AN EXAMINATION OF INTRAPERSONAL AND ENVIRONMENTAL FACTORS RELATED TO USE OF NUTRITION AND PHYSICAL ACTIVITY COMMUNITY RESOURCES AMONG UNDERSERVED WOMEN

Stephanie Bell Jilcott

A dissertation submitted to the faculty of the University of North Carolina at Chapel Hill in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the Department of Nutrition in the School of Public Health.

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Approved by
Advisor: Alice Ammerman
Reader: Shrikant Bangdiwala
Reader: Robert DeVellis
Reader: Kelly Evenson
Reader: Barbara Laraia
ABSTRACT
Stephanie Bell Jilcott

An Examination of Intrapersonal and Environmental Factors Related to Use of Nutrition and Physical Activity Community Resources Among Underserved Women
(Under the direction of Alice Ammerman)

Health promotion interventions among the underserved should address community-level barriers to healthy behaviors, as it is likely that such barriers exacerbate health disparities. This study employed qualitative and quantitative research methodology to examine intrapersonal and environmental factors related to use of nutrition and physical activity community resources among underserved women. Qualitative interviews were conducted to develop a conceptual framework describing influences on food choice in specific food environments. Key environmental influences on food choice were: (1) urban and rural differences in access to community food sources; and (2) the importance of the community nutrition environment surrounding work. At the intrapersonal level, food choices were influenced by women’s desires to (1) provide healthy food for children and (2) prevent or manage disease. These data were also used to develop theory-informed community resource intervention tools, designed to enhance the ability of women to identify and address community barriers and resources.

The newly developed community resource intervention tools were used in a randomized intervention trial of a cardiovascular disease risk reduction program for underinsured, midlife women (n = 236). In order to evaluate the impact of the community resource intervention tools, mediation analyses were conducted. In urban women, there was a
significant intervention effect on self-reported use of nutrition resources. The effect on self-reported use of physical activity resources approached statistical significance. Self-efficacy for accessing resources was not a mediator, while knowledge was a potential mediator of the intervention effect on use of physical activity resources.

To further examine the relationship between intrapersonal and environmental factors, the correlation between perceived and objectively measured access to physical activity resources was examined, revealing slight to moderate correlations. Cross-sectional analyses between objectively measured moderate to vigorous physical activity and perceived and objectively measured access to physical activity resources showed statistically significant associations between activity and (a) perceived distance to gyms, and (b) objectively measured number of schools in a 1-mile radius of participants’ homes. Taken together, this research supports the importance of addressing both intrapersonal and environmental factors related to the use of community resources when designing future interventions.
To my parents, Stephen and Beverly Jilcott
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Low-income, midlife women are at increased risk of developing chronic diseases, and often have less access to preventive services and programs. Prevention programs for such women have the potential for far-reaching, positive impacts, because women are likely to influence the health behaviors of family and community members through their traditional roles in food preparation and as leaders in many spheres of community life.

Environmental factors, such as proximity to nutrition and physical activity community resources (e.g., produce markets, parks) can support or hinder healthy lifestyle practices. While socioeconomic health disparities may be partially due to the fact that low-income individuals face more community-level barriers to a healthy diet and physical activity, most low-income neighborhoods are also likely to contain supportive community resources. Because of this, individually-focused, clinic-based health promotion programs may be more likely to result in healthy behavior change if they incorporate linkages to these supportive resources. However, clinic patients and providers may not be aware of existing resources. Thus, a potentially effective strategy is the use of intervention tools to equip individuals to overcome community-level barriers to healthy behaviors by using existing community resources. Linking individuals more effectively to resources may be more feasible than creating new programs or structures.
Development of intervention tools linking program participants to community resources should take into account participants’ perceptions of community-specific nutrition and physical activity resources, so that relevant barriers are addressed and so that resources suggested are culturally appropriate and financially feasible for the priority population. To this end, intervention tools should be pilot tested with members of the priority population. Although other health promotion and chronic disease prevention programs have used community resource intervention tools, few have included a detailed description of how the tools were developed.

Once such tools are used in an intervention, it is important to elucidate the mechanisms by which the intervention tools exert an influence on participant outcomes so that in future interventions, the most influential constructs (mediators) can be targeted. Previous research evaluating the effectiveness of intervention tools linking individuals to community resources has not included examination of potential mediation of the intervention effects on use of resources by psychosocial and behavioral variables.

The relative influence of perceived versus objectively measured access to physical activity resources on physical activity is unclear from prior work. Clarification of the relative influence of individuals’ perceptions of access versus objectively measured access on physical activity is important for future intervention planning. For example, targeting psychosocial mediators associated with use of community resources may be an important intervention strategy if perceived access to resources is more strongly associated with physical activity than objectively measured access. If objectively measured access is more strongly related, strategies to improve the built environment, such as increasing access to parks and asking schools to allow the public to use facilities, will likely be most effective.
The WISEWOMAN (Well-Integrated Screening and Evaluation for Women Across the Nation) Project is a clinic-based, federally-funded initiative to develop and test innovative cardiovascular disease prevention programs among underinsured, midlife (40-64 years) women. This research project was ancillary to a multi-component, randomized controlled intervention trial of the WISEWOMAN Project. Qualitative data were used to develop community resource intervention tools specific to the study area. The tools were evaluated using quantitative data collected from the randomized trial. In a secondary data analysis, the correlation between perceived and objectively measured access to physical activity resources was examined. Finally, the relative associations between objectively measured physical activity and both perceived and objectively measured access to physical activity resources were assessed.

I.B. Specific Aims

Aim 1. To examine women’s perceptions of and interactions with their food and physical activity environments by conducting semi-structured, in-depth interviews.

Aim 1a. To develop a conceptual framework describing how underserved, midlife women perceive and interact with the food environment.

Aim 1b. To develop a theory-informed Community Nutrition and Physical Activity Resource Guide and a Neighborhood Assessment with Tip Sheets, which are intervention tools designed to enhance the ability of women to identify and address community resources and barriers related to a healthy diet and physical activity.

Aim 2. To evaluate the impact of the community resource intervention tools (the Community Nutrition and Physical Activity Resource Guide and Neighborhood Assessment with Tip Sheets) on the effect of the intervention.
Aim 2a. To examine whether knowledge of and self-efficacy for accessing community resources mediate the effect of the intervention on self-reported use of community resources.

Aim 2b. To examine whether self-reported use of community resources mediates the effect of the intervention on fruit and vegetable consumption and moderate to vigorous physical activity.

Aim 3. To determine whether there is an association between objectively measured moderate to vigorous physical activity and both perceived access to physical activity resources and objectively measured access to physical activity resources.

Aim 3a. To examine the correlation between perceived and objectively measured access to physical activity resources (e.g., parks, gyms, schools).

Aim 3b. To examine the cross-sectional association between moderate to vigorous physical activity and: a) perceived access to physical activity resources; and b) objectively measured access to physical activity resources.
CHAPTER 2
THEORETICAL FRAMEWORK

II.A. People-Environment Transactions

This research project was informed by the social ecological framework and the social cognitive theory. Both highlight the dynamic interplay between an individual’s environment and her personal attributes, purporting that the same environment will elicit different behaviors based on the individual’s personality, perceptions, and resources.\textsuperscript{1,2} Both theories posit that individual cognitions and attributes, individual behaviors, and individuals’ environments are influenced by each other, a phenomenon referred to as “people-environment transactions”\textsuperscript{1} or “reciprocal determinism.”\textsuperscript{2} Thus, an intervention that increases an individual’s knowledge about the health benefits of walking (individual cognition) and improves access to a safe, scenic route for walking (physical environment) may result in the desired outcome of increased walking (individual behavior). Increased walking by a few individuals in a community could change the social norm to be more supportive of walking (social environment) and provide impetus for construction of more walking trails (physical environment).

In addition, the social ecological framework suggests that there are multiple influences on health behaviors, and that approaches on multiple levels are needed to achieve and maintain individual behavior change.\textsuperscript{3,4} These levels include the intrapersonal level (e.g., food preferences, knowledge of the health benefits of physical activity); the interpersonal level (e.g., family norms regarding meals, co-workers attitudes about walking during lunch);
the organizational level (e.g., food provided at health care institutions); the community level (e.g., availability of walking trails); and the policy level (e.g., federal laws regarding agricultural subsidies). The social and physical environments also influence behavior and are included within the interpersonal, organizational, community, and policy levels. For the purpose of this research, the environment was defined as “those factors (social or physical) that can affect a person’s behavior that are physically external to that person.”

II.B. The Chronic Care Model

Most WISEWOMAN Projects are implemented in state health departments and in local community health centers. In such health care settings, addressing environmental and community factors that support or hinder healthy behaviors is difficult due to both the traditional focus of clinic-based prevention programs on individual-level attitudes and behaviors, and the limited resources available for preventive care. Wagner’s Chronic Care Model (Appendix A) provides a framework to begin addressing broader determinants of health in clinical settings. According to the model, the success of chronic disease prevention and management efforts depends on effective interactions between informed, activated patients and prepared, proactive practice teams. This research primarily addressed the following Chronic Care Model elements: (1) community resources and policies, or social-environmental supports related to preventive behaviors; and (2) self-management support, wherein the participant plays an active role in setting achievable lifestyle change goals and acquires the skills needed to make healthy changes. Although conceptualized primarily as a disease management tool, the Chronic Care Model is useful to inform preventive efforts and was evaluated in terms of its potential effectiveness for integrating WISEWOMAN into community health center settings. While the Model optimizes chronic disease management
and preventive care by integrating elements of the health care organization with community resources and policies, little is known about the best practices to effectively foster and support healthy behavior change through supportive community elements.

II.C. The Intervention Continuum

Public health intervention efforts fall on a continuum from passive to active strategies, where passive strategies are those that protect individuals automatically, such as policies to control toxic emissions, while active strategies, such as adding a warning label to cigarette packages, require individuals to make a choice for protection. Environmental interventions that target health behaviors can be passive or active and usually fall somewhere in the middle of the continuum. For example, interventions that add signs to vending machines promoting consumption of low-fat snacks or signs encouraging use of stairs cannot be labeled as solely passive or active. Such interventions require individuals to make some choice about what action to take, yet have also altered the physical environment so that healthier choices are easier to make. Glanz and Mullis define environmental interventions as “that class of strategies which does not require individuals to self-select into a defined educational program.” Schmid et al. define environmental interventions as “measures that alter or control the physical or social environment” and state that such measures may address availability, access, or social norms. For example, Booth et al. suggested several environmental interventions, including targeting the transportation industry to improve biking and walking infrastructure, working with architects to increase the attractiveness and accessibility of stairs, and working within the information environment to increase advertisements for healthy foods.
WISEWOMAN participants’ food and physical activity choices are affected by factors on each level of the social ecological framework, including the social and physical environments of their homes, workplaces, religious and social institutions, and communities. The intervention tools developed and evaluated for this research project were designed to change women’s knowledge and perceptions of the nutrition and physical activity environments. The tools operate at the intrapersonal level to support women in evaluating for themselves how environmental- and community-level factors may be contributing to diet and physical activity practices.

Because of the potential for broad reach into the population, policy change interventions are appealing public health strategies. Here, policy is defined as “those laws, regulations, formal and informal rules and understandings that are adopted on a collective basis to guide individual and collective behavior.” Sallis et al. note that policies should include provision of behavior change programs to encourage individuals to take advantage of supportive environments. Such programs are needed in an overall strategy to decrease chronic disease risk by increasing healthy dietary patterns and population levels of physical activity. Thus, if federal policy continues to mandate and fund WISEWOMAN and if the intervention tools developed as a part of this research are disseminated and used by other projects, the tools may also be considered part of a policy-level intervention.
CHAPTER 3
LITERATURE REVIEW

III.A. Need for Effective Health Promotion Interventions among Low-income Midlife Women

There is currently an epidemic of obesity in the United States, followed closely by rising rates of associated chronic diseases such as cancer, diabetes, and cardiovascular disease. Individuals who consume recommended amounts of fruits and vegetables and are physically active are less likely to become obese and more likely to delay or prevent onset of chronic diseases.14-16 The burden of these chronic diseases and related risk factors is higher among low-income individuals.17,18 Thus, innovative and effective health promotion strategies are needed for low-income populations. Women in particular offer a strategic population in which to intervene, because they are gatekeepers, typically shopping for and preparing food for their families, and have the potential to positively influence the health behaviors of family members.19,20

III.B. The WISEWOMAN Project

Designed to address the need for health promotion interventions in low-income women, the WISEWOMAN (Well-Integrated Screening and Evaluation for Women Across the Nation) Project is a federally-funded cardiovascular disease risk reduction program administered in a clinical setting. It is designed to help underserved women between the ages of 40 and 64 years reduce their risk of heart disease and stroke through screening and a lifestyle intervention to support adoption of a healthier diet, increased physical activity, and
smoking cessation. In the past, the lifestyle intervention component of the WISEWOMAN Project primarily addressed individual-level factors, with less attention given to the obesigenic environments in which participants are making choices. This led to the recommendation from a group of experts evaluating the WISEWOMAN Project to “make greater use of existing community resources and community members in WISEWOMAN projects’ intervention designs.” The group stated that by doing so, “WISEWOMAN projects may be able to make more efficient use of the limited program funds available for lifestyle interventions, while developing interventions that more clearly target community-level risk factors.” However, it is challenging to address community-level factors in the WISEWOMAN clinic-based intervention because it traditionally has had an individual-level focus and there are limited resources for prevention and community change.

While low-income and minority individuals face many environmental barriers to healthy living, low-income neighborhoods may also have affordable and accessible community resources, such as county-funded gyms and fresh produce stands. These resources can support healthy choices, making it possible for individuals to overcome environmental barriers to a healthy diet and active lifestyle. Therefore, the approach used in this research project (which was ancillary to a randomized trial of the WISEWOMAN Project) was to equip individuals to overcome knowledge and access barriers to the use of community resources, as this may be a more feasible approach than creating new resources.

III.C. Community-level Influences on Physical Activity and Food Choice

Socioeconomic disparities in health-related behaviors may be partially due to the fact that low-income and racial minority individuals face many community-level barriers to a healthy lifestyle. Low-income individuals also have fewer resources to overcome such
barriers compared to more affluent individuals. Qualitative research suggests that community-level barriers to physical activity among low-income women include the high cost of some recreational opportunities, lack of culturally appropriate programs and resources (especially for rural women), and perceived crime. Focus group discussions conducted among midlife women explored individual, socio-cultural, environmental, and policy level influences on women’s physical activity, resulting in a model which suggested physical environmental interventions, such as creating women-only facilities and improving lighting in parks and on streets, and policy interventions, such as providing transportation to and from exercise facilities and providing financial assistance for the cost of programs.

