Prior to the harvest season, researchers met with the CG leaders and taught them how to use the scale and were available to address any issues with them. CG leaders submitted completed harvest logs bimonthly via post mail, email, and/or fax methods to the research team for analysis. Harvest logs and demographic questionnaires were analyzed in SPSS version 18.0 to find descriptive statistics (i.e., sums, means).

Qualitative Data Collection and Data Analysis

To address aims two and three, purposeful sampling (Creswell & Plano Clark, 2010) targeted CG from the summer 2011 harvest log data collection to better understand CG leader and participant reflections and visions for the future maintenance and sustainability of each CG involved. Semi-structured script questions were adapted from a recently developed RE-AIM planning tool (Belza, Toobert, & Glasgow, 2007) and included reflection and vision probes from all five dimensions of the RE-AIM framework. Sample questions are included in tables 2-6. The key informant semi-structured interview script included 15 questions and 20 suggested probes (see Appendix B). Results from the interviews helped guide the focus group script, which included 15 questions with 16 suggested probes (see Appendix D). Inclusion criteria for focus groups required individuals to be 18 years of age or older and a CG participant. This excluded child participants from the two school CG and one church CG, while other CG had only adult

participants. Following the focus groups, each participant completed a short demographic survey (see Appendix F) and a one-item indicator of future CG participation. The demographic survey included race, gender, age in years, highest level of education reported across seven categories, income level reported across 12 categories of $5000 increments, and self-reported health. To compensate their time, CG leaders and participants received a gift card to Wal-Mart ($20, $25 respectively).

A similar process was used for both key informant interview and focus group qualitative data analyses. The interviews and focus groups were recorded and transcribed verbatim. The five RE-AIM dimensions and associated components were used to develop a coding matrix and identify emerging themes (Bartlett, 2010; Besculides, Zaveri, Farris, & Will, 2006). A minimum of three researchers individually coded the transcribed interviews using a deductive approach, which included line by line coding of raw data into meaning units. The researchers then met together and reached consensus on determining codes for each meaning unit. All study instruments and methods were approved by the Virginia Tech Institutional Review Board.

Results

Quantitative: Harvest log data

This case study included six CG; two each from community, church, and school settings. The two churches implemented in ground CG, while the rest of the CG used raised beds in individual box plots. Five of the six CG were initiated in 2011. Four CG received funding from a local grant mechanism, the Danville Regional Foundation Make it Happen Grant for $10,000. Three CG leaders had been active in the DRPHC since the formation of the partnership in 2009. The six CG yielded 811 pounds of produce. CG Community one harvested the greatest amount of produce (385 pounds), while the two school CG produced the least. Both church CG were effective in produce distribution to the surrounding community (Table 1).

Qualitative: Key informant interviews and focus groups

Key informant interviews with CG leaders (N=6), took place in October 2011 and on average lasted 75 (SD=13) minutes. Then, four focus groups with CG participants (N=21) were conducted in the winter of 2011 and on average took 67 minutes (SD=14) minutes. Recruitment for focus groups by the combined efforts of the CG leader and researchers resulted in three to seven participants for each focus group. Focus groups were equally distributed by gender, education, and income. The majority of focus group participants (95%) stated they would continue CG participation the following season. Tables 2-6 illustrate summary results from the qualitative key informant interviews and focus groups. The numbers of meaning units are listed in the tables to explain data saturation and reliability of the emerging themes.

The a priori **reach** dimension was examined with the following components: target population, methods to reach the target population, and CG characteristics (Table 2). Meaning units identified a wide range of targeted participants (i.e., local community, youth, adults, parents, elderly, and low income). Methods to reach certain segments of the population included communication via email, word of mouth or personal contact, and newspaper. Participants agreed that word of mouth was the most effective because they appreciated the personal contact from CG leaders. Codes related to CG characteristics included several barriers to individual engagement in CG, such as time (i.e., school, work) and transportation issues. Overall, the local community seemed to be the most adequate target for CG, which was supported by the desired method of communication (face to face contact). Also local residents live close to the CG, which would reduce the transportation barriers.

The **effectiveness** dimension components included changes in primary study outcomes, impacts on quality of life, and adverse or unanticipated outcomes (Table 3). The changes in primary study outcomes varied across each CG mission of increased knowledge, availability of fresh FV, physical activity, and/or positive changes in eating habits/attitudes. Determinants of CG effectiveness included natural barriers to planting or harvesting and the size of the CG. The

importance of high effectiveness was supported by CG leader and participant visions to increase the size of the current CG or start another CG. CG leaders and participants associated the increased availability of fresh produce as a key measure of success. Participants identified positive changes in their quality of life from their CG experiences related to individual and community level outcomes. When asked about adverse outcomes, most participants commented on the unanticipated natural barriers to their growing season and few adverse effects surfaced. Natural barriers, such as inclement weather, delayed planting produce and disrupted growth, which in turn limited the harvest. CG leaders need to be prepared to deal with these obstacles in order to increase the overall effectiveness of the CG.

Related to the evaluation of effectiveness but not an a priori component, CG leaders and participants were asked about their perceptions on evaluation strategies for the success of their CG and harvest log completion. Though CG leader feedback on evaluation tools was elicited prior to data collection, a reflection post gardening season was necessary to understand the successes and barriers experienced during the evaluation process. Overall, CG leaders worked cooperatively with the academic research team and appreciated the evidence based approach to evaluation methods. As one CG leader stated a limitation to their CG current evaluation methods:

> I don't know how to measure how much I changed their overall eating habits or when they went to the grocery store if they get apples and did they find that whatever cabbage is and how to prepare it in the future. I'd like to think they learned the families learned healthy eating habits as a result of having and eating the fresh produce that they prepared. Or they talked about how good it was, but I don't know I would just be purely guessing on how much influence I had or their change in their habits.

Similarly, the majority of CG participants were excited to learn the amount of produce they harvested and were not bothered by the additional time harvest log completion required, although a few participants found it to be laborious.

The **adoption** dimension components included the characteristics of the organization and the expertise of the delivery agent. In this CG case study, characteristics of the CG setting served as the organization and the CG leader served as the delivery agent (Table 4). Codes describing CG characteristics included: accessible or visible location, community cohesion, fear of high crime area, rural and urban setting differences, and diversity or poverty. This study included school, community, and church sites to compare useful setting level characteristics and the nuances each site brings to the program. CG leader characteristics included: communication with CG participants, ability to teach, dedication, time available, and previous gardening knowledge. Due to their limited time availability, CG leaders addressed the need of an additional individual (i.e., CG coordinator) to help with CG infrastructure and communication with CG participants. Among both CG leaders and participants previous gardening knowledge was found to be important. CG participants attributed their own gardening knowledge, as well as CG leader gardening knowledge as influential to their CG experience.

Across the **implementation** dimension the a priori components explored were resources used to deliver the protocol, intervention duration or frequency, and protocol delivered as intended (Table 5). Resources used to deliver protocol included educational programs and events, built partnerships, planting and growing resources, handbook for CG guidelines, and involve CG experts. Under implementation “planting and growing resources” received the greatest number of meaning units from CG participants out of all five dimensions. The CG participants spent more time and resources in the garden than CG leaders and were better able to comment on the sufficiency or insufficiency of the resources provided. Access to CG experts and partnerships contributed to implementation success, which related to the level of CG leader and participant gardening knowledge (discussed in the adoption dimension).

The frequency of intervention component can be defined in terms of the growing and harvesting seasons for CG. Emerging codes included inaugural season issues and meetings for across each CG site. Several logistical problems related to planting and growing among CG

were reasoned by CG leaders as first year issues of inexperience. Generally, CG participants enjoyed meeting together with the CG leader and other CG participants, but would like more opportunities for fellowship in the future.

Whether or not the protocol was delivered as intended depended on cost. In the CG context it is important to consider cost on two levels, capital cost (i.e., equipment) and human cost (i.e., human resources). Across the CG, capital cost seemed easier to obtain than human cost due to lack of individual's time to devote to the project. Though grant monies helped initiate four of the six CG, managing the budget was a challenge for some CG leaders.