Two quantitative studies demonstrated that low-income areas had fewer physical activity resources than higher income areas. In a small Midwestern city, low and mid-socioeconomic neighborhoods had significantly fewer free-for-use physical activity facilities than did high-socioeconomic areas. In South Carolina, Wilson et al. found fewer trails in low socioeconomic neighborhoods compared to higher-socioeconomic areas. Cross-sectional studies have demonstrated that perceived and objectively measured access to physical activity resources (e.g., parks, fitness centers) are both associated with more physical activity. Overall, qualitative and quantitative data indicate that low-income individuals may be hindered in efforts to be physically active because they face geographic and economic barriers to using supportive community resources.

Qualitative research regarding environmental influences on food choice also indicates that there is restricted access to places with healthy, inexpensive food in rural and urban, inner-city areas, where low-income individuals are likely to reside. In the rural Western Isles of Scotland, the quality and quantity of fresh produce was severely limited, and because of
the high cost of produce, study participants indicated that it was a luxury.\textsuperscript{36} A Canadian study used observations and in-depth interviews to study food practices of low-income women in an urban center.\textsuperscript{37} Women in the study had limited access to affordable food stores, and food stores in the inner city had prices 10\% higher than stores of the same chain in a suburban area.\textsuperscript{37}

Quantitative studies also indicate that there is greater access to unhealthy foods (e.g., fast food) and less access to healthy options in low socioeconomic areas. More specifically, there are fewer supermarkets in low-income, urban and rural areas compared to higher-income, suburban areas.\textsuperscript{38-41} Primarily African American neighborhoods were further from supermarkets than neighborhoods with primarily white residents.\textsuperscript{42;43} Additionally, foods recommended as a part of a healthy diet are less likely to be sold in grocery stores in some minority areas.\textsuperscript{44;45} Three studies have demonstrated that fast food restaurants, considered a community-level barrier to healthy eating, are more common in neighborhoods where low-income and minority individuals live.\textsuperscript{46-48}

Living closer to supermarkets is associated with consumption of a more healthful diet. In two cross-sectional studies of this relationship, produce consumption increased\textsuperscript{43} and diet quality improved\textsuperscript{49} with increasing proximity to supermarkets. Rose et al.\textsuperscript{50} found that participants in the Food Stamp Program who lived further from supermarkets purchased less fruit. The construction of a supermarket in a ‘food desert’ (a pre-defined area without access to healthy, low-cost foods) was followed by an increase in produce consumption among individuals living in the area, and those living closest to the supermarket reported the largest increases in consumption.\textsuperscript{51}
Taken together, research to date suggests that the unequal burden of chronic disease and obesity in low-income and minority populations is partially due to geographic and economic barriers to obtaining healthy, low-cost food and safe and appealing opportunities for physical activity. Strategies to combat these community-level barriers are needed. Design of effective interventions to address such barriers in a specific population of low-income, midlife women should include qualitative research to learn about community-specific barriers and about local community resources women use to overcome barriers. More work is needed to learn about the most effective approaches to help women overcome intrapersonal and environmental barriers to accessing resources. Effective strategies may involve individual-level approaches, such as increasing knowledge of and self-efficacy for accessing available options, or environmental approaches, such as increasing access to resources (e.g., building a park).

**III.D. Use of Nutrition and Physical Activity Community Resources**

Increasing individuals’ use of nutrition and physical activity resources is an important goal because use of resources is associated with healthful downstream behaviors (e.g., fruit and vegetable consumption, physical activity). For example, previous work indicated that use of a large supermarket was associated with increased fruit and vegetable consumption\(^\text{51}\) and use of physical activity resources was associated with increased activity.\(^\text{52,53}\) Price,\(^\text{54}\) taste,\(^\text{55}\) convenience,\(^\text{56}\) and proximity to supermarkets\(^\text{49}\) are thought to affect food choice. Therefore, food stores offering inexpensive, tasty, convenient foods are likely to be used most often. In contrast, lack of transportation and increasing distance are likely to be associated with less frequent use.\(^\text{57}\) In terms of physical activity resources, a review of prior work revealed that neighborhood streets, parks, and other outdoor, free-for-use neighborhood facilities are most
frequently used for physical activity, likely due to cost and convenience of use. Lindsey et al. found that positive correlates of urban trail traffic were socioeconomic status of the trail neighborhoods, population density, vegetative health, and percent of neighborhood in commercial use. Intrapersonal factors such as gender, race, and perceptions of other park users influence use of parks, as do environmental factors, such as distance to, attractiveness, and size of the park.

Specific factors that influence the use of a particular supportive resource (e.g., a produce market or community gym), likely fall on two levels: (1) intrapersonal influences; and (2) characteristics of the resource that influence use. It is important to examine factors that determine use of supportive community resources. Resulting knowledge can guide development of new community resources, as well as guide development of individual-level interventions to encourage individuals to use existing resources.

III.E. Development and Use of Health Promotion Directories

Intervening on the individual level to increase awareness and use of existing community resources is a potentially effective intervention strategy for clinic-based programs such as WISEWOMAN. Assets-mapping, traditionally used in the field of community development, entails evaluating and building connections between the capacities, assets, and skills of individuals, associations, and institutions in a community. Rather than focusing on community deficiencies, as in needs assessment, assets-mapping focuses on community strengths.

To increase awareness of community strengths and resources, several investigators have developed health promotion directories and wellness guides. In California, extensive community involvement was used to develop an 80-page booklet covering a wide
range of health-related personal, social, and environmental topics.\textsuperscript{63} Drafts of this Guide were reviewed by experts and by over 500 residents of California. Participants in an evaluation study were WIC (Supplemental Feeding Program for Women, Infants, and Children) clients in a random sample of WIC clinics where the Guide was distributed and a control group of WIC clients in randomly selected clinics where the Guide was not distributed. The investigators found consistently greater improvements among Guide recipients compared to non-recipients in: (1) knowledge about where to get more information about health-related topics; and (2) confidence for wellness assistance-seeking. Evaluation results indicated that the Guide was well received and used (Table 3.1). Favorable results were partially attributed to community participation in the development of the Guide.\textsuperscript{63}

Miller and Miller\textsuperscript{64} developed a physical activity directory after consulting with members of the priority population of older adults. The Directory was a 28-page pocket-sized booklet and had activity options including fitness centers, sports clubs, and water aerobics classes. The Directory was evaluated using two groups: one group of individuals requested the Directory, and the other group was given the Directory at a local health promotion program. After six weeks, evaluation results suggested that the Directory was acceptable to participants, but few (5\%) reported using resources in the Directory. (Table 3.1) Individuals who requested the directory were more likely to have read it but were not more likely to have called or used a class or service.\textsuperscript{64}

Haber and Looney\textsuperscript{65} provided a description of the development, distribution, and use of a Health Promotion Directory for older participants. The Directory included topics such as medical screenings, physical activity, nutrition, and home and driving safety. Based on input from 25 diverse older adults and 25 health professionals, the Directory was revised in several
ways (e.g., reduced the scope and number of topics covered, reduced the reading level).

Evaluation results indicated that, compared to other studies, a large proportion of participants reported calling a number in the Directory. Favorable results were partially due to the extensive community feedback used to revise the Directory.

Miller and Miller\textsuperscript{64} and Haber and Looney\textsuperscript{65} concluded that randomized controlled designs should be used to evaluate future health promotion directories and wellness guides. In addition, Haber and Looney suggested that health promotion directories be developed using feedback from health professionals and members of the priority population.\textsuperscript{65} Little is known about the most effective methods to gather information about community-specific resources and about how to most effectively encourage the use of such resources. Thus, formative research is important to guide development of future health promotion directories.

### Table 3.1. Summary of Health Promotion Directory Use

<table>
<thead>
<tr>
<th>Process or outcome measure</th>
<th>Sample size and reference</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N = 356\textsuperscript{63}</td>
</tr>
<tr>
<td>Remember receiving the Directory (%)</td>
<td>--</td>
</tr>
<tr>
<td>Read the Directory (%)</td>
<td>86</td>
</tr>
<tr>
<td>Called a number in the Directory (%)</td>
<td>16</td>
</tr>
<tr>
<td>Attended a class in the Directory (%)</td>
<td>--</td>
</tr>
<tr>
<td>Directory prompted behavior change (%)</td>
<td>26</td>
</tr>
<tr>
<td>Topics or resources in Directory discussed with friends (%)</td>
<td>--</td>
</tr>
<tr>
<td>Will use Directory in the future (%)</td>
<td>65</td>
</tr>
</tbody>
</table>

#### III.F. Use of Health Promotion Directories in Multi-Component Interventions

Several multi-component interventions have used health promotion directories to link participants with supportive community resources.\textsuperscript{66-69} Two studies used a resource manual
listing local physical activity opportunities as one intervention component to increase physical activity. In both studies, intervention participants were significantly more active at follow-up, yet there was no description of how the resource manual was developed or how it may have facilitated the intervention’s effect on increasing physical activity. The Healthy Directions-Health Centers study gave participants information about local resources that could support physical activity or dietary goals. The intervention was associated with favorable changes in dietary goals, but no data were presented to indicate how the use of nutrition resources may have contributed to favorable intervention effects.

Glasgow et al. implemented the “Choosing Well” diabetes self-management intervention to facilitate healthier dietary practices. Participants’ use of community resources was one intervention outcome, measured using a validated Chronic Illness Resources Survey. The intensive intervention (baseline to 6-months) consisted of a brief counseling session, a computerized assessment of dietary patterns and barriers, and a summary of tailored dietary goals. Participants also received either: (1) a telephone support maintenance intervention, consisting of follow-up calls which provided problem-solving training and relapse prevention; or (2) a community support maintenance intervention, which included a binder of community resources for a healthier diet, eight newsletters encouraging participants to look for community support, and face-to-face goal-setting activities for using community nutrition resources. The intervention was associated with modest, yet significant, favorable changes in healthful dietary practices, clinical measures, and use of community resources. Against expectations, participants randomized to the community support maintenance intervention did not report significantly greater increases in use of resources compared to those in the telephone follow-up support group. An improvement to the design of the study...
would have been measurement of specific constructs that potentially mediate the effect of the intervention leading to increased community resource use, such as knowledge of or self-efficacy for accessing resources.

**III.G. Potential Mediators of Intervention Effects**

Baranowski et al.\(^7^2\) note the importance of examining mediators of intervention effects so that future interventions can target relevant intrapersonal, interpersonal, and environmental constructs. Knowledge of existing resources is a potential mediator of the effect of community resource intervention tools on use of resources: Although an individual might live close to a local resource, if she is not aware of it or does not perceive that she has access to it, she will not use it. In one study,\(^7^3\) more than 80% of respondents said that an environmental support did not exist in their communities when one in fact did exist, suggesting low awareness of existing community resources.

Self-efficacy is another potential mediator, defined as “a person’s confidence in performing a particular behavior” (p 157).\(^2\) Prior research studies have evaluated self-efficacy for physical activity\(^6^7;^7^4\) and self-efficacy for making time for activity\(^7^5\) as mediators of the intervention effect on physical activity. Haber and Looney\(^6^5\) suggested that increasing an individual’s knowledge of community resources should increase skills and self-efficacy (confidence) for accessing resources. Evaluation of the California Wellness Guide revealed that both knowledge and confidence to acquire wellness-related information increased among Guide recipients.\(^6^3\) More work is needed to learn of the effects of community resource intervention tools on potential intrapersonal-level mediators (e.g., knowledge, self-efficacy) related to community resource use.

**III.H. Perceived and Objectively Measured Accessibility to Physical Activity Community Resources**
Increased knowledge of and self-efficacy for using community resources may change individuals’ perceptions of access to resources. Perceived access to physical activity facilities is positively associated with physical activity.\textsuperscript{29-32} A recent meta-analysis of 16 studies found that individuals who were active at recommended levels were 20% more likely to perceive that physical activity facilities were accessible compared to those not achieving recommended physical activity levels (OR = 1.20, 95\% CI = 1.06, 1.34).\textsuperscript{32}

Objectively measured access to resources is also associated with physical activity levels.\textsuperscript{33-35} A study among older women found that closer proximity to golf courses and post offices was associated with more pedometer-measured physical activity.\textsuperscript{35} In another study, there was no association between the presence of activity resources (measured by counting parks and other resources within 400-meter buffers around participants’ homes) and meeting physical activity recommendations, leading to the conclusion that perceived access may be more influential in predicting activity compared to objectively measured access.\textsuperscript{76}

Although they are likely related, perceived and objectively measured access to resources may contribute independently to physical activity levels. Learning which measure of access has a stronger relationship with activity will help to inform future intervention efforts. Providing individuals with health promotion directories or resource guides may increase perceived access to resources, yet if objectively measured access is more strongly related to activity, environmental change strategies may be needed. Few studies have addressed this by including both perceived and objectively measured access in the same study.\textsuperscript{33,34,77} Results of one of these found a significant effect of objectively measured distance to local resources on physical activity, but also found that individual and social factors were more important predictors of physical activity than distance.\textsuperscript{77} Data from Sallis
et al.\textsuperscript{33} indicate that objectively measured density of physical activity facilities was positively associated with physical activity, while individuals’ perceptions of convenient facilities were not significantly associated with activity. Another study found that use of a bikeway was inversely associated with GIS road network distance and with self-reported distance to the bikeway, but that the association was stronger using the objective (GIS) measure.\textsuperscript{34} Three perceived environmental variables (i.e., enjoyable scenery, presence of streetlights, and sidewalks) and one objectively measured environmental variable (GIS-measured distance to a trail) were significantly related to transportation activity in a subsequent study.\textsuperscript{78}

Little is known about the relationship between perceived and objectively measured access to resources. Sallis et al.\textsuperscript{33} found that, contrary to their hypothesis, there were no significant correlations between individuals’ perceptions of the convenience of facilities and objectively measured density of facilities. However, there was a significant correlation between self-reported distance to a community trail and GIS-derived distance to the trail ($r=0.46$).\textsuperscript{34} Kirtland et al.\textsuperscript{73} reported Kappa coefficients as a measure of agreement between neighborhood survey items (perceptions) and GIS (objective) neighborhood measures. The Kappa for the item “Does your neighborhood have public recreation facilities?” was 0.30, with inactive respondents having lower agreement than active respondents (Kappa = 0.16, 0.35 respectively) between perceptions and GIS measures. However, another study found no agreement between individuals’ awareness (perception) and GIS measured presence of trails.\textsuperscript{79} Thus, there is conflicting evidence from studies that have measured agreement between perceived and objectively measured access to physical activity resources: three found low to fair agreement between the two measures\textsuperscript{33,73,79} and one found a significant correlation between the two measures of access.\textsuperscript{34}
Objective measures of physical activity are important to reduce measurement error due to inaccurate recall or social desirability.\textsuperscript{80} King et al.\textsuperscript{81} found that women who reported living within walking distance to a park, trail or department, discount, or hardware store had higher numbers of steps, measured objectively by pedometer. A subsequent analysis revealed that GIS-measured proximity to a golf course and post office were associated with more pedometer-measured PA.\textsuperscript{35} Three additional studies of the association between environmental variables and PA have used objective measures of PA.\textsuperscript{82-84} Saelens et al.\textsuperscript{82} used accelerometers to validate an environment scale, finding that residents of more walkable neighborhoods had significantly more minutes of objectively measured PA. Two other studies have linked perceived\textsuperscript{83} and objectively measured\textsuperscript{84} neighborhood walkability with objectively measured PA. However, no studies have evaluated the relationship between objectively measured distance to and density of PA resources and accelerometer-measured physical activity among low-income, midlife women.