The **maintenance** dimension components included both individual and organizational level factors that determined the sustainability of CG for greater than six months (Table 6). At the individual level emerging themes were retention issues, anticipated outcomes (harvest and quality of life), communication for individual involvement, and time involved. Discussion alluded to participant retention over the duration of the growing season as well as retention for future seasons. Effective advertisement of the anticipated benefits of the CG participation (i.e., harvest, quality of life) was suggested to increase individual involvement. As in other dimensions, time was also a barrier to sustain individual level participation.

From the organizational level the following codes emerged, increased number of volunteers or workforce, financial resources (i.e., donations, seeds), and participant ownership. CG leaders expressed their reliance on future donations, as the awarded grants were only one year in duration and would not be renewed for the next CG season. Fortunately, many expenses of the CG were related to initiation costs (i.e., fences, equipment) and were covered by grant allocations.

Discussion

This process evaluation is important because it promotes the sustainability of six CG in the health disparate DRR for future years of fruitful CG efforts. Overall, most CG were effective at harvest production, but lacked a produce distribution system to reach more community

members. Church CG had the most effective strategies for the distribution of produce for their fairly high yields of produce. As one church CG leader commented on community relationship:

> [Community members] talk about how they got some of this, some of that out of the garden and how good it was, and they know that it's an outreach for the community from the church. And they talk about other people in the community; they get produce outta the garden.

The church CG had a focused outreach mission to reach the local community, which helped them achieve their effective distribution efforts. Notably, one school CG was able to engage a high number of students, but both school CG had low levels of harvest production and distribution. The limited harvest was due to their primary mission was to educate youth rather than to increase the accessibility of FV.

In our findings, several major themes emerged across RE-AIM dimensions such as increased number of residents participating in CG, increased consumption of produce, key characteristics of successful CG leaders and locations, programs associated with CG, and the need for adequate funding and resources to ensure organizational-level maintenance. Overall, CG were perceived as successful by both CG leaders and participants; however, several challenges presented should be considered by CG leaders in order to experience a more successful CG season. A primary concern across CG was sustainability, similar to many other public health interventions priority of program continuation. Therefore, CG leaders should actively pursue maintenance issues expressed by the CG participants (i.e., improved planting and harvesting resources, communication) to secure their future participation and improve the effectiveness of produce harvested. Participation in the past growing season, included varied target populations, congruent with the claim of previous literature that CG can reach a wide variety of audiences (Draper & Freedman, 2010).

Strengths of this innovative study include the successful use of a CBPR approach to execute a process evaluation using the RE-AIM framework, which was used for the first time to

determine the potential public health impact of CG. This study revealed barriers experienced by CG leaders and participants, as well as guidelines and for future adoption, implementation, and maintenance of CG. A benefit to RE-AIM is the emphasis placed on “maintenance,” as a program must be sustained in order to study longitudinal effects on both individual and community level outcomes.

Findings from the quantitative harvest logs coupled with qualitative analyses helped to determine best practice CG models for effective produce yield and distribution. Furthermore, the specific adoption level characteristics of the CG identified appropriate geographic areas or characteristics that would be a good setting for other CG, such as a visible, accessible location. The CG studied here included either individual raised bed garden plots or one, large in-ground garden for planting and harvesting. The in-ground approach was used by both of the churches and may have allowed for greater distribution of their produce than the other CG. The raised beds were operated by individual participants, whereas, the in-ground CG were maintained by a more collective effort among participants. It is important to note that some of the CG with individual plots promoted participant ownership and allowed for participants to work together in a collective effort. CG with the mission to distribute a large amount of produce to the community may consider using the in-ground collective plot model. The individual plot model may be best for CG to increase reach by promoting participant ownership of their plot within the larger CG. Thus, this approach may be better suited to engage participants to increase the likelihood of CG sustainability.

In order to disseminate data back to the community, the Second Annual CG Forum was recently held in Danville to inform and motivate CG maintenance and participation in the 2012 growing season. The DRPHC will continue to use CBPR principles to address the obesity epidemic in the DRR. Importantly, partnerships with local stakeholders will increase the likelihood of the sustainability of current CG, as well as promote the adoption and implementation of future CG within the DRR. Future DRPHC initiatives should expand from CG

programs and explore ways to improve the community food system to support local, sustainable agriculture. A wider scale community food system initiative could promote a healthier way of life, rather than a limited focus on individual level changes. A healthy community that supports healthy lifestyles encourages each resident to be healthy.

This study aimed to provide a necessary process evaluation of the "first fruits" of these early CG, whereas future studies within the DRPHC should examine FV intake of CG participants as well as overall nutrition behaviors to determine if participants are really changing their diets to become more healthy (i.e., eating less foods with high saturated fat) or only adding FV to their diet without removing unhealthy options. An individual dietary behavior change in is necessary to begin to make an impact on sustainable weight loss over time. Future research should include longitudinal randomized control designs to evaluate changes in dietary intake of fruits and vegetables, as suggested by previous CG reviews (Draper & Freedman, 2010; Robinson-O'Brien, et al., 2009).

Limitations

One limitation of this study is the measure of the amount of produce harvested, which is likely to have been underestimated as in previous studies (Vitiello & Nairn, 2009; Vitiello, Nairn, Grisso, & Swistak, 2010). During the focus groups, participants confessed they did not always track the produce they harvested each time. Also, the script was developed with the intention to elicit participant responses about expectations, outcomes, and visions, but both CG leaders and participants had a difficult time distinguishing their reflections from their visions. The following is an example of the blended responses, as one CG leader commented, *"I try to work with the schools and work with maybe parents at schools or just community businesses to try to see if we can, cause after our grant money runs out, we have to know how to sustain it."* While it is good that CG leaders were able to reflect upon the past season, their vision was often blended or immediately preceded their reflection, which made it difficult to distinguish their reflections from their visions. Also, depending on the mission of the CG, different outcomes will be targeted

across CG, making a systematic evaluation difficult. Furthermore, some CG leaders may prioritize quality of life changes, rather than increased FV availability or consumption.

Though the RE-AIM framework is a systematic and appropriate guide to determine the public health impact and translatability of many interventions, there are limitations of its utility in CG studies. Several themes did not fit into a singular RE-AIM dimension, such as retention and cost. Previously, retention has been evaluated across multiple dimensions (Belza, et al., 2007); however, in the DRR case study it was evaluated within the maintenance dimension. This was appropriate because the time from planting to harvest was greater than six months; therefore, CG participants needed to participate for the duration of the season in order to reap the benefits (i.e., harvest, quality of life changes). In other public health interventions, retention could be considered in the reach dimension if the duration of the program is less than six months. Furthermore, retention could be a primary study outcome in the effectiveness dimension, as some CG leaders targeted individual level CG participation as their primary CG mission. For example, one CG leader was proud of the waiting list for the CG plots because there was such high interest for CG participation within the community. Cost has also been examined across multiple RE-AIM dimensions (i.e., adoption, implementation, and maintenance) (Glasgow, et al., 1999). The second theme examined in multiple dimensions was cost, which was examined in both implementation and maintenance dimensions. For CG and other public health interventions, there is a high start-up cost. Since this was the first year for most CG leaders many commented on cost associated to the implementation dimension; however, cost is also a necessary consideration to maintain public health programs. Despite these limitations, RE-AIM was appropriate for the scope of this project, a process evaluation of six CG in the DRR.

Conclusion

Though individual behavior change is difficult to evaluate, this study begins to shed light on the potential public health impact of CG. Future research should use a conceptual framework to capture longitudinal community level health outcomes, as well as potential health behavior

changes. Future research should include a thorough investigation of community level outcomes that can impact the community food system in this region. Previously, participants indicated a positive association of CG with home gardening, as home gardening was seen as a continuation of gardening interest sparked by a CG (Twiss et al., 2003). The spread of gardens, whether at home or in the community, can positively impact the stability of the community food system. Though home gardening is of some use, it is important not to neglect the added bonus of CG on building social capital and community togetherness. Though the primary outcome of the CG studied here was an increased availability of fresh produce, there is still a disconnect between the harvest and consumption of produce. A thriving local food system needs a solid infrastructure and should be a priority to promote accessibility of fresh and local FV. Perhaps the most interesting aspect of CG isn't the actual produce that is harvested from the garden, but the personal relationships produced within the community to create a healthy community.

Table 1. Garden characteristics and descriptive characteristics

Setting of CG	Total N (%)	Church 1	Church 2	Community 1	Community 2	School 1	School 2
Year of CG		1	1	1	4	1	1
Funding		Make it Happen (MIH)	MIH	MIH	VCE	MIH	School
CG Participants (N=)		9	19	21	8	87	4
Recipients (N=)		18	36	19	1	0	4
Harvest Production (lbs.)		181.4	132.3	385.0	64.6	25.5	22.4
Harvest Distribution (lbs.)		105.0	131.3	119.9	4.4	0.0	22.2
CG Leader/ Key Informant	6	Reverend	Church Volunteer Coordinator	Community Market Program Director	Virginia Cooperative Extension (VCE) Agent	VCE Agent	Principal
DRPHC active		Yes	No	Yes	Yes	No	No
Focus Group Participants (N=)	21	5	7	6	3		
Garden Next Year							
Yes	20 (95.2)	4	7	6	3		
No	1 (4.8)	1	0	0	0		
Gender							
Male	10 (47.6)	3	4	2	1		
Female	11 (52.4)	2	3	4	2		
Race							
White	13 (61.9)	0	6	6	1		
Black	8 (38.1)	5	1	0	2		
Education							
High school diploma	7 (35)	1	3	2	1		

or less					
Some college or specialized training or 2 yr.	7 (35)	3	4	0	0
Received Bachelor's degree (4-yr college graduate) or graduate school	6 (30)	1	0	3	2
Income					
$0-19,999	8 (40)	2	3	2	1
$20,000-49,999	7 (35)	2	2	1	2
More than $50,000	5 (25)	1	2	2	0
Self-Health Rating					
Excellent	3 (14.3)	0	1	1	1
Very good	6 (28.6)	0	2	4	0
Good	9 (42.9)	4	3	0	2
Fair	2 (9.5)	0	1	1	0

Table 2. Emergent codes from responses to reach dimension questions: In this past growing season, please describe who your garden has touched or reached.; When you started this CG this past spring, who were you hoping would be engaged with or *benefit* from your garden, In the future, who would you like to get involved with your garden?"

Reach Components	Codes	Key Informant # of mentions	Key Informant Sample Quote	Focus group # of mentions	Focus Group Sample Quote
Target population	Local community	34	"Keep the focus of the community. When you say CG, you wanna keep all your people in the community involved in the garden."	16	"I was thinkin that the CG would cause the people in the community to come together and… would make them more, more community oriented."
	Youth	31	"I think you gotta get them hooked early…because if the kids wanna come then the parents are likely to wanna bring them."	35	"We got a tutorial program over at the school and that is one way of reachin' them. We have a youth department at the church and that is another way we can reach them as well."
	Family	26	"The challenge lies in keepin' 'em engaged and comin' and that doesn't all lay on the kids. It comes back to their family and their mom and dad bringin' em."; "We can really bring the parents and grandparents in with [the community garden]."; "[The students] would talk to their parents and say, 'This is what I did today.'… We're all about tryin' to teach them, but also teach their parents."	5	"I think lots of people had parents and grandparents who had gardens. I think people need to get back to think local and fresh."
	Elderly	16	"We have an elderly population that comes out and gardens and a lot of times, that all that I hear that they do"; "as they get older, they can't work the garden"	2	"The elderly, especially since the box gardens come up to a level where they could reach easily."
	Low income	6	"They are poor they are more interested in the garden. There is free food involved, when the food	0	

			supply gets low; those little tomatoes were pretty good to them. If they were wealthier they might prefer to go to the convenience store and buy some that are bigger than what we could grow on that land out there."		
Methods to reach people	Communication for reaching people	21	"You know I think we were successful in getting the word out and other people getting interested in the gardens."	33	"We talked about getting' fliers out to the community and let people know."; "I thought the first thing we was gonna have a community forum where we would tell everybody, "The garden is good."
CG characteristics	Barriers: Time (School, work)	10	"Not to the student participation when they were here. The barrier we had was that they got out for the summer, so they weren't here for most of the harvest the tomatoes and so forth."	6	"I've got 30 minutes, run run run pull pull pull, run run run back to work"; "Our kids are really involved in lots of other things. They work … tryin' to find another way to get them there in the summer."
	Transportation/ Distance	8	"Local, I really wanted it to be available for people that could walk here if they wanted to, within walking distance. I limited it. My application says '1 mile radius or maybe 2, of this area'…We pretty much got that."	18	"Within the center nucleus of your city, the proximity to a lot of businesses, you know people even if they live 10 miles out of town, they can still tend to a garden right here. Take 15 minutes of their lunch break or whatever, especially a lot of people that work within a couple minutes of here."

Table 3. Emergent codes from responses to effectiveness dimension questions. "In this past growing season, what outcomes did you hope your garden would achieve?"; How did you track the short term impact of your garden?; "any adverse or unanticipated effects, you have seen from your CG, "What outcomes would you like to see in the future?"

Effectiveness Components	Codes	Key Informant # of mentions	Key Informant Sample Quote	Focus group # of mentions	Focus Group Sample Quote
Changes in primary outcomes	Increased knowledge	34	"Increase knowledge of agriculture because a lot of people didn't know they couldn't plant certain things together … increased knowledge of how to maintain an organic garden."	36	"My kids got to learn how to plant and the different processes and stages and to be patient and watch it grow."
	Increased availability of fresh produce	30	"We did a good job. The harvest was good. We had a very successful year growing produce. I think every participant that was out there was successful in their own plot."; "We had a huge tomato harvest too. Pounds and pounds of tomatoes."	78	"I got pictures showin' the progression and then when [the kids] pulled that first squash. We let it grow really big, and it was this big (holds hands up) when I was holdin' it you know."; "I just growed it to see if it would grow and it growed and then I gave it to my community. It was really successful."
	Increased physical activity	20	"You come by and work so many hours, moving, doing a little hoeing and raking, that you can burn this many calories and then look at the impact, health wise. Seems like I worked out there and if I go back and look at the calories I burned, I lost 10 pounds."	9	"The highlight of their day is to sit and smoke and sit and smoke, and to get them active is a major accomplishment. To get them active in anything, that would be an outstanding way to get them just to exercise, because you could park, several feet away from the garden and get them to walk."

	Positive change in eating habits/ attitudes	20	“Obviously it’s better for people to eat tomatoes and squash and cucumbers than to eat cheeseburgers and French fries. That’s an obvious benefit there… it’s a healthier option and even if they’re not changing their diet. They’re mixing that stuff in, so even if they’re still eating the bad foods, at least they’re mixing in the good stuff now, maybe it will balance out a little bit you know… if you eat a couple of tomatoes, that will balance out the cheeseburgers.”	9	"I am always astounded at the number of kids who will eat greens and that think cooked greens are just terrific, so I think that was a chance for those kids to realize that you know green stuff can be comfort food too, it doesn't have to be macaroni and cheese. So that whole awareness of just foods that are good, that taste good and make you feel good can be healthy as well."; "The health benefits were unbelievable for my family. I have never eaten so many salads in my life.”
Quality of life	Community togetherness	36	“I think it’s drawing people closer together. They realize they have ownership.”; “Community acceptance…To let me know that this was a worthwhile project in their eyes. How are they seeing the garden spots?” How are they as excited as the children were? Would they like to have input into it?”	108	"[CG participant] and I would call or email, but never knew what each other looked like until this garden."; “The kids wanted to be together, they cooperated with each other and there were no arguments. They just all came together and just did what [the CG leader] told them to do.”