**III.I. Summary and Conclusions**

There is a disproportionate burden of chronic disease and associated risk factors among low-income, midlife women, partially due to inequitable geographic and economic access to supportive community resources. There is a critical need for interventions addressing individual, social, and physical environmental factors in this population. Use of nutrition and physical activity community resources is associated with fruit and vegetable consumption and physical activity. In order to design more effective interventions and policies, greater understanding is needed regarding how women overcome community-level barriers, about specific resources they use, and about factors that influence use of community resources.
Interventions including health promotion directories have attributed favorable results to formative research and pilot testing in the priority population. However, few studies provided details on pilot testing, on how information about community-specific resources was obtained, or about how to develop community resource intervention tools. Few studies have explored potential pathways by which such tools contribute to an overall intervention effect. Thus, research is needed to learn about the process of developing community resource intervention tools and the mechanisms by which such tools may lead to increased use of resources, ultimately supporting downstream behavior change.

There are conflicting results regarding the correlation between perceived and objective measures of access to physical activity resources. Additionally, few studies have assessed the relative associations between objectively measured moderate to vigorous physical activity and both perceived and objectively measured access to physical activity resources. Clarifying these relationships is important for designing future interventions and policies to promote increased physical activity in underserved, midlife women.
IV.A. WISEWOMAN Project Randomized Controlled Trial

The WISEWOMAN (Well-Integrated Screening and Evaluation for Women Across the Nation) Project is a cardiovascular disease risk-reduction program for underserved, midlife women. To be eligible, women must be 40-64 years old, enrolled in the National Breast and Cervical Cancer Early Detection Program, and be un- or underinsured. WISEWOMAN Projects are either standard or enhanced, and both types of projects include cholesterol and blood pressure screening and a lifestyle intervention which focuses on supporting adoption of a healthier diet, more physical activity, and smoking cessation. Enhanced projects test the effectiveness of innovative program approaches to CVD risk reduction by randomizing women or sites to receive either a minimum intervention (control group) or a special intervention.

This project occurs within the context of an enhanced WISEWOMAN Project, wherein 236 women were randomized to either an intervention or control group. The larger study (WISEWOMAN) was funded by the Centers for Disease Control and Prevention and tested 2 new program approaches to CVD risk-reduction: (1) lay helpers (Community Health Advisors) and (2) linkages to community resources. Figure 4.1 shows the WISEWOMAN Project flow diagram. The 12-month WISEWOMAN Project intervention consists of several components. A manuscript describing baseline characteristics of the study population and the study designed to evaluate the intervention’s effectiveness is in Appendix A. At baseline,
women were, on average, 53 years old, 60% were non-Hispanic white, 95% had no health insurance, and approximately 75% of participants were overweight or obese.

The focus of this study was the development and testing of a new WISEWOMAN program approach of linking participants to supportive community resources. To this end, a Community Resource Guide was developed, which listed local community resources to support a healthier diet and increased physical activity. It was given to participants at the second individual counseling session, where the health counselor encouraged participants to try one or more resources. It was also referred to at group sessions, where women set goals to visit a new resource. At the six-month clinic visit, the health counselor administered another community resource tool, the Neighborhood Assessment, designed to help women evaluate their interactions with environmental and community-level resources and barriers. The Assessment facilitated collaborative goal-setting to overcome environmental barriers and use resources. The health counselor used corresponding Tip Sheets to encourage the woman to use community resources (e.g., parks) and to provide motivation for overcoming community-level barriers. Women were given copies of their goals to put up in the home as a reminder, and community health advisors asked women about their progress on goals in monthly phone calls. Within the larger framework of the WISEWOMAN Project, the new tools developed and evaluated as a part of this study are shown in Figure 4.1 in bold italics: the Community Resource Guide (CRG) and the Neighborhood Assessment and Tip Sheets (NHA). (See tools in Appendix B.)
Baseline measures: diet, physical activity, blood pressure, height, weight, blood lipids, blood glucose, psychosocial measures (N = 236)

118 women randomized to intervention group (Group A) received:
- Individual counseling sessions (CRG)
- Group sessions (CRG)
- Community health advisor contacts

Administration of the NHA; Group A gets counseling and goal-setting using the NHA tip sheets

6-month follow-up measures: diet, physical activity, blood pressure, height, weight, blood lipids, psychosocial measures

Maintenance intervention included mailings (CRG) and community health advisors (CRG and goals from NHA)

12-month follow-up measures: diet, physical activity, blood pressure, height, weight, blood lipids, psychosocial measures; Administration of the NHA

118 women randomized to control group (Group B):
Received 2 mailed pamphlets on diet & activity
IV.B. Description of Study Area

Most of the women enrolled in the WISEWOMAN Project were from New Hanover, Pender, and Brunswick counties, in southeastern North Carolina. The Project was based in New Hanover Community Health Center, a federally and locally funded clinic for the underserved in the area. The Community Health Center is located in downtown Wilmington. Wilmington is situated on the Cape Fear River and is approximately 10 miles from the intercoastal waterway. Table 4.1 presents demographic data for the area (U.S. Census Bureau, 2000, www.factfinder.census.gov). Figure 4.2. shows downtown Wilmington with colors representing percentages of individuals below poverty. Darker colors represent more poverty. The star indicates the location of the New Hanover Community Health Center.

Table 4.1. Demographic Data for the Study Area

<table>
<thead>
<tr>
<th></th>
<th>New Hanover County</th>
<th>Brunswick County</th>
<th>Pender County</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total population</td>
<td>160,307</td>
<td>73,143</td>
<td>41,082</td>
</tr>
<tr>
<td>Population 35-64 years (%)</td>
<td>40</td>
<td>43.2</td>
<td>42.2</td>
</tr>
<tr>
<td>White (%)</td>
<td>79.9</td>
<td>82.3</td>
<td>72.7</td>
</tr>
<tr>
<td>Black (%)</td>
<td>17.0</td>
<td>14.4</td>
<td>23.6</td>
</tr>
<tr>
<td>High school graduate or higher (%)</td>
<td>86.3</td>
<td>78.3</td>
<td>76.8</td>
</tr>
<tr>
<td>Unemployment (%)</td>
<td>3.8</td>
<td>2.6</td>
<td>3.3</td>
</tr>
<tr>
<td>Walking to work (%)</td>
<td>1.7</td>
<td>1.6</td>
<td>1.2</td>
</tr>
<tr>
<td>Mean travel time to work (minutes)</td>
<td>20.7</td>
<td>24.6</td>
<td>29.2</td>
</tr>
<tr>
<td>Per capita income (dollars)</td>
<td>23,123</td>
<td>19,857</td>
<td>17,882</td>
</tr>
<tr>
<td>Individuals below poverty level (%)</td>
<td>13.1</td>
<td>12.6</td>
<td>13.6</td>
</tr>
<tr>
<td>Grandparents responsible for grandchildren (%)</td>
<td>51.8</td>
<td>59.1</td>
<td>64.7</td>
</tr>
</tbody>
</table>
### IV.C. Background Work: Exploring the Nutrition and Physical Activity Environments

**The Nutrition Environment:**

A grocery store audit was conducted in New Hanover County in December of 2002. The purpose of the audit was to learn more about the barriers low-income women may face in the acquisition of low-cost, healthy foods. A list of all convenience stores, small grocery stores, and supermarkets in the area was generated from the Reference USA Business database using standard industrial classification (SIC) codes. Three stores in each category...
were picked at random. Because Super Wal-Mart is used by many individuals for grocery shopping, it was also added to the list of stores to be audited. A total of ten stores were audited. Availability and price of a variety of foods (specific sizes and brand names) were examined, including broccoli, red delicious apples, bananas, lean ground beef, whole wheat bread, non-hydrogenated peanut butter, skim milk, Quaker “quick oats”, Total Raisin Bran, and Olive oil. These foods were chosen because they were thought to represent a variety of healthy foods that are economically feasible for low-income individuals.

Overall, there were fewer foods available at convenience stores and small neighborhood stores. There were not noticeable discrepancies in products offered in Super Wal-Mart compared to those offered in supermarkets. Groceries at Super Wal-Mart were less expensive than those in supermarkets surveyed. The total cost of the same foods surveyed in Super Wal-Mart, Food Lion, and Harris Teeter was $30.30, $34.81, and $38.00 respectively. Broccoli was 18% cheaper at Super Wal-Mart than at a local supermarket; chicken was 37% cheaper; tuna was 12% cheaper; skim milk was 5% cheaper, and olive oil was 25% cheaper. When comparing the local supermarket to a small neighborhood grocery store, one can of tuna was 56% cheaper at the supermarket; skim milk was 12% cheaper; and olive oil was 25% cheaper. The smaller neighborhood grocery stores surveyed were in low-income, inner-city areas. No supermarkets were in the inner-city area, supporting previous work demonstrating disparate access.

*The Physical Activity Environment:*

The local physical activity environment was explored over the course of the WISEWOMAN study’s duration by the primary author, who walked or ran at local parks (Greenfield Lake Park and Castle Hayne Park) and trails (Senior Center Trail, Summer’s...
Rest Trail, The Loop), and went on site visits to a community center, a community gym, and a Senior Center. Overall, the area is not conducive to walking. There are local parks, but most residents must drive to use them. Some interview respondents (see next section) warned of going alone to one park located near the inner-city of Wilmington, stating that it was crime-ridden. This impression was supported by a site visit. Downtown Wilmington has a nice community gym (the Boxing Center) with a reasonable membership fee ($40 per year). A site visit revealed a pleasant atmosphere with cardio and weight equipment, yet the focus is on boxing (an activity that midlife women are unlikely to pursue). There is also a school track that community members use in downtown Wilmington. The Senior Center was a resource that offered low-cost classes, but is only available for those over 55 years. The YMCA is expensive ($400 per year), but offers reduced membership fees to low-income individuals.

**IV.D. Qualitative Interviews**

To inform development of the community resource intervention tools, qualitative interviews with women similar to WISEWOMAN participants were conducted. Results are presented in Chapters 5 and 6. This section expands on the methods provided in those chapters.

*Subject Recruitment:*

Women from southeastern North Carolina were recruited from a senior center, a community health center, a community recreation center, and from community health advisor contacts. They completed semi-structured, in-depth interviews, to provide their perspectives on how community-level factors may influence their health behavior choices. Although women were not asked about their incomes, they were recruited through agencies that
provide services to lower-income individuals. A combination of sampling strategies was used: typical case sampling, wherein women were recruited based on their similarity to the typical WISEWOMAN participant in age, socioeconomics, and area of residence; purposive, to ensure that black and white, urban and rural women were interviewed; and snowball sampling, wherein women who were interviewed were asked to recommend others for interviews.

The Interview:

Women were asked about various community barriers and resources related to healthy eating and increased activity (See Appendix C for Qualitative Interview Guides). The guiding paradigm was the principle of reciprocal determinism, which posits that individuals’ behaviors, individual attributes, and individuals’ environments influence one another. Learning of women’s perspectives on the ways environmental factors influence their diet and activity behaviors was important to develop new intervention tools to address these factors. Women were asked about things in the community that made it harder or easier for a person to eat healthier or to exercise; about the feasibility of using local resources; and about the resources they personally used and barriers to use. Women were asked to give advice to a hypothetical friend for overcoming community-level barriers. Some women were asked what they would suggest a fictional woman (“Lisa”) do to overcome various barriers to being active and to getting low-cost fruits and vegetables. To get their perspectives on community advocacy, women were asked what they thought about “Lisa” advocating for change to improve her community.

Coding and Analysis:
The interview transcripts were read for content and coded by 2 nutrition graduate students. Textual data were imported into a qualitative data management system, QSR N’vivo, for coding, annotation, and data management and reduction. To address Aim 1a, four detailed and representative interviews were read and examined inductively, and important themes were identified as they emerged from the text. A codebook was developed based on agreed upon codes and operational definitions. Specific coding rules were created as ambiguous coding possibilities emerged. (See Appendix D for codebook) The remaining transcripts were read. A summary of salient influences on food choice was written and a schematic highlighting those influences was drawn for each interview participant. (See Figure 4.3) Codes were assigned separately by the two coders and final coding decisions were made with consensus from both coders.

**Figure 4.3. Schematic of Salient Influences on one Participant’s Food Choice (+ indicates positive influence, - indicates negative influence)**

![Food choice diagram](image)

To address Aim 1b, data were analyzed deductively, using codes developed a priori from research questions. Information from these interviews was used to refine the Nutrition and Physical Activity Community Resource Guide and Neighborhood Assessment and Tip
Sheets. Themes regarding commonly used community resources, urban and rural differences in resource availability and use, and tips for overcoming barriers or using resources were examined. (Chapter 6 and Table 4.2.)

**Table 4.2. Barriers to Use of Nutrition and Physical Activity Community Resources**

<table>
<thead>
<tr>
<th>Nutrition resource</th>
<th>Barrier to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farmer’s Market</td>
<td>• Not close to home</td>
</tr>
<tr>
<td></td>
<td>• No transportation</td>
</tr>
<tr>
<td></td>
<td>• Hours not convenient</td>
</tr>
<tr>
<td>Super Wal-Mart</td>
<td>• Stressful environment</td>
</tr>
<tr>
<td></td>
<td>• Too crowded</td>
</tr>
<tr>
<td>Nutrition classes</td>
<td>• Cost</td>
</tr>
<tr>
<td></td>
<td>• Hours not convenient</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Physical activity resource</th>
<th>Barrier to use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community gym or fitness center</td>
<td>• Cost/ potential to waste money</td>
</tr>
<tr>
<td></td>
<td>• Embarrassed about weight or fitness level</td>
</tr>
<tr>
<td></td>
<td>• No transportation</td>
</tr>
<tr>
<td>Parks or trails</td>
<td>• High perceived crime</td>
</tr>
<tr>
<td></td>
<td>• Not close to home</td>
</tr>
<tr>
<td></td>
<td>• No transportation</td>
</tr>
<tr>
<td>School track</td>
<td>• High perceived crime</td>
</tr>
<tr>
<td></td>
<td>• Not close to home</td>
</tr>
<tr>
<td>Mall walking</td>
<td>• “More talking that walking”</td>
</tr>
<tr>
<td></td>
<td>• No final destination</td>
</tr>
</tbody>
</table>
Synthesizing Qualitative Results:

Results of Aim 1a of this research were synthesized to describe how low-income, midlife, Southern women perceive different food sources in their communities. A graphic describing influences on food choice within different food environments was developed (Chapter 5). Results of Aim 1b were the intervention tools (See Appendix B) and a manuscript describing how to develop and refine similar community resource tools for an individually focused, clinic-based intervention (Chapter 6). These results were also used to create a manual to guide other WISEWOMAN Projects or health promotion programs in the development of similar intervention tools (Appendix G).