	Excitement/ Enjoyment	32	“They were excited particularly at first when things started to grow and some of them walked by looking over everything.”	51	“[Another participant’s] mood certainly improved that day and then the next couple of weeks, he would brag about what he produced at the garden.”; “It’s just an amazing thing, you take one little thing that you can hardly see and throw it in the dirt, you put some water on it, and two or three months later, you’re eating it!”; “You know just the excitement like ‘wow that came from the garden!’"

Table 4. Emergent codes from responses to adoption dimension questions. Please describe the setting where your CG is located; Can you describe key characteristics or qualities of a successful CG leader."

Adoption Components	**Code**	Key Informant # of mentions	Key Informant Sample Quote	Focus group # of mentions	Focus Group Sample Quote
Characteristics of organization/ institution	Accessible/ Visible location	40	"We wanted it to look nice, to fit in with the setting, be something that people noticed when they came by. We have approximately 70,000 people at this facility each year, so it's a lot of people that come through here, for different events and all, so we wanted it to get maximum exposure. That's kind of why this setting was good for it, I think. So it's right in the middle of a busy, popular kind of area. It's right in their downtown."	67	"Easily accessible for people to come in and harvest and also work in it, because they can park along the street."; "Before they locked it, I had freedom to go in and take care of my plants every day. But once they locked it, I'm not gonna get on the phone and call someone to say come over and unlock it."; "I love where it's located. Cause it's away from everything…the serenity of it. I just go down there, take my little tea, and just sit for a minute. It's just peaceful."
	Community cohesion	45	"A tool to get more people involved in your community, that people can look at it and say you know, they're doin' something, making something happen."; "A church body that is really concerned about the community and trying to reach out and do everything they can."	22	"I just have faith in people and peoples as a whole."

	Fear of high crime area	9	“We had fear there might be some vandalism. We had none. We believe that the pride of the community in it was so great that it kind of looked out for anyone that would vandalize things.”	26	"You didn't have somebody come in and rip it up just for fun. Now that would have been really discouraging. That was a good city experience. People were actually safe here."
	Rural and urban settings	8	“[The teachers] had never raised a garden. They live in the city and they always will. So they had to learn with the students.”; “The more urban kids are not interested at all in being farmers, but they were interested in how much money it made.”	24	“We live in the city of Danville and we don't have an area to grow a garden in our yard. This presented an opportunity to allow us to have a garden.”
	Diversity, poverty	6	“The school itself is very high poverty, rural area.”; “The lower incomes, they’re working all the time. They’re working several jobs or they’re not working at all and they don’t really garden or do anything else.”	12	“Pretty bad neighborhood around here.”; “They condemning’ a lot of the old houses in this neighborhood and tearing’ ‘em down.
Expertise of CG leader	Communication with CG participants	51	“I’d love to have more communication with the gardeners”; “It’d be great if we could have more open communication within the garden”; “The communication piece? That’s’ something that we talked about earlier that we gonna have to strategize on with the board on how we gonna be more effective in communicating.”	60	“…collaboration of what things should have happened.”; "That's right, communication better…But as we began to work on it, our communication began to fall off."; “But when I mentioned that at the focus groups last year, [Garden Leader] said they tested the soil, and it tested good. But I don’t know who tested it. I don’t know what they tested it for. Good for what? They should have said, “It tested good for tomatoes, or potatoes or whatever.”; “Emails, people are always on their computers and always

				online.”
Ability to teach	41	“I could physically go out and help somebody with setting up their boxes.”	32	"He's also very supportive. But he does let you know. He's that good monitoring sort of person."
Dedication	39	“You have to have one person that leads, it’s not gonna happen unless there’s a driving force…someone has to have the vision for it.”; “Well obviously the love for people who are going to benefit in our case children so you have to love children. And uh of course we are concerned, society as a whole thing, goodness is concerned about the health of folks and you know the CG is all a piece of that even the first lady believes that.”; “I plan that as long as I am here. I plan to you know be involved with it and help and try to do anything I can.”	27	“Having somebody like [CG leader] that’s really dedicated in seeing this thing happen because a lot of people once you get involved in it and you see how much work it is you just kind of let it go”; “I think the challenge is the monitoring. We have the advantage here of an infrastructure that supports it.”
Time available	47	“My personal time is the biggest challenge.”; “A CG coordinator would help me out because some people get in and when they don’t have a constant volunteer out there helping them…”	14	"Better management of it. If you got a lock you have better managed who has the key and let em know what time that you wanna get to the garden, and if you aren't available then somebody else should had the key. It's a key thing."

Previous gardening knowledge	17	“The leader needs to have the actual knowledge of what plants grow well, time to plant them, the kind of fertilizers to use… need to have some plain old common sense and knowledge on how to do it. Now of course I grew up on a farm and I knew and that was not a problem.”	7	"I've always had a garden you know at home, a small spot and I grew up on the farm, so I just liked dealing with the land, planting some and seeing it grow.”

Table 5. Emergent codes from responses to implementation dimension questions. What changes to your garden's organizational structure would make it more successful?" What programs, events, and/or meetings would you add?"

Implementation Components	Codes	Key Informant # of mentions	Key Informant Sample Quote	Focus group # of mentions	Focus Group Sample Quote
Resources used to deliver the protocol	Educational program and events	52	"We bought curriculum that already had lessons plans, so that the teachers wouldn't be like this is another job…that was really a really good way to kind of get them involved."	34	"We could have a picnic gathering."; "like a harvest jubilee sort of thing."
	Built partnerships	39	"Working with the partnership for a healthy community that keeps us stirred in the right direction."; "Our successes were, we made more partners than we ever thought about making. The farm to school program, my best friend is in charge of it, but I woulda never thought to bring her in, as part of it. … local greenhouses who gave us a tremendous discounts … the health department."	18	"I think maybe some of the local businesses right here on bridge street. [College] just located on bridge street."
	Planting and growing resources	32	"But the really rich free dirt was full of weeds and grass and seeds came up and it was beyond keeping them down. Free is not always the best."	134	"Water is a big challenge. Had we not had access to water it would totally burn up, [Garden Leader's] magic drip system is just terrific."
	Handbook for CG guidelines	30	"I just looked across the country on the internet at lots of different CG and their rules and regulations I just	70	"I don't know whether you could whether we could come up with a list of things, that these are the type of things that it takes to have

			put ‘em together in a handbook that has everything from when you have to plant by.”		a CG.”
	Involve CG Experts	22	“I would recommend to anybody who was deciding on doin a CG, a school garden, to talk to several people who have done it…just like this… ‘What was the problems you had? What was the good things you had? What would you do different? Things like that and that’s just a ‘me’ thing.’ I’m just all about tryin’ to find out and talk to people and try to figure out how not to screw up the least. ”	21	"Maybe a weekly gardening tip. Maybe that could come from the community extension, from the extension service"; "From the master gardeners to have something on the city's website but it would be different every week. And so people would maybe be encouraged to see what was different, but in the meantime you're soaking up some actual knowledge that might be helpful to you at home."; "I would come down here on a Saturday morning and a master gardener would be here at the farmer's market and I would ask them a question and they would come out and they'd help me with my garden.
Frequency of intervention	Inaugural season issues	29	“Challenging in that we had to start from scratch this year. We had to actually build the raise beds and buy the dirt to go in it. We ran a little bit late with the dirt and beds which let our seedlings get a little too big. And then the watering of it.”	51	"It was a learning process, is what it was, what you grow in certain spots you know. And how much to grow."; “All of us have learned what to do.”
	Meetings	15	“We had a one meeting that we talked and went over everything and we’ll have another one at some point in	18	"The kick off meeting was really good. I liked meeting new people that are going to be out there. I think that's a good thing."; "We

			the winter and talk about the year and see how it went and see what changes should be made. We'll also bring new people into the group at that time. It will probably actually be the end of winter, right as we're going into Spring."		should have meetings to tell people to come in and everybody talking and everybody agree to something."; "More meetings and I think those people who work in the garden should be involved in those meetings, not just called in to work in the garden. They should be involved in the meeting and planning session for the garden."
Protocol delivered as intended	Cost: grants, budget issues, donations	45	" The [grant] we were able to receive and that got us started."; "You always have people that think it could be done differently or in a better way but a lot of time people don't think about the cost."	57	"There is no harm in returning money. And in fact you look better if you look better if you return it, rather than to do unnecessary."; "Certain individuals were doin what they wanted to do without going by the way the grant was written."