IV.E. Aim 2 Survey Measures

Self-efficacy:

Aim 2 of this project examined potential mediation of the intervention effect on increasing use of resources by knowledge of and self-efficacy for accessing community resources. Two items made up a scale for self-efficacy for accessing nutrition community resources ($\alpha = 0.65$) and four items made up the scale for physical activity resources ($\alpha = 0.80$). Responses to items were summed to obtain 2 separate scores (“self-efficacy for accessing nutrition or physical activity community resources”). In mediation analyses, the change in self-efficacy score was a continuous, dependent variable in linear regression analyses with intervention status as the independent variable. In a subsequent regression equation, self-efficacy was the independent variable predicting change in use of resources. If a respondent was missing data from any items, no “self-efficacy” score was derived.
All items measuring self-efficacy for finding out about and using community resources begin with the following stem: “First, I’m going to ask you how sure you are that you could get yourself to find out more about what is available in your community. Then I will ask you some questions about how sure you are that you could get yourself to start using these resources.” Item responses ranged from 1 = “I am not very sure” to 10 = “I am very sure.” Items measuring self-efficacy for accessing existing community resources were:

- “I can get myself to find out what classes about good nutrition are available”
- “I can get myself to attend at least 3 classes or programs a year about good nutrition.”
- “I can get myself to find out what exercise places are affordable and offer the kinds of things that are right for me.”
- “I can get myself to join an affordable exercise place and attend class or use the equipment at least once a week.”
- “I can get myself to learn more about parks, walking trails, and tracks.”
- “I can get myself to start using parks, trails or tracks on a regular basis.”

Knowledge:

Knowledge of existing community resources was the second potential mediator. Knowledge of nutrition and physical activity resources was measured using 2-items for each. If a respondent was missing data from any items, no “knowledge” score was derived.

Items measuring knowledge all had the following stem: “How much do you feel you know about what kinds of things are in your community to help you eat healthier or exercise more? Using a scale of 1-10, where 1 means you know nothing and 10 means you know a lot, please tell me how much you know about the following things in your community:”

- “What classes or sessions you could attend to learn how to eat healthier.”
• “Where to shop to get fruits and vegetables for the least money
• “Affordable exercise places where you could join classes or use equipment”
• “Parks, walking trails or tracks where you could go to get more exercise.”

The responses to these items were summed to get a score reflecting self-reported knowledge of existing community resources. Change in this score from baseline to 12-months was used as a continuous, dependent variable in regression models, with intervention group status as the independent variable. Change in knowledge was then used as the independent variable to predict change in use of resources.

Use of Community Resources:

To measure use of community resources, women were asked:

• “How much would you say you currently make use of what your community has to offer in terms of being more physically active?”
• “How much would you say you currently make use of what your community has to offer in terms of healthy food options?”

Responses to these items were on a 10-point scale, with 1 = “not at all” and 10 = “a great deal.” Women’s responses to each question were used as the dependent variable in regression analyses, ranging from 1-10. If a participant was missing a value for one or both of these items, she was not included in analyses.

Summary of Self-efficacy, Knowledge, and Use Items:

Very few women had missing data. At baseline, there was one missing value for: use of physical activity resources; use of nutrition resources, and self-efficacy for using parks, trails, and tracks; and 2 missing values for self-efficacy for learning about parks, trails, and
tracks. Of 211 women who returned for 12-month follow-up visits, 208 observations were used in modeling. (See Appendix E and Table 4.3)

**Table 4.3. Summary of Aim 2 Measures**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Number with complete data</th>
<th>Mean (Standard Deviation)</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline self-efficacy for PA resources</td>
<td>210</td>
<td>25.3 (9.4)</td>
<td>4, 40</td>
</tr>
<tr>
<td>Baseline self-efficacy for nutrition resources</td>
<td>210</td>
<td>12.8 (5.5)</td>
<td>2, 20</td>
</tr>
<tr>
<td>Baseline knowledge of PA resources</td>
<td>210</td>
<td>10.0 (5.6)</td>
<td>2, 20</td>
</tr>
<tr>
<td>Baseline knowledge of nutrition resources</td>
<td>210</td>
<td>9.9 (4.3)</td>
<td>2, 20</td>
</tr>
<tr>
<td>Baseline use of PA resources</td>
<td>209</td>
<td>2.9 (2.6)</td>
<td>1, 10</td>
</tr>
<tr>
<td>Baseline use of nutrition resources</td>
<td>209</td>
<td>4.8 (3.1)</td>
<td>1, 10</td>
</tr>
<tr>
<td>Change in self-efficacy for PA resources</td>
<td>208</td>
<td>1.2 (11.7)</td>
<td>-30, 32</td>
</tr>
<tr>
<td>Change in self-efficacy for nutrition resources</td>
<td>210</td>
<td>1.1 (6.5)</td>
<td>-18, 18</td>
</tr>
<tr>
<td>Change in knowledge of PA resources</td>
<td>210</td>
<td>2.4 (5.6)</td>
<td>-11, 16</td>
</tr>
<tr>
<td>Change in knowledge of nutrition resources</td>
<td>210</td>
<td>2.6 (5.2)</td>
<td>-16, 18</td>
</tr>
<tr>
<td>Change in use of PA resources</td>
<td>208</td>
<td>1.3 (3.4)</td>
<td>-9, 9</td>
</tr>
<tr>
<td>Change in use of nutrition resources</td>
<td>208</td>
<td>1.1 (3.5)</td>
<td>-7, 9</td>
</tr>
</tbody>
</table>

**IV.F. Mediation of Intervention Effects**

Baron and Kenny\(^8^5\) define mediating variables as those that account for the relation between an independent and dependent variable, thus explaining how or why an independent variable affects a dependent variable. In reference to Figure 4.4, mediators must meet the following conditions: (1) variation in the independent variable results in variation in the proposed mediating variable (path a); (2) variation in the mediating variable accounts for variations in the dependent variable (path b); and (3) when paths a and b are controlled, a
previously significant association between the independent and dependent variables is no longer significant (path c). This model assumes that the dependent variable is not a cause of the mediating variable. To provide evidence that this is not the case, Kraemer et al. recommend demonstrating that changes in the mediating variable occur before changes in the dependent variable.

FIGURE 4.4. Baron and Kenny Model for Mediation

Baron and Kenny also note that because the mediator and independent variable are likely to be correlated, multicollinearity and reduced power result from the estimation of the effects of the independent and mediating variables on the dependent variable. MacKinnon et al. conducted a Monte Carlo study to evaluate the Type I error rates and statistical power of 14 methods used to test the statistical significance of the intervening (mediating) variable effect. The 14 methods were grouped into three categories: (1) causal steps (e.g., Baron and Kenny method); (2) difference in coefficients before and after adjusting for the mediator; (3) product of coefficients involved in the mediation pathway (a*b). This last method divides the intervening variable effect (a*b) by its standard error and compares this value to a standard normal distribution. The Sobel test is one commonly used variant of this method.

Investigators conducting the Monte Carlo study recommended that the methods in the third
group (e.g., Sobel test) were the best compromise, having less power than other methods but more accurate Type I error rates.\textsuperscript{87}

**IV.G. Outcome Measures**

*Self-reported Fruit and Vegetable Consumption:*

Outcome measures for Aims 2 and 3 of this study included self-reported fruit and vegetable consumption and objectively measured physical activity. The Dietary Risk Assessment (DRA) was used in WISEWOMAN to measure diet and to provide a basis for counseling for healthful dietary changes. It has been previously validated;\textsuperscript{88} however, the DRA has been modified over time to reflect new recommendations regarding components of a heart healthy diet. (Appendix F is a manuscript describing validation of the modified DRA.) Baseline self-reported fruit and vegetable consumption was measured by responses to four items on the DRA, which were:

- “How many servings a day do you have of fruit?”
- “How many servings a day do you have of juice?”
- “In an average week, how many servings of tossed salad do you eat?”
- “How many servings a day do you have of vegetables of any kind?”

Responses to these items were summed to create a fruit and vegetable index (higher score indicating less consumption of fruits and vegetables.). This index was found to have significant correlations with an estimate of fruit and vegetable consumption from a longer, previously validated food frequency questionnaire.\textsuperscript{89} The fruit and vegetable index also had significant associations with biochemical markers of fruit and vegetable intake, even after adjusting for potential confounders. (Tables 4.5. and 4.6)
Table 4.4. Pearson’s Correlation Coefficients (r) between Dietary Risk Assessment (DRA) Fruit and Vegetable Index and Measured Plasma Carotenoids

<table>
<thead>
<tr>
<th>DRA index</th>
<th>Plasma Carotenoid</th>
<th>r (n = 200)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit/vegetable</td>
<td>Carotenoid index (Sum of zeaxanthin, α-carotene, β-carotene, cryptoxanthin)</td>
<td>-0.30</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Fruit/vegetable</td>
<td>Zeaxanthin</td>
<td>-0.15</td>
<td>0.03</td>
</tr>
<tr>
<td>Fruit/vegetable</td>
<td>α-carotene</td>
<td>-0.23</td>
<td>0.0009</td>
</tr>
<tr>
<td>Fruit/vegetable</td>
<td>β-carotene</td>
<td>-0.31</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Fruit</td>
<td>Cryptoxanthin</td>
<td>-0.27</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Vegetable</td>
<td>Zeaxanthin</td>
<td>-0.10</td>
<td>0.16</td>
</tr>
<tr>
<td>Vegetable</td>
<td>α-carotene</td>
<td>-0.33</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Vegetable</td>
<td>β-carotene</td>
<td>-0.35</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>
Table 4.5. Association between the Dietary Risk Assessment (DRA) Fruit and Vegetable Index and Natural Log of Plasma Carotenoid Index

<table>
<thead>
<tr>
<th>Model</th>
<th>Covariates</th>
<th>Standardized parameter estimate</th>
<th>p-value</th>
<th>Adjusted ( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, ( n = 200 )</td>
<td>--</td>
<td>-0.25</td>
<td>0.0004</td>
<td>0.06</td>
</tr>
<tr>
<td>2, non-smokers, ( n = 145 )</td>
<td>--</td>
<td>-0.20</td>
<td>0.01</td>
<td>0.03</td>
</tr>
<tr>
<td>smokers, ( n = 55 )</td>
<td>--</td>
<td>-0.36</td>
<td>0.006</td>
<td>0.12</td>
</tr>
<tr>
<td>3, non-smokers, ( n = 145 )</td>
<td>BMI</td>
<td>-0.19</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>smokers, ( n = 54 )</td>
<td>BMI</td>
<td>-0.40</td>
<td>0.003</td>
<td>0.13</td>
</tr>
<tr>
<td>4, non-smokers, ( n = 140 )</td>
<td>BMI, HDL, LDL, VLDL</td>
<td>-0.18</td>
<td>0.04</td>
<td>0.02</td>
</tr>
<tr>
<td>smokers, ( n = 53 )</td>
<td>BMI, HDL, LDL, VLDL</td>
<td>-0.41</td>
<td>0.005</td>
<td>0.15</td>
</tr>
<tr>
<td>5, non-smokers, ( n = 140 )</td>
<td>BMI, HDL, LDL, VLDL, age</td>
<td>-0.22</td>
<td>0.01</td>
<td>0.07</td>
</tr>
<tr>
<td>smokers, ( n = 53 )</td>
<td>BMI, HDL, LDL, VLDL, age</td>
<td>-0.45</td>
<td>0.003</td>
<td>0.15</td>
</tr>
</tbody>
</table>

1Participants with α-tocopherol values ≥ 2 mg/dl and/or β-carotene values ≥ 50 ug/dl, values consistent with supplement use, were excluded.
**Objectively Measured Physical Activity:**

The dependent variable for Aim 3 of this project was moderate to vigorous physical activity, measured using the ActiGraph model 7164 accelerometer, formerly known as CSA (ActiGraph LLC, Fort Walton Beach, FL). The ActiGraph is a valid and reliable measure of moderate physical activity in the field.\(^90\text{,}^91\) One study found a statistically significant correlation between accelerometer data and measured VO\(_2\) for lifestyle activities (mean \(r = 0.55\)).\(^92\) There was 68.4% agreement between accelerometer and activity diary classifications of subjects into low, moderate, or highly active groups.\(^90\) The CSA/MTI had the least variability and highest reliability in a study of 4 activity monitors.\(^93\) Accelerometer data are not influenced by social desirability or other biases inherent to self-report and are thought to be more precise than self-reported activity.\(^94\) The accelerometer measures uniaxial acceleration using a piezoelectric plate; signals (counts) generated from acceleration are summed and stored over a user-specified time interval (epoch).\(^90\) In this study, one-minute epochs were used as the time interval, and the instrument collected 22 consecutive days of data.

Several accelerometer calibration studies have established cutpoints for accelerometer counts to determine levels of activity (Table 4.7).\(^94\) The general method for these studies is to compare activity counts recorded using the accelerometer and measured oxygen consumption during specific activities, such as walking or running.\(^94\) The population studied and the choice of activities used in these studies accounts for a substantial amount of variability in the cutpoints generated to distinguish activity intensity levels. For instance, Freedson et al.\(^95\) found moderate-intensity activity (metabolic equivalents between 3 and 6) fell between 1952 and 5724 counts per epoch, while Swartz et al.\(^96\) found that counts between 574 and 4944
represented moderate-intensity activity. Therefore, it is important to choose cutpoints derived based on activities of interest conducted in a similar population to the one under study.

**Table 4.6. Cutpoint Calibration Studies**

<table>
<thead>
<tr>
<th>Reference</th>
<th>Population</th>
<th>Activity</th>
<th>Cutpoints</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freedson et al. 1998&lt;sup&gt;95&lt;/sup&gt;</td>
<td>25 males, 25 females; Females’ average age was 22.9 years; average BMI = 22.8</td>
<td>Walking and jogging on a treadmill</td>
<td>Light: 706 – 1951</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Moderate: 1952 – 5724</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vigorous: 5725 – 9498</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very Vigorous: &gt;9498</td>
</tr>
<tr>
<td>Yngve et al. 2003&lt;sup&gt;97&lt;/sup&gt;</td>
<td>18 men, 16 women; Females’ average age was 43 years; average BMI was 22.6</td>
<td>Field study of walking and jogging on a track</td>
<td>Accelerometer placed on the hip, activity done on a track</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Moderate: 2743 – 6403</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vigorous: 6403 +</td>
</tr>
<tr>
<td>Swartz et al. 2000&lt;sup&gt;%&lt;/sup&gt;</td>
<td>31 men, 39 women; Females’ average age was 42 years; average BMI was 26</td>
<td>28 self-selected activities (yard work, walking carrying items, housework, family care, conditioning, tennis, golf)</td>
<td>Moderate: 574 – 4944</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vigorous: &gt;9445</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very Vigorous: 9317 +</td>
</tr>
<tr>
<td>Hendelman et al. 2000&lt;sup&gt;%&lt;/sup&gt;</td>
<td>10 males, 15 females; Average age = 40.8 years; average BMI of all participants was 24.4</td>
<td>10 activities, self-selected (washing, dusting, lawn mowing, planting shrubs) Walking, self-selected</td>
<td>Self-selected activities</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Moderate: 191 – 7524</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vigorous: 7525 +</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Walking</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Moderate: 2191 – 6892</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vigorous: 6893 +</td>
</tr>
<tr>
<td>Nichols et al. 2000&lt;sup&gt;%i&lt;/sup&gt;</td>
<td>30 adults</td>
<td>Self-selected walking and running on a track</td>
<td>Moderate: (4 – 6.9 MET): 3285-5676</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Vigorous: &gt;9445</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Very Vigorous: 5677 +</td>
</tr>
</tbody>
</table>
WISEWOMAN participants were instructed to wear the accelerometer for 7 days and then mailed it to the research office in postage paid box, at baseline, 6-, and 12-months. The accelerometer data (counts per epoch) were uploaded from the device and data were reduced using the ActiProcess program (Catellier, 2004). Valid days of data were determined by examining and eliminating epochs that were contained within strings of 20 or more consecutive zeros, then summing the remaining epochs and dividing by 60. The ad hoc minimum wearing criteria was 6 valid hours to be defined as a day. Data were considered valid only if the accelerometer was worn a minimum of 4 days. At 12-months, 184/236 (78%) women had valid accelerometer data, with averages of 11.2 hours per day worn and 5.7 days worn. Average minutes of moderate to vigorous physical activity were calculated by dividing the sum of total minutes of activity above 574 counts (using Swartz et al.96 count cutpoints) by the days worn. Swartz et al.96 cutpoints were used because participants in that study were the most similar to the participants in the current study in terms of BMI and age. Additionally, the Swartz cutpoints were established using activities that are likely to be done by WISEWOMAN participants.

While accelerometers are valid and reliable measure of physical activity, there are several limitations to the use of accelerometers and the data collected. Accelerometers do not provide data on physical activities that do not generate vertical acceleration, such as bicycling. They may induce activity in participants for the first few days of wearing due to heightened sensitivity to monitoring; thus, multiple days of wearing are recommended. Obtaining valid accelerometer data depends on participants complying with accelerometer wearing instructions; individual characteristics may make some participants more likely to wear the monitor than others. An additional limitation is that there are not population and
activity-specific cutpoints for translating the magnitude of counts into minutes of moderate and vigorous-intensity physical activity.

Participant adherence is another limitation of accelerometer-based data collection. It is recommended that the accelerometer is worn between 3 and 5 days to reliably estimate physical activity. Differential wearing time (e.g., between overweight and normal weight individuals) could introduce bias. To improve adherence, WISEWOMAN participants were given one-on-one instructions about wearing the accelerometer, a log sheet to record days and times the accelerometer was worn, and a postage paid box to mail the accelerometer back to the research office. Women were called approximately 8 days after the enrollment visit, to find out how many days the accelerometer was worn, any problems they had, and were given a reminder to mail the device back to the research office.

IV.H. Aim 3 Measures

Neighborhood Assessment:

For Aim 3 of this project, 3 items were used to assess perceived existence of physical activity resources in participants’ neighborhoods: “Is there a [school/ gym or recreation center/ park or trail] where you could exercise in your neighborhood?” (Neighborhood was defined as a 10-minute drive from home.) Although the Neighborhood Assessment was not validated or tested for reliability, it has been piloted with women similar to WISEWOMAN participants, and revisions have been made accordingly. Evenson and McGinn calculated test-retest reliability for questions about various aspects of the physical environment, including traffic, presence of sidewalks, street lighting at night, problems with unattended dogs, safety from crime, places to walk, and places to exercise. The intraclass correlation coefficients (a measure of reliability) of the questions ranged from 0.64 to 0.91, indicating
substantial reliability. More specifically, these investigators asked the following questions:

“The next few questions are about facilities that may be available in your community (defined as 20-minute drive from home)…would you say that the availability of private recreational facilities in your community was…excellent, good, fair, poor, there are no facilities in community” and found test-retest reliability (ICC) for that item = 0.60 (0.46, 0.71); For an item about availability of public recreation facilities, ICC = 0.51 (0.36, 0.64); and for an item about availability of public school recreational facilities ICC = 0.39 (0.21, 0.55). In addition, Kirtland et al.73 reported reliability = 0.52 for a question asking participants whether or not their neighborhood had public recreation facilities. Because the Neighborhood Assessment items are somewhat similar to those used in these studies, it is expected that they have moderate to high reliability. The Neighborhood Assessment response rate was 89.4%.

Perceived Distance:

Also for Aim 3, three questions assessed participants’ perceived distance to the closest physical activity resource: “How close to your home, in miles, is the closest [school/ gym or recreation center/ park]?” Responses were in miles (continuous). The response rate for this survey was 76.3% (180/236). This survey also asked where women had been active in the past month. Table 4.4 shows the locations for activity and the percentage of women who reported being active in that location in the past month.
Table 4.7. Locations Where Women Reported being Physically Active in the Last Month

<table>
<thead>
<tr>
<th>Location</th>
<th>Percent active in that location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fitness center, health club, gym</td>
<td>11</td>
</tr>
<tr>
<td>Other indoor facility (e.g., dance studio)</td>
<td>6</td>
</tr>
<tr>
<td>Home or apartment or yard (e.g., exercise machine)</td>
<td>61</td>
</tr>
<tr>
<td>Park</td>
<td>21</td>
</tr>
<tr>
<td>Outdoor recreation area (e.g., lake, hiking trail)</td>
<td>17</td>
</tr>
<tr>
<td>On streets near home (e.g., cycling, brisk walking)</td>
<td>51</td>
</tr>
<tr>
<td>On streets near work</td>
<td>22</td>
</tr>
<tr>
<td>On streets in another neighborhood</td>
<td>17</td>
</tr>
<tr>
<td>Workplace (e.g., workout room or exercise class)</td>
<td>16</td>
</tr>
<tr>
<td>Public swimming pool</td>
<td>3</td>
</tr>
<tr>
<td>Private swimming pool</td>
<td>7</td>
</tr>
<tr>
<td>School or school grounds</td>
<td>9</td>
</tr>
<tr>
<td>Shopping center or mall (e.g., mall walking)</td>
<td>32</td>
</tr>
</tbody>
</table>

*Covariates:*

Potential covariates in these analyses (Aims 2 and 3) included race, age, education, income, body mass index (BMI), physical limitations on activity, smoking, and urban or rural residence. Other potential covariates are baseline use of community resources, baseline self-efficacy for use of resources, and baseline knowledge of community resources. To measure race, women were asked: “What race do you consider yourself?” and response options were: “American Indian or Alaska Native”, “Asian”, “Black or African American”, “Native Hawaiian or Other Pacific Islander”, “White”, “unknown”, or “refused”. Women could choose more than one race. In this analysis, race was dichotomized (white, non-white).
Women were asked to provide their birthdate at the WISEWOMAN enrollment visit. Age was calculated from this date (continuous variable). Women were asked about the highest grade completed, responses ranging from 0 to 17+. Education was dichotomized, based on high school graduation. To measure income, women were asked “What was your household’s total income last year?” with response options “<$10,000”, “$10,000-$29,999”, “$30,000-$49,999”, “$50,000-$69,999”, “$70,000+”, and “I prefer not to answer this question.” Income data were skewed toward lower values. Thus, this variable was dichotomized, based on incomes less than $10,000 per year or greater than or equal to $10,000 per year. BMI (continuous) was calculated using weight measured with a Detecto balance beam scale (Detecto, Webb City, MO), and height measured with a Schorr portable height board (Schorr Productions, Olney, MD). A dichotomous variable was used to indicate whether women had physical limitations on physical activity. Smoking (dichotomous) was assessed by self-report.

Urbanicity was a potential moderator in Aims 2 and 3 of this research project. (see Chapters 7 and 8) The town of Wilmington in southeastern North Carolina is moderately-sized and surrounded by smaller coastal towns and agricultural areas. If a participant reported a Wilmington address, she was classified as urban and if she lived in a surrounding small town, she was classified as rural.

**IV.I. Defining Access to Physical Activity Resources**

Talen and Anselin define several approaches to measuring accessibility, including the container approach (counts of facilities in a specific area) and measuring minimum distance to nearest facility. Both approaches were used in Aim 3 of this study. Several studies have used the container approach to study the relationship between access to resources and
physical activity, using the number or presence of facilities within buffers of different sizes, while others have used the minimum distance approach. (see Table 4.8)

Table 4.8. Definitions of Access to Physical Activity Resources

<table>
<thead>
<tr>
<th>Container approach</th>
<th>How access was defined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sallis et al.33</td>
<td>Number of pay-for-use and free-for-use facilities in a 5-km boundary around participants’ homes</td>
</tr>
<tr>
<td>Hoehner et al.76</td>
<td>Number of parks within a 400 m radius of participants’ homes</td>
</tr>
<tr>
<td>Wilson et al.28</td>
<td>Presence or absence of facilities in 0.5-mile radius</td>
</tr>
<tr>
<td>Reed et al.99</td>
<td>Presence or absence of trails in 10-mile radius</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Minimum distance approach</th>
<th>How access was defined</th>
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<tbody>
<tr>
<td>Troped et al.34,78,78</td>
<td>Network distance to a trail</td>
</tr>
<tr>
<td>Evenson et al.104</td>
<td>Euclidean distance to a trail</td>
</tr>
<tr>
<td>Rutt et al.105</td>
<td>Shortest network distance to park, school, path, or gym</td>
</tr>
<tr>
<td>King et al.35</td>
<td>Network distances to parks, trails, golf courses</td>
</tr>
</tbody>
</table>

When examining the association between access to resources and physical activity, it is important to define the region of influence, or the “neighborhood.” The way the neighborhood is defined for measurement purposes should change, depending on the processes and outcomes in question,104 including the population of interest, urbanicity of the area, the activity of interest, and whether the participants will walk or drive to use the facility. For example, Giles-Corti et al.105 suggest that for studying local walking behavior, “neighborhood” should be defined as 10- to 15-minutes from the subject’s home, and for objective measures, defined as 1.6 kilometers from the participant’s home. Additionally, researchers should opt for a definition of the neighborhood that is meaningful to residents.
rather than using less meaningful administrative boundaries (e.g., census blocks). The neighborhood should be defined based on qualitative data regarding individuals’ ideas about the boundaries of their neighborhoods, and should reflect the social reality of neighborhood boundaries. In qualitative interviews (conducted as a part of the current study), one participant said about her rural neighborhood, “I think of my neighborhood as being 5 miles on each side.” This participant had recently moved from a more urban area, and noted that her neighborhood would be defined using a much smaller distance if she still lived there. In addition, when attempting to discern the appropriate area to examine regarding neighborhood influences on health behaviors, one should also consider quantitative data from transportation and planning studies regarding travel patterns of people in the population of interest. For example, National Household Transportation Survey (2001) data indicate that the average length of a trip taken for social and recreational purposes was 11.4 miles, suggesting that the average radius from the home for a trip is 5 to 6 miles. Using these data, it was decided that access to physical activity resources would be measured by counting resources in 2- and 5-mile Euclidean (“as the crow flies”) buffers around each participant’s home. However, there were few 5-mile buffers that contained no resources, making the comparisons for Aim 3a impossible. Therefore, 1- and 2-mile buffers were used.

 Other factors besides geographic proximity to a facility determine individuals’ access to that facility. The attractiveness of the resource to the potential user is important, as are cost and safety concerns. There is increasing awareness of the value of combining qualitative and quantitative research methods to develop measures, identify relevant phenomena, interpret quantitative or qualitative data, and conduct longitudinal analysis.
Thus, for the accessibility analyses in Aim 3 of this study, qualitative data were used to identify the resources WISEWOMAN participants would be most likely to use.

Geographic Information Systems (GIS) database:

GIS has been used extensively to study the relationship between objectively measured access to physical activity resources and activity levels. GIS allows researchers to objectively measure access variables rather than relying solely on participant perceptions of access. GIS is a system of electronic information used to manage, analyze, and display geographic data. Different electronic map layers are used to represent different aspects of the physical environment (e.g., road networks, census tracts, schools). Addresses can be mapped as points using address locators (computer scripts that locate the address on a road segment). Geographic features such as roads and trails are mapped as line elements. Distance between two points, and points within a certain area can be calculated using GIS. However, GIS is not without its limitations, which can include inaccurately mapped addresses and different data capture dates between datasets.

The third aim of this study used data from WISEWOMAN Project participants who lived in one of three counties (New Hanover, Brunswick, Pender). New Hanover County participants’ home addresses (n = 179) were mapped as points in ArcGIS Version 9.1 using a geocoding service created from the New Hanover County roads network layer. The resulting attribute table had a column with accuracy scores for the match. The attribute table was sorted in ascending order according to accuracy score. From among the lowest scorers, 10% of all participants’ addresses (n = 18) were checked against the New Hanover road network. Only one was mapped incorrectly. This point was deleted, and the correct address was manually geocoded. Brunswick County participants’ home addresses (n = 26) were mapped
using a geocoding service created from the Brunswick County roads network layer. Three
(10% of all Brunswick participant addresses) of the lowest scoring addresses were checked
against the Brunswick county road network layer. All were mapped correctly. Pender County
participants’ home addresses (n = 14) were mapped as points using the Streetmap 2000
geocoding service. (The Pender County road network layer was in a format that could not be
used as a base layer for creating a geocoding service.) Two (10%) of the lowest scoring
addresses were checked against www.mapquest.com and both looked accurate.

Park addresses were obtained using the Internet and by calling each county’s Parks
and Recreation Department to request information. For Wilmington, the city Parks
Department was contacted to request information. Although park size is associated with use,
all parks, regardless of size were mapped, because small parks may be part of an overall
aesthetically pleasing neighborhood environment. The survey item used to compare
perception with the objective measure asks “How far from your home, in miles, is the closest
park?” and does not specify size. Park layers included state, county, or city-maintained mini-
parks, neighborhood parks, community parks, large urban parks, sports complexes, and
natural resource areas. Park layers did not include Nature Conservancy or other privately-
owned natural areas. Each county’s Parks and Recreation Department was contacted to find
out if the larger parks had multiple parking lots. All parks in Brunswick County had one
entrance. Two parks in New Hanover County had 3 entrances and one park had 2 entrances.
All others had 1 entrance. Pender county Parks and Recreation could not be reached,
although all parks with size data were less than 20 acres. Each list of parks was geocoded
using the county-specific geocoding services described earlier. New Hanover County park
points with a score < 90 were checked against New Hanover County roads and were
correctly mapped. Seven points were manually geocoded (5 different parks). There were 63 total park points. Brunswick County park points with accuracy score < 90 were checked against Brunswick County roads. They were all mapped correctly: 15 were manually geocoded, 18 mapped with Brunswick County geocoding service, and 1 remained unmatched. Brunswick County had a total of 33 park points. Pender County park points were mapped with Streetmap 2000. Overall, park data for Pender County is less accurate, so there were 2 parks with accuracy scores < 70. Seven were mapped with Streetmap 2000 and 4 were manually geocoded for a total of 11 parks. There were 107 park points in all three counties.