Table 6. Emergent codes from responses to maintenance dimension questions. First let's talk the most important factors that will determine if you're involved into the next year?; Now I want to talk about your organization. How will your CG be sustained over the next year? …Over the next 5 years?

Maintenance Component	Code	Key Informant # of mentions	Key Informant Sample Quote	Focus group # of mentions	Focus Group Sample Quote
Individual level	Retention issues	37	"Some people talk about it but they not gone put on no work clothes and go in the garden."	65	"To reap the reward of a garden, it's not an overnight process. I mean, most stuff don't bear fruit for 90 days, so you're looking at three months [of working in the garden]…"
	Anticipated outcomes (harvest/quality of life)	13	"If the incentive was good enough: free, fresh vegetables, …."; "You have to be excited about it just excitement is contagious, you have to be excited about what you want them to be excited about."; "They had a good time with it this year, they'll do it next year. I think that's pretty obvious in that enjoyment is direct correlation with participation, if you enjoy it, you do it again."	22	"We'll have to find a connective system to get them here in the summer."; "You got turnip greens out here now, and they will reproduce by the spring of the year and you gotta come in and get those off and they the best kind in the spring of the year, but you gotta harvest 'em, redo the land again."
	Communication for individual involvement	8	"Step by step we need to have it written out, we need to do this by this time for this crop. This is what you need to do so, and that way I think it's gonna get more people actually involved."	45	"Run it in the paper, maybe right before spring and you'd get more participation."
	Time involved	5	"Day to day maintenance of the garden is very time consuming."	16	"You have to tend your garden a certain amount of hours per week in order to be able to keep it up."

Organizational level	Increase the number of volunteers/ workforce	44	“We’d love to have people that all 12 boxes are owned by a group or person that you know, it just all about it, you know, loves it, knows about it, and wants to know more, wants to do more. But realistically, as long as their getting something out of it, I’m okay with that.”; “We need that person along with other persons to share the vision and get people involved in the vision, because when you say CG, and only 1 to 2 or 2 to 3 people working it, that’s really not community you want a total community involvement.”; “It’s basically maintained by volunteers.”	62	“ Well I think we have to be careful that we don't engage so many people and raise too many expectations over what we have."; “In the fall I let Jacob know we are going to give our box up so that way it could go to somebody else on the waiting list. So kind of taking turns."; "For every 10 that don't wanna do it, there is somebody else that does.”; “You have to have people, you know if you can't get the people you can't make it happen.”
	Financial resources (donations, seeds)	20	“Maintenance, we just almost at the close of the first year, we’re gonna work through as we go along… creating a garden fund for people in the community that want to donate. They got some produce outta the garden, would be interested in giving a few dollars to get the new garden started.”	43	"I think we got the equipment to help sustain it."; “Well they got enough plows and stuff to redo it."
	Participant ownership	8	“I don’t think it really benefits the participants if we’re out there holding their hand, step by step. That’s why we provide them with the program so they can go out there and do it themselves. If you give a	31	"There are people that have been master gardeners for a long time who could be a big help to everybody. I will just try to network with them to get them more involved next year. It would be helpful.”

person a fish, they'll eat for a day, but if you teach them how to fish, they eat for a lifetime. I wanna teach 'em how to fish so they can maintain the whole garden, so they can learn how to grow different things and they can expand their garden, and we can expand the CG as well."

CHAPTER 3: Conclusions and Implications for Future Research

Community gardens (CG) act as change agents to promote community building, civic engagement, and social well-being (Teig, et al., 2009). While the popularity of CG has risen dramatically over recent years, the potential impacts of CG across numerous levels of influence remains largely understudied. This study attempted to close several gaps in literature, one being it is the first study to evaluate the potential public health impact of CG using the RE-AIM framework. Secondly, it provided data on CG effectiveness (i.e., harvest data) which is often unreported across CG literature. Finally, it provided a process evaluation to determine best practices for CG in the DRR determined from RE-AIM dimension results and provided insight on the sustainability of current CG to promote implementation of future CG.

Congruent with the CBPR principle of dissemination of data back to the community partners, throughout this study preliminary process evaluation reports (i.e., garden logs received, hours worked, pounds of produce harvested) were given at DRPHC monthly meetings. Also, preliminary study results were shared during the Second Annual CG Forum held in Danville on February 23, 2012. The forum included: 1) a presentation on this study's preliminary findings and CG evidence-based literature; 2) a panel discussion with local community members, who shared their reflections, experiences, and visions for CG; and 3) a key note speaker, Virginia Cooperative Extension agent, on proper soil preparation to improve nutrient quality of the soil and harvest. The forum was highly attended (N=38) and even warranted local media coverage (Bozick, 2012). Future dissemination plans include a comprehensive report in the form of a white paper to describe best practices and guidelines for successful CG in the DRR. Furthermore, the DPRHC public relations subcommittee will aid in the dissemination of research findings via their recently launched website, "drhealthy.org" (Dan River Partnership for a Healthy Community, 2012).

Unlike "community-placed" interventions (Israel, et al., 2005; Robinson-O'Brien, et al., 2009), the DRPHC prides itself on several community-based initiatives and provides an

organizational structure, which capitalizes on local expertise to ensure long term follow-up and sustainability of interventions. Within CBPR studies, rigorous longitudinal studies are often difficult to execute, thus measuring behavior change using qualitative analyses may be more practical. Future evaluations should include more quantitative measures, as this study only determined reach and effectiveness quantitatively. FV intake data was not obtained from CG participants in this study because FV intake was not focus of this process evaluation.

A public health impact must expand upon the individual level behaviors of consuming proper nutrition. Accordingly, the DRPHC vision is: *"To promote an environment that supports opportunities for all DRR residents to make healthy food choices and to be physically active in order to achieve or maintain a healthy weight"* (Dan River Partnership for a Healthy Community, 2012). CG are a preliminary step to increase fresh FV consumption, but broader efforts must incorporate multiple ecological levels and systems to promote sustained dietary change and positive health outcomes. DRPHC future research initiatives include a proposed study to engage two local housing authorities to design and test the effectiveness of a youth garden-based nutrition education intervention. The Junior Master Gardener (JMG) curriculum will be used to determine the effectiveness of JMG-enhanced curriculum among youth and their caregivers compared to a standard contact control group (JMG). The enhanced group will have the JMG curriculum in addition to access to a garden, whereas the JMG group will only have the curriculum components. Overall, the DRPHC nutrition subcommittee is committed to CG promotion in the DRR, with the aim to improve availability of fresh fruits and vegetables to the community. Other nutrition related research initiatives promoted by DRPHC include built environment exploration through the Nutrition Environment Measures Survey (NEMS), Physical Activity Resource Assessment (PARA), and other Geographic Information System (GIS) mapping analyses.

Sensitive to the increasing number of CG in the DRR and across the country, this study aimed to further explore the potential public health impacts unaddressed by previous literature.

CG can play an important role in the community food system as they act as a means to reach the local community and engage them in sustainable food production. Once people become a part of a CG they are likely to become involved in other sustainable agriculture initiatives (Armstrong, 2000). However, it is not enough just to provide opportunities for communities to access to fresh FV, because there is no guarantee CG participants know how to prepare FV and if they will actually consume them. Therefore, evidence based nutrition education programs are needed, especially to teach food preparation skills, in order to bridge the gap from getting the produce from the CG plot to the kitchen table.

Future research initiatives should thoroughly examine both community and individual level health outcomes. Social change embodied by a civic agriculture perspective can have a great impact on the overall health of a community (J. Wilkins, 2009). Furthermore, increased social support can influence people to make healthier lifestyle decisions. Taking a population level approach to public health is useful to target the obesity epidemic (Berkman & Kawachi, 2000) and can equip healthy communities to build healthy individuals, rather than target a handful of healthy individuals and expect a drastic change in the community. Furthermore, CG are a mechanism to empower communities to make healthier lifestyle decisions and once communities implement CG, they become more likely to adopt other sustainable options (i.e., farmer's markets, growers cooperatives) to continue the effort of building the community food system (Wilkins, 2009; Wilkins, et al., 2010). A community level approach can begin to use mechanisms of social power great enough to initiate a change of public health in the positive direction. A community level health impact is difficult to evaluate, but researchers must start somewhere in order to obtain a baseline and track incremental changes over time.

In conclusion, the mission of this project was to plant seeds for future community-based programs and conduct research activities that benefit the community. Not only did this project support future research initiatives in the DRR, it also motivated the community to promote a more sustainable community food system. The CG engaged residents in a common purpose

that they can build upon to further promote healthy changes in the community. CG grow more than produce, they cultivate relationships between people and unify a community to sprout future health promotion programs.

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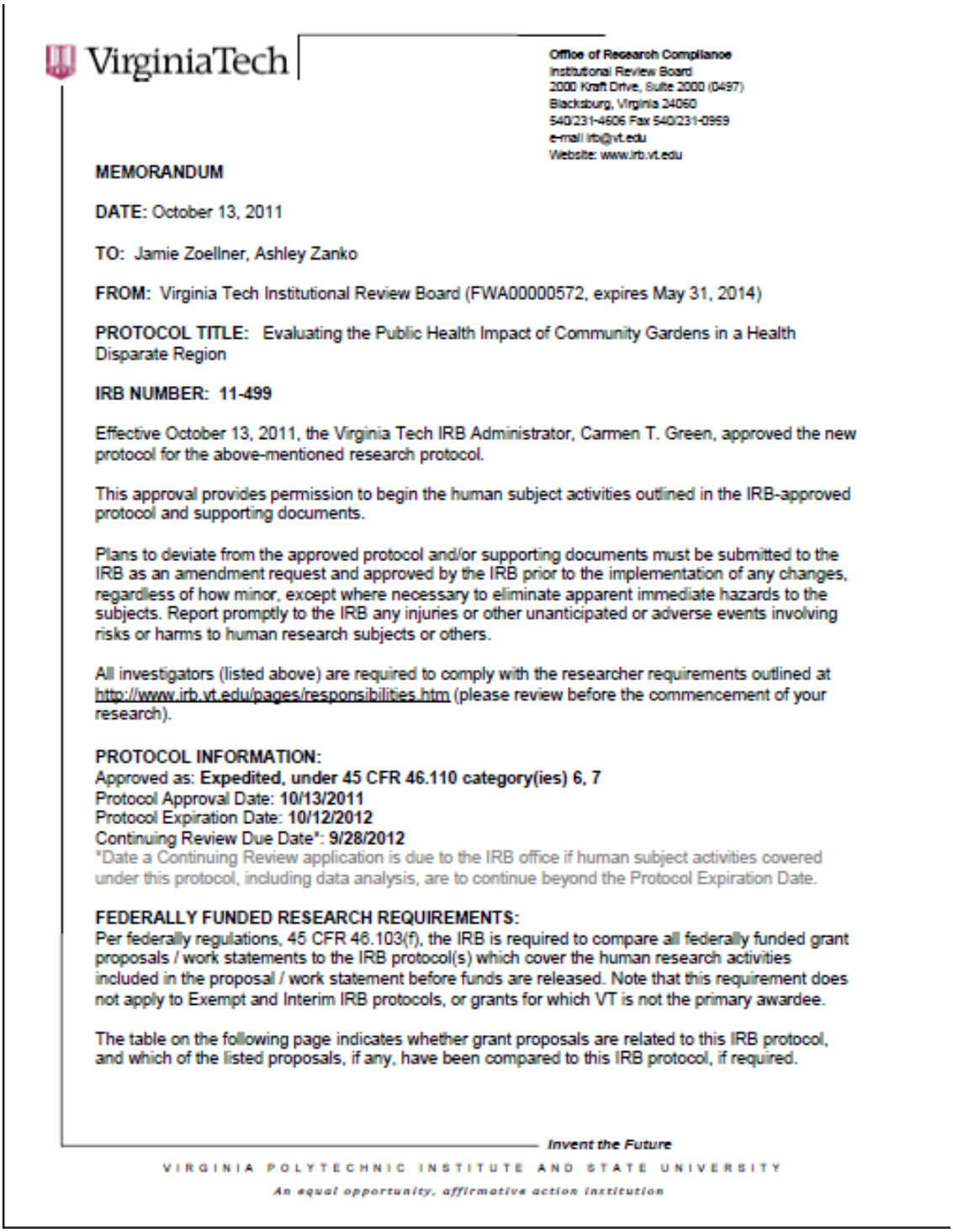
Appendix A: IRB Approval



VirginiaTech

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MEMORANDUM

DATE: October 13, 2011

TO: Jamie Zoellner, Ashley Zanko

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires May 31, 2014)

PROTOCOL TITLE: Evaluating the Public Health Impact of Community Gardens in a Health Disparate Region

IRB NUMBER: 11-499

Effective October 13, 2011, the Virginia Tech IRB Administrator, Carmen T. Green, approved the new protocol for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the IRB as an amendment request and approved by the IRB prior to the implementation of any changes, regardless of how minor, except where necessary to eliminate apparent immediate hazards to the subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at http://www.irb.vt.edu/pages/responsibilities.htm (please review before the commencement of your research).

PROTOCOL INFORMATION:
Approved as: **Expedited, under 45 CFR 46.110 category(ies) 6, 7**
Protocol Approval Date: **10/13/2011**
Protocol Expiration Date: **10/12/2012**
Continuing Review Due Date*: **9/28/2012**
*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:
Per federally regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Invent the Future

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

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Appendix B: Key Informant Interview Script

Department of Human Nutrition, Foods, and Exercise
Evaluating the Public Health Impact of CG
Key Informant Interview Script

Introduction: "Good afternoon, my name is Ashley Zanko. I am currently a Master's student at Virginia Tech in the Department of Human Nutrition, Foods, and Exercise. I am working on evaluating the public health impact of CG through an evidence-based evaluation framework called 'RE-AIM'. Each letter stands for a different dimension of the project: reach, effectiveness, adoption, implementation and maintenance. I will describe each dimension as we get to them, so don't worry about knowing them now. I want to thank you for taking the time to participate in this interview today. The information you share with me will be helpful to this project and hopefully to your CG program. Do you have any questions before we begin?"

[RE-AIM]: "Can you talk to me a little bit about the overall mission/vision/purpose of your CG?"

"Now I would like to ask you some more direct questions about each dimension of RE-AIM. For each of these 5 dimensions, I will ask you to share your reflections (R), visions (V), and facilitators and barriers you have experienced with your garden.

"We'll start with 'reach' or the number of people your garden has been able to reach and some characteristics of participants."

[Reach-R]: "In this past growing season, please describe who your garden has touched or reached."

[Probe-R]: "Talk to me about your successes, how were you able to engage those folks?"

[Probe-R]: "What were some barriers to their participation?"

[Reach-R]: "When you started this CG this past spring, who were you hoping would be engaged with or benefit from your garden?"

[Probe-R]: "Tell me if the garden reached the individuals you had hoped for."

[Reach-V]: "In the future, who would you like to get involved with your garden?"

[Probe-V]: "How do you plan on reaching or engaging them?"

[Probe-V]: "What are the advantages of trying to reach or engage these individuals?"

[Probe-V]: "Talk to me about some of the challenges, if any, that you may have in reaching them?"

"Next, I would like to talk to you about the outcomes or effectiveness of your CG. I want to start with you reflection on this past season. "

[Effectiveness-R #]: "In this past growing season, what outcomes did you hope your garden would achieve?"

[Probe-R]: "Tell me more. Are there any additional outcomes?"

[Probe-R]: "Any additional or broader outcomes besides [insert those already mentioned]?"

[Probe-R]: "How is your program achieving the outcomes that you had set?"