A list of all public schools in each county was obtained from the Internet. Each school was contacted to see if the public was allowed to use school facilities. Facilities available at schools ranged from open fields, to tracks, to tennis courts. Only those schools that allowed the public to use facilities without obtaining special permission were geocoded. In New Hanover county 15 schools (1 university, 2 high schools, 2 middle schools, and 10 elementary schools) allowed the public to use facilities. Three were manually geocoded. Five schools were mapped in Brunswick County (3 high schools, 2 middle schools). Four schools had accuracy scores < 80, and were checked; all were correctly mapped. Two Pender County schools (1 high school, 1 elementary school) allowed the public to use facilities, and both mapped correctly with Streetmap 2000. A total of 22 school points were address matched.

Gym and recreation center addresses were obtained by searching the Internet, calling Parks and Recreation Departments to request information, and by searching for senior centers in each county. New Hanover County had a total of 33 gyms and recreation centers. There were 9 city or county-funded centers (city gyms, community centers, senior centers, parks
and recreation centers) and 24 fee-for-use gyms. Only one had to be manually geocoded. Brunswick County had a total of 20 gyms and recreation centers. There were 9 city or county-funded centers and 11 fee-for-use gyms. Six were manually geocoded and one was unmatched. Pender County had 4 gyms and recreation centers. (1 senior center and 3 fee-for-use gyms) Two gyms were manually geocoded, the other 2 had low scores, but looked accurate when compared to mapquest.com.

In addition to data from WISEWOMAN participants, qualitative interview data were used to identify physical activity resources most likely to be used by WISEWOMAN participants. As a part of Aim 1, in-depth interviews were conducted with women from the study area who were similar to WISEWOMAN participants. They were asked about community factors related to diet and physical activity. This qualitative study had the primary purpose of informing the development of intervention tools to be used in the WISEWOMAN Project (Aim 1b). Data from urban participants around Wilmington (n = 15) and from those who lived in rural areas but worked in Wilmington (n = 8) were analyzed for Aim 3 of this study. PA resources that study participants currently used, previously used, or knew of a friend or relative who used were mapped. Qualitative data used for Aim 3 were from respondents who lived in urban and suburban areas (n = 15) and those who lived in rural areas but worked in more urban areas (n = 8). Women gave conflicting reports about fee-for-use gyms and about 2 parks. Three women reported using a fee-for-use gym but appeared to be moderate-income; other respondents said that such gyms were not feasible for them to use because of the cost (did not want to get “locked into a contract”). For this reason, and also because the overwhelming majority of WISEWOMAN participants said that cost was the most important factor they considered when deciding where to be active, fee-for-use
gyms were not geocoded for this analysis. As an exception, although the YMCA is expensive, many women mentioned using it in the past or having a relative who currently used it, so it was geocoded. Two parks were noted as being unsafe by a few women, but these were mapped because other women mentioned using them. Five women reported driving to a physical activity resource. Thus, we obtained information on park entrances, and geocoded park entrances to represent parking lots. A total of 20 points were geocoded to represent resources from qualitative interviews: 2 school tracks, 1 mall, 4 recreation centers, and 5 parks with 1 entrance, 3 entrances of 2 parks, and 2 entrances of 1 park. Nine were manually geocoded, 16 were geocoded using the New Hanover County road network layer geocoding service.

**Table 4.9. Participants and Physical Activity Resources Geocoded, by County**

<table>
<thead>
<tr>
<th>County</th>
<th>Participants</th>
<th>Parks</th>
<th>Schools</th>
<th>Recreation centers</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Hanover</td>
<td>179</td>
<td>63</td>
<td>15</td>
<td>33</td>
</tr>
<tr>
<td>Brunswick</td>
<td>26</td>
<td>33</td>
<td>5</td>
<td>19</td>
</tr>
<tr>
<td>Pender</td>
<td>14</td>
<td>11</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>219</td>
<td>107</td>
<td>22</td>
<td>56</td>
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</tbody>
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CHAPTER 5

PERCEPTIONS OF THE COMMUNITY NUTRITION ENVIRONMENT AND MODIFYING INFLUENCES ON EATING PATTERNS AMONG MIDLIFE WOMEN

V.A. Abstract

Introduction: Qualitative research on food choice has mainly focused on psychosocial and demographic influences, with less examination of individuals’ perceptions of community nutrition environments or related modifying influences on eating patterns. Thus, the purpose of this qualitative analysis was to examine low- to moderate-income, midlife, Southern women’s perceptions of the community nutrition environment. Modifying influences on eating patterns at work and at home were also examined.

Methods: Twenty-eight low- and moderate-income, midlife (37-67 years) women from southeastern North Carolina responded to semi-structured, in-depth interview questions about influences on eating. Interviews lasted 40-60 minutes, were taped, and transcribed verbatim. Two coders read 4 detailed and diverse interviews and developed codes based on repeated themes. All 28 transcripts were double-coded and content-analyzed.

Results: Women perceived differences in available food sources between urban and rural community nutrition environments, with rural areas having fewer supermarkets and fast food restaurants compared to urban areas, which had fewer produce stands. Workplace eating patterns were affected by the perceived social environment, personal health concerns, and the surrounding community environment. The home food environment and subsequent eating
patterns were primarily influenced by family members, health concerns, and the convenience of food sources along the route between the home and workplace.

**Discussion:** Urban and rural differences in access to community food sources, women’s interactions with the community nutrition environment at work and on the commute between home and work, and the importance of family and personal health were key findings. While future quantitative studies should explore these relationships in more representative populations, potential intervention strategies can be inferred, such as emphasizing healthful aspects of the community nutrition environment. Intervention and advocacy efforts are needed to improve aspects of the community environment that constrain healthy choices.

**V.B. Introduction**

The current nutrition environment in the United States, with its overwhelming selection of energy dense, low-cost foods, has often been noted as a significant cause of the obesity epidemic. Simultaneously, corroborative quantitative studies of environmental influences on diet have proliferated, documenting increasing portion sizes and associations between proximity to supermarkets and diet quality or fruit and vegetable consumption.

To guide further research regarding environmental influences on eating patterns, Glanz et al. proposed a conceptual model of policy, environmental, and individual-level variables that affect eating patterns. The model emphasizes the influence of environmental variables and includes the community nutrition environment and the organizational (e.g., home, work) nutrition environments. The model also includes individual variables, such as the perceived nutrition environment and psychosocial factors, which Glanz et al. note are potential mediators and moderators of the influence of the environment on eating patterns.
For the purposes of this paper, a mediator is defined as a variable (e.g., perceived nutrition environment) occurring along the causal pathway from independent (e.g., objective nutrition environment) to dependent (e.g., eating pattern) variable, a moderator is defined as a variable that affects the direction and/or strength of the relationship between an independent and a dependent variable. For example, a woman may live a long distance from a particular supermarket, but if she perceives that it offers a desirable selection of reasonably priced food, she will be willing to travel to shop there. It is important to determine potential mediating and moderating influences in order to design effective intervention and policy approaches to support healthy dietary patterns, as well as to guide future quantitative analyses of environmental effects on eating patterns. However, little is known about how the community nutrition environment is perceived and little is known about variables that modify the relationship between the perceived community nutrition environment and eating patterns.

While previous research has determined that taste, cost, convenience, and health are key influences on food choice, it is likely that the relative importance of these factors differs depending on the population studied and the environment in which choices are made. For instance, health might be a primary influence for an older woman concerned about her high blood pressure, while cost may be most influential for a low-income mother when she is out shopping for food to feed her four children. The current nutrition environment offers a wide selection of convenient, palatable, energy-dense, and low-cost food. However, though inundated with unhealthy options, there are individuals who make healthier choices. Thus, for future health promotion efforts, it is important to learn of those factors that enable and motivate individuals to overcome environmental forces that favor a less healthful dietary pattern, so that they choose more healthful options.
A deeper understanding of these influences is needed among low-income, midlife women in particular. Such women are at higher risk of chronic disease. They may also be more likely to face environmental barriers to healthy food choices, because low-income neighborhoods may have fewer supermarkets and more fast food restaurants. Finally, women are gatekeepers, doing much of the planning, shopping for, and preparing of family meals, thus having the potential to positively influence family members’ diets.

Qualitative inquiry is a useful method to examine individuals’ perceptions of the community nutrition environment and how perceptions and related factors influence individuals’ interactions with the environment. At least five qualitative studies have conceptualized how adult men and women choose the foods they purchase, prepare, and consume. These studies were based in West Virginia, upstate New York, and the United Kingdom, and three tangentially acknowledged the role of the environment in food choice. None of these studies involved women residing in the South, and none focused on the perceived nutrition environment and other individual-level variables that modify the effect of the surrounding community nutrition environment on eating patterns. Therefore, this paper’s purposes are twofold: (1) to examine low- to moderate-income, midlife women’s perceptions of food sources in the community nutrition environment; and (2) to examine potential modifying influences on eating patterns in two specific organizational nutrition environments (home, work).

V.C. Methods

Participant Recruitment:

Data analyzed for this paper were collected using semi-structured interviews, which were conducted to inform the development of intervention tools to be used in a clinic-based
health promotion program for underserved, midlife women (the WISEWOMAN Project). Interview respondents were recruited through key informants at four community centers that served lower-income populations in southeastern North Carolina. Typical case and snowball sampling were used to recruit women similar to participants in the larger health promotion program in age, area of residence, income, and race. Upon agreeing to participate, participants signed informed consent, and were paid $25 after completing the interview. This study was approved by the University of North Carolina at Chapel Hill School of Public Health Institutional Review Board.

Participants (n = 28) ranged in age from 37 to 67 years. Nineteen were black and nine were white. Fifteen lived in an urban area and thirteen lived in surrounding rural areas. Eight of the women who lived in a rural area reported working in an urban area. Fifteen women worked, three volunteered regularly, and ten were not currently employed. Participants were housekeepers, beauticians, and worked in administrative roles at a senior center, community center, and local university. Women’s household compositions varied, reflecting the complexities of this stage of life. Twelve lived alone, seven lived with spouses or significant others (usually had adult children living elsewhere), six had children or grandchildren living in their homes, and three lived with a spouse and school-aged children. Four women reported caring for aging parents.

Conducting the Interviews:

Two interview guides were used and included similar questions to assess facilitators and barriers to healthy eating and physical activity on multiple levels of the social ecological framework, with emphasis on environmental and community-level factors. (Table 5.1) For example, one question was: “I’d like to hear your ideas about all the things that come to mind
when I ask about places or things in your community that make it either easier or harder to eat healthier or get more exercise. Some of these things might be a walking trail, fast food restaurants on every corner, or a fruit stand. What are things that might make it harder (or easier) for a person to eat healthier (or be physically active)?” Physical activity data were not analyzed for this paper. Interviews lasted 40-60 minutes, were taped, and later transcribed verbatim. The interviewer took field notes, which were reviewed before analysis began and informed code development.

**Data Analysis:**

Two coders (one was also the interviewer) read four representative, detailed and diverse interviews, and developed codes based on themes repeated throughout the interviews. New themes were added as coding progressed. The code book included 27 nutrition-related themes and operational definitions. All transcripts were read and coded independently by the two coders, who then met to discuss and reach consensus on coding decisions. Both coders summarized each transcript, detailing the most salient influences on food choice. Similar to the cause maps or causal networks described by Miles and Huberman, a schematic of important influences on diet was drawn for each participant. Transcripts were imported into QSR N’vivo (QSR International, Melbourne, Australia) for data management and to assign codes to appropriate segments of text. Key influences on women’s eating patterns at work and at home were included only if those influences or themes were mentioned by at least three women with sufficient substance to allow exploration of the various dimensions of the theme. To increase the credibility of results, an audit trail of important analytical steps and decisions was kept and all transcripts were double-coded.
V.C. Results

Participants’ perceptions influenced where they purchased food and subsequent eating patterns. Thus, we first describe women’s perceptions of food sources in the community nutrition environment. We then outline factors that modified the relationship between perceptions of the community nutrition environment and eating patterns at work and home. Figure 5.1 is a graphical representation of results. Eating patterns in each of the three nutrition environments resulted from a combination of influences, which included perceptions of community food sources, food sources surrounding the workplace and along the commute between work and home, women’s perceptions of family members’ and coworkers’ food preferences, and the perceived impact of diet on health. Finally, we describe how the current analysis confirms previously demonstrated influences on food choice, though specifically reflecting the life situations of this group of low- to moderate-income, midlife women.

The community nutrition environment consisted of the following food sources: supermarkets, discount superstores, produce markets, and three types of restaurants. Women’s perceptions of each food source affected their interactions with the food source and subsequent eating patterns. Overall, participants reported differences in the availability of food sources, depending on whether the community was urban (inner-city and surrounding areas) or rural. (Figure 5.1)

Supermarkets and discount superstores:

Women from the inner-city area and rural areas generally lived further from supermarkets. One inner-city participant without a car said that living far from a supermarket constrained her food options because the only food store in her area was a small convenience
store, which did not have the selection available at a large supermarket. A rural participant noted:

“It’s deserted…There are no grocery stores within maybe 10 miles to the right or the left. I’d have to go way over 10 miles to get fresh fruits and vegetables.”

Located in both urban and rural areas, Discount Superstore X, in addition to the products offered at a normal discount store, also contained a full-size grocery store with prices much lower than at local supermarkets. Some described the shopping experience at Discount Superstore X as unpleasant and stressful:

“I don’t go to “[Discount Superstore X] or places like that…I might would go to “[Discount Superstore X], but just to go in there and buy groceries, no…It’s just, I don’t know, maybe the parking and the traffic.”

“[Discount Superstore X], if you want the noise, you’ve got the time to go there and walk a long time, you know it’s better prices but it’s more of a hassle, noisier.”

However, to most participants, the competitive pricing and “one stop shopping” offered were extremely appealing:

“[Discount Superstore X] …I love it…It’s got everything in one spot and I love to go there….I like it because there’s bargains and it’s reasonable, it’s not so high.”

*Produce markets:*

Most participants found produce markets and stands appealing due to the lower cost and fresh taste of produce that was in-season. Women also noted the opportunity to support local farmers. While generally perceived as healthful, pleasant food sources, many women did not visit produce markets or stands often, reporting that produce could be more conveniently purchased at a supermarket. In addition, urban women perceived that produce
markets were not located in their communities relative to rural-dwellers’ reports of having plentiful produce stands. Rural women said:

“… You know there’s a fruit stand not far from where I live and I always buy fresh vegetables.”

“Now one thing that has made it easier to get certain things is the little fruit stands…because we do have a couple of places like that within our area where they offer, you know, like fresh fruits and vegetables.”

Restaurants:

When discussing the community nutrition environment, women often recalled experiences eating at different types of restaurants. Participants perceived that family-style restaurants, described as large buffet- or cafeteria-style restaurants offering a variety of food, were healthier than fast food restaurants. One respondent noted:

“…you come to some of these family restaurants, like [Restaurant Y], they have healthy stuff like the salad bar, steamed vegetables, but they also have the fried foods, so people have a choice, but these fast foods really don’t.”

Characterized by greasy, energy-dense menu options, participants reported that soul food restaurants were located in the urban, inner-city area. Participants said that these restaurants made healthy eating difficult:

“…usually the restaurants in this area, like certain days they might have a leafy vegetable but …then if they don’t have enough green vegetables…you don’t have a choice.”

 Compared to rural participants, those who lived and/or worked in urban areas more frequently noted the abundance of fast food restaurants. Urban participants noted:

“There are a bunch of fast food places, you know, within almost walking range.”

“It seems like everywhere you go there’s a fast food, so you cannot duck them, I don’t care what streets you go down. You are going to come to a fast food, there are just so many fast food restaurants.”
Participants mentioned positive attributes of fast food restaurants, such as palatability, convenience, and availability of healthy options, but felt that some fast food restaurants had questionable sanitation. Despite this, the notion that fast food has an irresistible draw was reflected in descriptive phrases such as “sometimes it just calls you,” “jumping out and grabbing onto you like a magnet,” and “hypnotic grease smell.” Although women noted several negative aspects of fast food and soul food restaurants, the convenience and taste of prepared foods, combined with women’s desires to cater to family preferences, as well as their own taste preferences, led participants to purchase foods from these sources.

While food sources differed depending on whether the community was urban or rural, the relationships depicted in Figure 5.1 are relevant to both urban and rural participants. Overall, the main limiting factors to accessing food sources were access to a vehicle and adequate time to travel to each location. As described below, participants’ perceptions of community food sources influenced eating patterns at work and at home, potentially modified by social influences at work, family influences at home, and women’s personal health concerns.

*Modifying Influences on Eating Patterns in the Work Environment:*

Most women’s workplaces were located in urban areas. These women commonly reported eating unhealthy foods from food sources in the community environment surrounding the workplace. For example, one woman’s choices were constrained by the limited restaurant options around her workplace, located in an inner-city, urban area:

“…But as far as this area, I don’t really think…that there is any place that’s any good that you can eat…a lot of places here, they fix a whole lot of starches and not enough green vegetables.”
Participants also mentioned the influential social environment at work. One working woman ate at a soul food restaurant near her workplace because bringing food from home was not the norm for employees. Another recalled that her co-workers sometimes ordered fast food breakfast for the entire office.

Participants noted that food brought from home to work was usually healthy, but this practice was reported infrequently. Those who brought food from home to work did so because they either could not leave work to purchase food from the surrounding community environment or because they had a significant health concern that motivated healthier practices:

“Because I can’t eat [fast foods] any more… It’s a matter of my health now…I don’t buy snack things in the supermarket any more…I buy fruits, yogurt…because…I was real, real sick.”

The commute between the workplace and home provided further exposure to food sources in the community nutrition environment, especially for women who lived in a rural place and worked in a more urban setting. Participants noted the convenience of using the commute to pick up fast food, often prompted by the desire to please family members:

“Again, it’s a time factor…for my 15-year-old who has a really hard time getting up and out of the house in the mornings, which causes me to be late every single day, I’ve even made deals with her…’if we can leave the house by 7:30 I will take you by [Fast Food Restaurant X] and get you something to eat’…”

“…and even though I should still be concerned about my husband and I, because we are older and the risk factors are up…it’s just easier…on my way home to drive by [Fast Food Restaurant X], or [Fast Food Restaurant Y], or [Fast Food Restaurant Z], or call the [Take Out Restaurant X].”

However, women also stopped to shop at a supermarket or produce market on the commute home from work. This practice was often due to women’s health concerns or because the market was conveniently located along the route:
“I try to go [to a produce market] once a week. Sometimes I’ll go a couple of times if I’m running out of something… there are 2 on my way home … Really nice produce/ fruit stands.”

Food purchased while commuting between work and home was incorporated into the home food environment. Thus, factors that modified the relationship between the perceived community nutrition environment and foods purchased on the commute were the same as the modifying influences in the home environment. These are described in detail below.

Modifying Influences on Eating Patterns in the Home Environment:

While women’s eating practices at work were primarily influenced by surrounding community food sources, the social environment (co-workers), and health concerns, the most prominent influence in the home environment was that of the family. For example, women caring for children were highly motivated to provide healthy food for them:

“I don’t buy junk food because I don’t like my son to have it and if it’s there you can eat it.”

“Despite me eating unhealthy, I have tried to keep my children healthy, so when we go on trips, I bring apples or bananas or fruit…”

Conversely, participants whose children were no longer living at home noted that their motivation to prepare healthy meals had decreased:

“I think when you were raising your children, nutrition and planning meals was a very big part of your life. If you live alone, it is not as big a part of your life.”

“Now that my children are grown … being nutritious in my cooking and my eating habits is harder because the desire … to set that good example for my children is gone…”

Women commonly noted the influence of their children’s or spouse’s taste preferences when explaining what they chose to purchase from food sources in the community environment. Specifically, because children often accompanied women when
they were running errands, children’s desires for unhealthy snack foods strongly affected food decisions made there. One mother of two young children related: “Yes, I mean if I stop to buy the children ice cream, you know I’m going to get me one too right.” A grandmother avoided dealing with this obstacle, explaining:

“…Most of the time when I go grocery shopping, I don’t let anybody go with me. It’s much easier to pick up more healthy foods than if they’re [children] not there, bringing things to the cart and saying, ‘Please, please let us have this, let us have that.’”

Another participant described how she previously had included meat in every meal, influenced by her husband’s taste preferences. After her husband died, this changed:

“…well I live alone now and I don’t have to cook for somebody else and try to cook to please them. My husband always liked to have meat and I don’t necessarily have to cook meats now, so I can eat an all vegetable supper …”

Women wrestled with the inner conflict between their desires to provide healthy food for family members and desires to please family members. This conflict was not easily reconciled. Often women gave in to family member’s preferences (and their own preferences) for unhealthy fast food or convenient snack foods. Yet some women withstood family pressure to purchase unhealthy foods, primarily due to concerns for their own health, also a key influence on eating patterns in the home environment. While participants who believed they were healthy did not perceive the need to make healthy food choices, women with health concerns (e.g., high blood pressure, diabetes) described altering their eating patterns in order to prevent or manage disease:

“I just made up my mind that they [fast foods] were not good for my high blood pressure … So I was just committed that I needed to make a change in diet and fast food had to go.”
One participant with diabetes increased the availability of healthy snacks (fruit) in her home because she wanted to provide for her grandchildren and this also facilitated adherence to her diabetic diet:

“Sometimes just a bowl of mixed fruit and if they see it they run over there and try it... just prepare fruits like strawberries and blueberries... As long as it’s there, if the need is great enough for a snack, they will go in and get it and so that helps... me too because it helps me stay on my diet, because all I have to do is go in and get it and it’s there... it’s helped me prepare foods for them, because I realize that I can... get it instilled in them to eat a little healthier.”

Previously Demonstrated Influences on Food Choice:

Results of this analysis confirmed previous research demonstrating that taste, cost, convenience, and health are factors individuals take into account when making food choices. Table 5.2 gives illustrative quotes related to each of these influences. However, the relative impact of these factors on eating patterns was specific to women’s life stage and personal situation. For instance, as mentioned previously, health was more influential for women who had developed chronic diseases. Convenience was a primary influence for working women who were active in children’s lives or in community life. Cost was a major focus for women on a restricted budget due to retirement, or for those attempting to feed a family on a limited income. Often convenience and cost combined, leading to unhealthy food choices. One participant succinctly concluded: “You will tend to go with the convenience and advertised price of fast food.”

V.E. Discussion

The current study is unique in that we collected data from low- and moderate-income, midlife women from southeastern North Carolina to discover their perceptions of food sources in the community nutrition environment and influences on eating patterns at home
and work, two environments where women spend much of their time. Our results shed light on the different food sources available in urban and rural communities. Women from rural and urban, inner-city areas reported that large chain supermarkets were not located in their communities. However, rural women enjoyed closer proximity to produce markets and stands. In urban areas, many types of restaurants (fast food, family-style, and soul food restaurants) were available. It is noteworthy that while women recalled succumbing to children’s insistence that they purchase unhealthy snacks and fast foods, most women expressed a desire to provide children with healthy foods. This study also highlights the importance of the work nutrition environment, wherein women’s eating patterns were strongly impacted by the social and physical environments rather than by children. The commute between home and work was used for purchasing food, and was especially salient to women who lived in rural areas and worked in urban settings. Women’s family members and their perceptions about the influence of diet on personal health status were influential in determining the food purchased on the commute.

Glanz et al.\textsuperscript{116} noted that the perceived nutrition environment as well as specific psychosocial variables could mediate or moderate the influence of the community nutrition environment on eating patterns. Our study findings suggest that the following perceptions may modify the influence of the community nutrition environment on eating patterns: perceptions of bargains offered at food sources, perceptions of proximity to community food sources, perceptions of how food choices will affect personal health or that of family members, perceptions about family members’ taste preferences, and perceptions of socially acceptable eating patterns. In order to inform future intervention and policy strategies, these
potential modifiers should be tested in quantitative studies examining the effects of objective and subjective measures of the community nutrition environment on eating patterns.

Our results are supported by findings of other qualitative studies of food choice. In our study and others, individuals’ choices were affected by the general perception that healthier foods were more expensive, took more time to prepare, and were not as palatable as unhealthy foods. Participants in the current study frequently mentioned the influence of family members on their food choices, also a finding in other investigations. Finally, the desire to avoid or manage disease motivated healthier eating patterns in participants in our study and others.

This study has several limitations which should be considered when interpreting results. One is the health promotion context of the study, which is reflected in the recruitment of participants from community centers and in the interview guides, which were developed for the primary purpose of pilot testing intervention tools. Because participants were informed of the context of the study, they may have been more health-conscious than they normally are. In addition, we used a small, non-random sample. Thus, any intervention strategies that can be inferred from our results should be explored with larger, representative samples of similar women. This study analyzed women’s perceptions of influences on their dietary choices. Women may not be aware of broader environmental or societal influences on their diets. However, examination of women’s perceptions is also a strength of this study, because compared to objective measures of women’s environment or health status, women’s perceptions may be more closely linked to eating patterns. Strengths of this study include that it was an in-depth examination of how low- to moderate-income, midlife women make food choices with an emphasis on uncovering salient perceptions of the community nutrition
environment. The sample size and demographic variability of women interviewed were also strengths.

To conclude, our findings regarding differences in food sources in urban and rural communities demonstrate that positive aspects of communities can be emphasized in interventions. For example, the WISEWOMAN Project used a Community Resource Guide listing local nutrition and physical activity resources to increase participants’ awareness and use of healthful resources.\textsuperscript{123} Interventions among working women must recognize and address the facilitators and barriers to healthy choices in the surrounding community. This might include providing information on healthy restaurant choices and encouraging women to use the work commute to purchase healthy foods. Because health-promoting environments support individuals in initiating and maintaining healthful dietary behavior changes, such environmental elements should be available and accessible. Participant advocacy efforts could lead to improvements in the less healthful aspects of community nutrition environments, such as advocating for supermarkets or produce stands in inner-city areas, or encouraging soul food restaurants to provide healthier menu items.

While the life experiences of the women in the current study varied greatly, many common themes emerged, which were related to women’s stage in life. Midlife is a time when women may be undergoing significant life changes, such having children leave home, retiring, or developing health problems. These transitions may provide teachable moments, when women are ready to make healthy lifestyle changes. The data presented here can guide quantitative analysis and contribute to continued development of innovative, multilevel intervention strategies to promote the health and well-being of similar women.
### Table 5.1. Description of Interview Guides

<table>
<thead>
<tr>
<th>Introduction to Interview Guide 1&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Information elicited using Interview Guide 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A brief introduction to the WISEWOMAN Project</td>
<td></td>
</tr>
<tr>
<td>• Introduction to prepare respondent to talk about barriers and facilitators to a healthy diet and physical activity and to give feedback on the intervention tools.</td>
<td>• Multilevel facilitators and barriers to a healthy diet and physical activity</td>
</tr>
<tr>
<td></td>
<td>• Places or programs in the community that make it harder or easier to eat healthy or be active</td>
</tr>
<tr>
<td></td>
<td>• Reactions to the intervention tools</td>
</tr>
<tr>
<td></td>
<td>• Facilitators and barriers to using local nutrition and physical activity community resources</td>
</tr>
<tr>
<td></td>
<td>• Willingness to advocate for beneficial neighborhood changes (e.g., calling to get a sidewalk repaired)</td>
</tr>
<tr>
<td></td>
<td>• Advice for a hypothetical woman facing specific environmental barriers to a healthy lifestyle</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Introduction to Interview Guide 2&lt;sup&gt;2&lt;/sup&gt;</th>
<th>Information elicited using Interview Guide 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>• A brief introduction to the WISEWOMAN Project</td>
<td></td>
</tr>
<tr>
<td>• Example of how neighborhood and community-level factors could make a healthy lifestyle harder or easier</td>
<td></td>
</tr>
<tr>
<td>• Introduction to prepare respondent to talk</td>
<td>• Multilevel facilitators and barriers to a healthy diet and physical activity</td>
</tr>
<tr>
<td></td>
<td>• Environmental barriers to a healthy lifestyle and barriers to using local community resources</td>
</tr>
<tr>
<td></td>
<td>• Reactions to the intervention tools</td>
</tr>
</tbody>
</table>

<sup>1</sup>Interview Guide 1 was used with 12 participants.