[Effectiveness-R #]: How did you track the short term impact of your program?

[Effectiveness-R #]: "Can you please share with me any adverse or unanticipated effects you have seen from your CG?"

"This information is very helpful; now let's talk about your vision for the future."

[Effectiveness-V #]: "What outcomes would you like to see in the future?"

[Probe-V]: "How do you plan on achieving those outcomes?"

[Probe-V]: "How do you think you may track the impacts of your program?"

[Probe-V]: "Overall, how could you improve how you measure the ability of your garden to achieve your desired goals?"

“Thank you. Now we are going to talk more broadly (on an organizational level) about the programmatic characteristics of your CG.”

[Adoption –R]: “Please describe the setting where your CG is located.”

[Probe-R]: “What are the advantages to having a CG in this setting?”

[Probe-R]: “What are the disadvantages to having a CG in this setting?”

[Implementation R #]: “Through the process of implementing your garden, what successes did you encounter?”

[Implementation R #]: “Now, what challenges have you encountered in implementing your CG?”

[Probe-R]: “How did you overcome these challenges?”

[Probe-R]: “How did cost effect the decisions you made about your garden implementation?”

[Adoption-R #]: “Can you describe key characteristics or qualities of a successful CG leader.”

[Probe-R]: “Any other key qualities?”

“This information is very useful; now let’s talk about your vision for the future.”

[Adoption -V #]: “What is your planned involvement with your CG in the future?”

[Probe-V]: “Talk to me about your future plans, if any, related to the development or implementation of other CG.

[Probe-V]: “Can you vision other settings that would be conducive to Community gardening?”

[Implementation V #]: “What changes to your garden’s organizational structure would make it more successful?”

[Probe-V]: “What programs/events/meetings might you add?”

“Thank you for your information. Now we are going to talk about the maintenance and sustainability of your CG.”

[Maintenance- individual #]: “First let’s talk about the individuals involved with your garden. What are the most important factors that will determine if they’re involved into the next year?

[Maintenance - organizational #]: “Now I want to talk about your organization. How will your CG be sustained over the next year? Over the next 5 years?

[Probe]: “Sustainability can mean areas such as funding, personnel, etc.”

“Okay, I have one final question. If someone else wanted to develop and implement a CG in the DRR, what are the 2-3 take home pieces of advice that you’d give them to promote their success?”

“All of this information has been extremely helpful! Is there anything that I have not asked that you would like to tell me about your experiences or visions for CG in the Dan River Region?”

“Thank you for your time and providing valuable information.”

Appendix C: Key Informant Informed Consent

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Key Informant Interview Participants

Study Title: Evaluating the Public Health Impact of Community Gardens

Investigators: Dr. Jamie Zoellner, Principal Investigator, Virginia Tech
Dr. Jennie Hill, Co-Investigator, Virginia Tech
Dr. Kim Niewolny, Co-Investigator, Virginia Tech
Dr. Paul Estabrooks, Co-Investigator, Virginia Tech
Ashley Zanko, Graduate Research Assistant, Virginia Tech

I. Purpose

The purpose of this study is to gain understanding of community garden leader reflections and visions of community gardens in the Dan River Region. This is part of a larger study exploring how community gardens are a mechanism for impacting health outcomes and community development.

II. Procedures

Your participation requires you to participate in an individual interview, which will take approximately 60-90 minutes. This interview may occur in-person at a convenient location. You may choose whether or not to participate in this study. Your participation will require you to verbally answer questions about your perceptions towards community gardens in the Dan River Region.

III. Risks

There are no foreseen risks or adverse effects from your participation in this study. There is only the possible inconvenience associated with answering the interview questions. You do not have to answer any questions that make you feel uncomfortable and you may stop participating at any time.

IV. Benefits

You will have the opportunity to experience and understand the process involved in key informant research. This interview can help identify the progress and successes your garden has made the past season and identify how it might be improved. Results obtained will be shared with you and will have the opportunity to benefit you, your participants, and the surrounding community. It is important to mention that no promise or guarantee of benefits have been made to encourage you to participate.

V. Extent of Confidentiality

We will audio record the interview. The recordings will be converted to computer audio format (MP3) and be downloaded to a password protected external drive. A trained research assistant will transcribe the information and compile a report.

The research is confidential. We will not disclose your name or identifiable information to other people. We will audio record your responses to the questions without identifying the answers with the person in the final report. Only the research team will know that you participated in this study. The data from the interview will be stored for three years or until the research is published, then destroyed. All forms will be kept in a locked file cabinet in our offices at Virginia Tech. Only members of our research team will have access to this information. The collected data will be stored for three years and then destroyed. This research project has been approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University.

VI. Compensation

As a token of our appreciation, you will receive a $20 gift card to Wal-Mart for completing the interview.

VII. Freedom to Withdraw

If you decide not to participate, please inform the researcher. If you start to participate and then change your mind, you may stop at any time and notify the researcher. If you choose to withdraw, you will not be penalized. You are free not to respond to any question(s) during the interview.

VIII. Participant's Permission

If you are completing this interview over the phone, by agreeing to participate in the interview, you are verbally consenting to the procedures and therefore do not need to sign anything. If you are completing this interview in-person and agree to participate, please sign the bottom of this form. Do you have any questions or concerns regarding the procedures for this project?

Phone Interview: Completed by Interviewer
Participants Name: _____
I hereby certify that I have read the oral consent statement out loud to the key informant participant and answered all questions regarding the conditions of the project.
Interviewer Signature:_____Date:_____

In-Person Interview: Completed by Participant
I hereby certify that I have had all my questions answered and voluntary agree to participate in this interview.
Participants Name (Please print):_____
Participant's Signature: _____Date:_____
Interviewer/Witness Signature: _____Date:_____

Should you have any pertinent questions about this research or its conduct, and research subjects' rights, and whom to contact in the event of a research-related injury to the subject, you may contact:

Jamie Zoellner, PhD, RD
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HNFE ILSB 23 Rm 1031
1981 Kraft Dr
Blacksburg, VA 24061
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zoellner@vt.edu

Ashley Zanko
Graduate Research Assistant
Human Nutrition, Foods, and Exercise
azanko@vt.edu

Institutional Review Board Contact: If you have any questions about the protection of human research participants regarding this study, please contact:
Dr. David M. Moore
Chair, Virginia Tech Institutional Review
Board for the Protection of Human Subjects, Office of Research Compliance
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, VA 24060
(540) 231-4991

Appendix D: Focus Group Script

Department of Human Nutrition, Foods, and Exercise
Evaluating the Public Health Impact of CG
Focus Group Script

Introduction: "Good afternoon, my name is Ashley Zanko. I am currently a Master's student at Virginia Tech in Human Nutrition, Foods, and Exercise. I am working on evaluating the public health impact of CG through an evidence-based evaluation framework called 'RE-AIM'. Each letter stands for a different dimension of the project: reach, effectiveness, adoption, implementation and maintenance. I will describe each dimension as we get to them, so don't worry about knowing them now. I want to thank you for taking the time to participate in this focus group today. The information you share with me will be helpful to this project and hopefully to your CG program. Do you have any questions before we begin?"

"For each of these 5 dimensions, I will ask you to share your reflections (R), visions (V), as well as the facilitators and barriers you have experienced with your garden."

[REACH-R]: "In the past growing season, what motivated you to become involved in the CG?"

[Probe-E]: "What were some benefits to your participation in the garden?"

[Probe-E]: "What were some barriers to your participation in the garden?"

[Effectiveness-R #]: "In this past growing season when you became involved in the garden, what outcomes did you *hope* your garden would achieve?"

[Probe-R]: "Tell me more. Any additional outcomes besides [insert those already mentioned]?"

[Probe-R #]: "Has your garden achieved these outcomes?" Explain why or why not.

[Effectiveness-R #]: "Can you share with me any adverse or unanticipated effects you have seen from your CG?"

[Effectiveness-R #]: "How did you feel about weighing and logging the produce that came out of your garden?

[Probe]: "What are some pros/cons?"

[Effectiveness-V]: "In the future, what suggestions do you have to capture or measure the impacts your CG is having.

[Effectiveness-V]: "In the future, what things might you do differently to ensure that your garden is successful?

[Reach-V]: "In the future, who else do you think should get involved with working in CG?"

[Probe-V]: "What suggestions do you have to reach or engage these individuals?"

[Probe-V]: "What are the advantages of trying to involve these individuals?"

[Probe-V]: "Talk to me about some of the challenges, if any, to reaching them?"

[Probe-R]: "In the future, who else do you hope will benefit from your garden?"

[Adoption –R]: "Now I want you to think about where your CG is located. What do you think are the *advantages* to having a CG in this setting?"

[Probe-R]: "What do you think are the *disadvantages* to having a CG in this setting?"

[Adoption –V]: "In the future, if more CG were developed and implemented, where would be the best location/setting."

"Now let's talk about the structure or organization of your CG."

[Implementation-R]: "What things about the structure or organization of your CG worked well?"

[If needed probe]: "think about the leadership, meetings, programs, events associated with your garden."

[Implementation-V]: In the future, what *suggestions* do you have that may improve the structure or organization of your CG."

[Probe-V]: "Again, please think about the leadership, meetings, programs, events

associated with your garden."

[Adoption-R #]: "Can you describe key characteristics or qualities of a successful CG leader."

[Probe-R]: "Any other key qualities?"

"Thank you for your information. Now we are going to talk about the maintenance and sustainability of your CG."

[Maintenance- Individual]: "What are the most important factors that will determine if you're involved into the next year?

[Maintenance –Organizational]: "How will your CG be sustained over the next year?

[Probe]: ""How will your CG be sustained over the next 5 years?"

[Probe]: "How do you hope to impact the sustainability of your garden?"

[Probe-V]: "What other suggestions do you have for the garden program's improvement?"

"All of this information has been extremely helpful! Is there anything that I have not asked that you would like to tell me about your experiences or visions for CG in the Dan River Region?"

"Thank you for your time and providing valuable information."

Appendix E: Focus Group Informed Consent

VIRGINIA POLYTECHNIC INSTITUTE AND STATE UNIVERSITY

Informed Consent for Focus Group Participants

Title of the Project: Evaluating the Public Health Impact of Community Gardens

Investigators: Dr. Jamie Zoellner, Principal Investigator, Virginia Tech
Dr. Jennie Hill, Co-Investigator, Virginia Tech
Dr. Kim Niewolny, Co-Investigator, Virginia Tech
Dr. Paul Estabrooks, Co-Investigator, Virginia Tech
Ashley Zanko, Graduate Research Assistant, Virginia Tech

I. Purpose of the Study
We are conducting a project involving community garden participants from gardens in the Dan River Region. We hope to identify community garden participant values and motivations for community garden involvement. This is part of a larger study exploring how community gardens are a mechanism for impacting health outcomes and community development.

II. Procedures
We will be holding focus groups for community garden participants at four community gardens in the Dan River Region. You are being asked to participate in focus groups with approximately 9 other participants. The focus group session will last approximately 60-90 minutes. Following the focus group, we will also ask you to fill out a short demographic screener.

As a participant in this study, you will be asked about what you liked or did not like about the past gardening season. Each of the focus groups will be audio recorded to provide an accurate report of your answers in the interview. Written notes will be taken as well.

When the focus group is complete the researchers will transcribe the focus group conversation without recording the names of the participants. We will also provide a summary of the focus group for the people who participated, so that you can look it over and provide any comments.

III. Risks
There is no risk to participate in this project. You may feel a slight discomfort while disclosing information in the focus group. Identities and information of participants will be protected at all times.

IV. Benefits
You may not personally benefit from this research. By participating in this research study, you will provide information that may lead to the progress of the community garden. You may contact the researcher at a later time for a summary of the research results.

V. Extent of Anonymity and Confidentiality
Your name and any other identifying information will be kept confidential and will not be released so that persons can identify you. You will only be identifiable to the members of the research team who conduct the focus group. The sessions will be transcribed by research assistants under the supervision of the principal investigator. The audio recording will be destroyed once the transcription is complete. All data will be stored in a locked cabinet in a

locked office at the Integrated Life Sciences Building at Virginia Tech. Only the research team will have access to the full transcription. Within the transcripts, you will be identified by a number. False names will be used to identify you in any written materials. All data will be destroyed after the study duration, the publication of any articles resulting from the study, or presentations made related to the study. This research project has been approved by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University.

VI. Compensation
As a token of our appreciation, each participant will receive refreshments and a $25 gift card to Wal-Mart at the focus group.

VII. Freedom to withdraw
You are free to withdraw from this study at any time without explanation. You are free not to respond to any question(s) during the focus group.

VIII. Your Responsibilities
I voluntarily agree to participate in a focus group as described above and complete a survey.

IX. Your Permission
I have read and understand the Consent Form and the conditions of this project.
I voluntarily agree to participate in the 60-90 minute **focus group and survey**.

_____ _____/_____/_____
Participant Signature Date

_____
Participant Printed Name

If you have any questions regarding this study, you can contact one of the investigators:

Jamie Zoellner, PhD, RD
Assistant Professor, Virginia Tech
Human Nutrition, Foods and Exercise
HNFE ILSB 23 Rm 1031
1981 Kraft Dr
Blacksburg, VA 24061
540-231-3670
zoellner@vt.edu

Ashley Zanko
Graduate Research Assistant
Human Nutrition, Foods, and Exercise
azanko@vt.edu

Institutional Review Board Contact
If you have any questions about the protection of human research participants regarding this study, please contact:

Dr. David M. Moore
Chair, Virginia Tech Institutional Review
Board for the Protection of Human Subjects, Office of Research Compliance
2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, VA 24060
(540) 231-4991

[NOTE: Subjects must be given a complete copy (or duplicate original) of the signed Informed Consent.]

Appendix F: Demographic Screener

CG Participation

1. Would you like to participate in a CG next year?

☐ **No$_0$** ☐ **Yes$_1$**

Demographic Questions

This questionnaire is needed to help us understand CG participants. For this reason it is very important information. Remember that all the information you provide is confidential and that you will not be singled out or identified as a result of this study. Please check the box to answer each question.

1. What is your gender?

☐ **Male$_0$** ☐ **Female$_1$**

2. What do you consider your race to be?

☐ **Black$_0$** ☐ **White$_1$** ☐ **Hispanic$_2$** ☐ **Other$_3$**

3. What is your age? (Please fill-in): _____

4. What is your height? (Please fill-in): _____**feet** _____**inches**

5. What is your weight? (Please fill-in): _____**pounds**

6. In general, would you say that your health is:

☐ **Excellent$_1$** ☐ **Very good$_2$** ☐ **Good$_3$** ☐ **Fair$_4$** ☐ **Poor$_5$**

7. What is the highest level of school or education you have completed?

☐	☐	☐	☐	☐	☐	☐
Less than 9th grade$_1$	**9th -12th grade- some high school$_2$**	**High school diploma or GED$_3$**	**Some college or specialized training- no degree$_4$**	**Received Associate's degree (2-yr college graduate)$_5$**	**Received Bachelor's degree (4-yr college graduate)$_6$**	**Attended graduate school$_7$**

8. Of these income groups, can you tell me which number best represents your family's total income in the last 12 months?

□ **Less than \$5,000$_1$**
□ **\$5,000-9,999$_2$**
□ **\$10,000-14,999$_3$**
□ **\$15,000-19,999$_4$**
□ **\$20,000-24,999$_5$**
□ **\$25,000-29,999$_6$**
□ **\$30,000-34,999$_7$**
□ **\$35,000-39,999$_8$**
□ **\$40,000-44,999$_9$**
□ **\$45,000-49,999$_{10}$**
□ **\$50,000-54,999$_{11}$**
□ **More than \$55,000$_{12}$**

9. How many children do you have under the age of 18 living at home? _____

10. Thank you for your time in answering all of these questions. The information you have provided is very valuable. Is there anything you would like to add?