<sup>2</sup>Interview Guide 2 was used with 16 participants.
- Investigator definition of a healthy diet
  (“one that includes plenty of vegetables and fruits, some whole grain breads, pastas, and cereals, and small amounts of fat from meats, dairy products, spreads and sauces.”)
- Investigator definition of a neighborhood
  (“the places around you that are easy to get to, within about a ten minute drive of your home.”)

| about barriers and facilitators to a healthy diet and physical activity and to give feedback on the intervention tools. | Advice for motivating a friend to use a helpful community resource and to overcome an environmental barrier to a healthy lifestyle |

Advice for motivating a friend to use a helpful community resource and to overcome an environmental barrier to a healthy lifestyle
Table 5.2. Previously Reported Influences on Food Choice and Illustrative Quotes from Interview Respondents

<table>
<thead>
<tr>
<th>Influence</th>
<th>Illustrative quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taste</td>
<td>“You know, I mean, fast food to me always tastes better.”</td>
</tr>
<tr>
<td></td>
<td>“I do eat sweets and that’s my downfall.”</td>
</tr>
<tr>
<td>Cost/ economy</td>
<td>“…you are thinking about the price at the time…because fat-free and sugar-free, they cost more…they cost much more than the regular can…”</td>
</tr>
<tr>
<td></td>
<td>“…I’ve got four children and you can take $10.00 and get everybody a burger and fries. And like at [Pizza Take Out X] now you get the little deals with the pizza where you buy one and get one free and so you spend $8.00 on one, you get one free.”</td>
</tr>
<tr>
<td></td>
<td>“And I’ve also found that I tend to eat quite a bit when I go in there [Fast Food Restaurant Z] and get that big thing of chicken instead of getting a little pack of it. I say oh this is cheaper to get and I find that I eat more. ‘Cause getting that 15 pieces and 6 biscuits is just too tempting and it’s good.”</td>
</tr>
<tr>
<td>Convenience</td>
<td>“Time….because in the morning when I get up to go to work, I don’t have time to eat breakfast…and then trying to eat something healthy in that way outside of fast food…that makes it very hard.”</td>
</tr>
<tr>
<td>Health</td>
<td>“Because you know what, sugar and high blood pressure run in my family and I am getting closer to 40, so it’s kind of like worrying on me, especially because I can feel it in me when I eat way too much or drink too much sodas and stuff like that, I can feel it you know and a day that I cook a good meal or go get some fresh vegetables and cook it, you feel better about that.”</td>
</tr>
<tr>
<td></td>
<td>“…if I don’t get myself in control of my eating and I just ate 2 chocolates and a piece of cookie…but my biggest concern is unchecked diabetes. I really look at my eating habits now and you know I’m mid-50s…”</td>
</tr>
</tbody>
</table>
Figure 5.1. Graphic Depicting the Association between the Perceived Community Nutrition Environment and Eating Patterns at Work and at Home

Perceived community nutrition environment

- Inner-city:
  - Soul food
  - Fast food

- Surrounding urban:
  - Fast food
  - Supermarkets
  - Discount superstore

- Rural:
  - Produce stands
  - Discount superstore

Eating patterns in home food environment

- Family
- Health

Eating patterns in work food environment

- Social
- Health

Food purchased between home and work (commute)
CHAPTER 6

A GUIDE FOR DEVELOPING INTERVENTION TOOLS ADDRESSING ENVIRONMENTAL FACTORS TO IMPROVE DIET AND PHYSICAL ACTIVITY

VI.A. Abstract

Low-income, midlife women are at increased risk of obesity and associated chronic diseases. Environmental factors influence health behaviors that contribute to obesity; thus, health promotion programs should address these factors. While low-income neighborhoods may pose many barriers to healthy behaviors, they may also have health-promoting environmental features, such as produce stands and walking trails. Thus, a potentially effective intervention strategy is to help individuals identify and overcome environmental barriers by making use of community resources that support a healthy diet and physical activity. In this paper, we describe the formative research process undertaken to develop two community-specific intervention tools to complement a clinic-based cardiovascular disease risk reduction program for underserved, midlife women in southeastern North Carolina. To assist women in identifying community barriers and resources, a Neighborhood Assessment with Tip Sheets was developed based on a literature review, field visits, and qualitative inquiry. The Internet and the local telephone book were searched to identify health-promoting community resources germane to the study area to include in a Community Resource Guide. We describe how the new intervention tools were finalized based on feedback from community members. We then describe how the tools were used in a multi-component intervention, and conclude with lessons learned.
VI.B. Introduction

Low-income and minority, midlife women (ages 40-64 years) are at increased risk of obesity and associated chronic diseases. Data from the National Health and Nutrition Examination Survey (1999-2002) indicate that a significantly higher percentage of non-Hispanic black and Mexican American women ages 40-59 years are overweight or obese compared to white women,\textsuperscript{127} likely due in part to a high prevalence of physical inactivity and an unhealthy diet. Significantly fewer minority respondents met national recommendations for fruit and vegetable intake compared to the national average.\textsuperscript{118} Results of the third National Health and Nutrition Examination Survey (1988-1994) demonstrated that minority respondents were more likely to be physically inactive during leisure time than their white counterparts.\textsuperscript{128} Thus, due to their high prevalence of disease and risk factors, low-income and minority, midlife women are a priority population for intervention. Such women also have the potential to positively influence the health behaviors of their family members.\textsuperscript{20}

Low-income, midlife women face individual, interpersonal, and environmental barriers to healthy lifestyle choices. They may have little time for physical activity and healthy cooking due to competing demands, such as long work hours and caring for dependent family members, including children and aging parents.\textsuperscript{26,129} They may also live in neighborhoods with fewer recreational facilities and walking trails, fewer supermarkets with inexpensive, fresh produce, and more fast food restaurants.\textsuperscript{28,37,47} Epidemiologic studies continue to demonstrate associations between environmental factors and health behaviors. For example, access to physical activity resources and factors related to walkability have been consistently related to individual levels of activity,\textsuperscript{31,78,130} and proximity to
supermarkets has been associated with increased fruit and vegetable intake and diet quality.\textsuperscript{43,49,50}

Due to empirical evidence of the influential role of environmental factors, and because interventions focused only on individual-level factors have been minimally successful,\textsuperscript{131} health promotion programs are beginning to broaden their focus to incorporate environmental components.\textsuperscript{22} Although low-income neighborhoods may present many obstacles to healthy choices, they are not necessarily devoid of health-promoting environmental features. Such neighborhoods may have affordable fitness centers supplemented by city or county funds, and venues for obtaining fresh produce (e.g., a local farmer’s truck). In a recent study, awareness of walking trails was not associated with the presence of trails,\textsuperscript{79} suggesting the need for more effective promotion of community resources for physical activity. Thus, a potentially effective strategy for interventionists working with lower income and minority individuals is to encourage them to identify unhealthy practices and interactions within their neighborhoods and communities, and to use community resources to support healthy diet and physical activity choices. This strategy is a key element in Wagner’s Chronic Care Model, which posits that chronic disease management and prevention efforts in primary care settings will be more effective if individuals (patients or program participants) are encouraged to tap into existing community programs and resources.\textsuperscript{6}

Some studies have used this strategy by including intervention tools designed to increase awareness and use of community resources and opportunities as a part of larger, multi-component interventions.\textsuperscript{66-69} However, we found only one study that provided a rationale and an in-depth description of the process of developing such intervention tools.\textsuperscript{65}
We found no studies detailing how such tools were refined using feedback from the priority population and how this process could be replicated by others working with low-income and minority populations. Thus, the purpose of this paper is to describe the development and use of community-focused intervention tools to complement a clinic-based cardiovascular disease (CVD) risk reduction program for underserved, midlife women. These intervention tools were designed to provide a framework for participants to set goals to overcome environmental barriers, and to increase women’s awareness and use of health-promoting community resources.

VI.C. Methods

The WISEWOMAN Project:

The WISEWOMAN (Well-Integrated Screening and Evaluation for Women Across the Nation) Project is a federally-funded CVD risk reduction program for underserved, midlife women, with the purpose of lowering women’s risk of disease through improved nutrition, increased physical activity, and smoking cessation. WISEWOMAN is currently funded in 15 states and operates in tandem with the National Breast and Cervical Cancer Early Detection Program, through local health departments and community health centers. The WISEWOMAN Project has generally produced favorable, yet modest effects on risk factors; these results, coupled with mounting evidence of the key role of environmental factors in supporting healthy behavior changes, prompted the recommendation that future projects incorporate strategies to address community-level factors.

As part of continued evaluation of the Project, a randomized controlled trial to determine the effectiveness of an enhanced lifestyle intervention for WISEWOMAN was conducted in southeastern North Carolina from March 2003 to December 2004. Women (n =
were enrolled into the 12-month intervention and were randomized to receive either a minimum intervention (control group) or an enhanced intervention (intervention group). Women in the minimum intervention group received two mailed pamphlets on diet and physical activity. Enhanced intervention components included 2 individual sessions and 2 group sessions with a WISEWOMAN Health Counselor, motivational phone calls and mailings, and Community Health Advisor contacts. The enhanced intervention facilitated individual barrier assessment and goal-setting using the New Leaf...Choices for Healthy Living manual, a behavior change program used in previous North Carolina WISEWOMAN projects. The WISEWOMAN Health Counselor began behavior change counseling by administering a dietary risk assessment and a physical activity assessment, which both list responses in one of 3-columns. Responses in the far left column indicate healthy behaviors that the Health Counselor encouraged participants to continue. Responses in the far right column indicate unhealthy behaviors, and the Health Counselor gave participants suggestions for changing these practices by addressing barriers to behavior change, using New Leaf Tip Sheets corresponding to the assessment items.

*Initial Development of the Community-specific Intervention Tools:*

In an effort to improve upon previous WISEWOMAN intervention impact by addressing community-level factors, the enhanced intervention also included 2 new intervention tools, designed to complement the New Leaf materials, which are the focus of this paper. In order to develop the new community-focused intervention tools, a formative research process was undertaken. The five step process focused on the development and pilot testing of a Neighborhood Assessment with Tip Sheets and a Community Resource Guide.
tailored for midlife women in the study area. The steps in the process of developing these tools and the purpose of each step are in Table 6.1.

The Neighborhood Assessment and accompanying Tip Sheets, (modeled after the dietary risk and physical activity assessments in the New Leaf manual) were designed to facilitate goal-setting to achieve healthier choices in one’s community. The Community Resource Guide linked participants to affordable community resources for a healthier diet and activity, and listed names and contact information for health-promoting community programs and facilities.

We drafted the Neighborhood Assessment after a literature review and exploration of the study area. The review of the literature focused on environmental barriers and resources for a healthy diet and physical activity, especially among lower-income, midlife women. We explored the community by visiting 3 convenience stores, 3 neighborhood grocery stores, 3 local chain supermarkets, and a large discount superstore, and comparing the price and availability of specific items on a list of healthy foods thought to be culturally appropriate for the study population. Field visits were also made to resources frequently mentioned by community members, including the food bank, a local produce market, 2 local parks, the Senior Center, and a community gym.

Data gathered from the literature and from exploration of the study area converged to reveal that a lack of supermarkets in the rural and low-income, inner-city areas of the study site and high fast food restaurant density were broader, community-level barriers. Proximal barriers noted in the literature included unhealthy food available at church, work, and at home. Pedestrian unfriendly neighborhoods and the lack of easily accessible, affordable, and safe physical activity venues (e.g., parks, affordable fitness centers) were barriers to activity.
Thus, on the Neighborhood Assessment, we included 7 items to assess nutrition barriers and 14 items to address physical activity barriers. We designed matching Tip Sheets as a resource for Health Counselors to give participants advice and encouragement to achieve the goals they set to overcome barriers identified on the Neighborhood Assessment. For example, for participants who report visiting fast food restaurants frequently, one tip is: “Take quick snacks, like apples or carrot sticks, when running errands, so that you are not hungry when you pass a fast food place.”

We designed the Community Resource Guide as a tool to increase awareness of local community opportunities and to address barriers identified by the Neighborhood Assessment. To draft the Guide, nutrition and physical activity resources in the study area, including those deemed relevant to lower-income, midlife women based on the literature review, were compiled from the Internet and phone book. Nutrition resources included: nutrition classes offered by the Cooperative Extension, Diabetes Coalition, and Health Department; local produce stands and pick-your-own farms; gleaning; and van rides to a large discount superstore that sold groceries (for participants without access to a vehicle). Physical activity resources included: places to walk (e.g., the mall, school tracks, and trails); parks; exercise programs offered by the Recreation Department; the YMCA, Senior Center, and a local community recreation center; and numbers to call to ask for improvements to make neighborhoods more conducive to activity (e.g., sidewalk repair). We visited or called each resource to confirm its business status and to obtain helpful information to include in the Guide.

Qualitative Study to Revise the Tools:
Once the Neighborhood Assessment and Community Resource Guide were drafted, two additional steps were carried out to augment and tailor the Tip Sheets and Community Resource Guide to the study population in southeastern North Carolina. First, a WISEWOMAN Community Advisory Board, a group of community representatives interested in health promotion, assembled to discuss community barriers and resources salient to underserved, midlife women in the area. Second, the drafts of the intervention tools were pilot tested using semi-structured, qualitative interviews with women similar to WISEWOMAN participants from southeastern North Carolina to determine whether the tools were culturally appropriate and relevant to women’s lives. We developed two semi-structured interview guides for the interviews. Both guides elicited information regarding multi-level influences on behavior. With one guide, the interviewer administered the Neighborhood Assessment, asked the respondent about the understandability of the Assessment, and asked her to provide advice to a hypothetical friend for overcoming various environmental barriers. When participants described an unhealthy environmental interaction (e.g., frequently eating at fast food restaurants), the interviewer probed about this behavior. Using the second interview guide, the interviewer elicited participants’ responses to the Community Resource Guide, asked about facilitators and barriers to using community resources, and about resources respondents currently used.

To recruit women for the qualitative interviews, we contacted a key informant at each of four community centers in the study area, who then asked women who used or worked at the center if they were interested in participating. Twenty-eight black and white women, ages 37-67 years, completed qualitative interviews. The Neighborhood Assessment interview guide was used with 16 participants, and the interview guide eliciting responses to the
Community Resource Guide was administered to 12 participants. Women read the informed consent, had a chance to ask questions, and after they gave informed consent, the interview began. Interviews lasted 40-60 minutes, were audio-taped, and transcribed verbatim. Participants were compensated $25 for their time. The protocol of the qualitative study was approved by the University of North Carolina at Chapel Hill School of Public Health Institutional Review Board.

A codebook with operational definitions was developed deductively from research questions. All interviews were coded independently by two coders, who met to discuss and reach consensus on codes to assign to segments of text. The transcripts were imported into N’vivo\textsuperscript{133} for data management.

**IV.D. Results**

The results focus on the findings from the qualitative inquiry and a presentation of the two tools. Overall, feedback from the Community Advisory Board provided important insights into several potential community resources for underserved, midlife women in the study area, as well as facilitators and barriers to using these resources. (Table 6.2) Board members identified several physical activity resources, while only one nutrition resource was mentioned (i.e., a nutritionist). Factors related to access to resources, such as transportation and cost, were noted often as facilitators or barriers to using resources. A community-level barrier to healthy eating emphasized by Board members was the abundance of fast food and other types of restaurants.

Tables 6.3 and 6.4 show examples of women’s suggestions for how they would motivate a hypothetical friend trying to overcome various barriers to a healthy diet and physical activity, respectively, and how this advice was incorporated into the Tip Sheets
accompanying the Neighborhood Assessment. Women employed creative strategies for overcoming barriers posed by the environment. Advice for overcoming nutrition barriers centered around bringing healthy food from home, rather than depending on local restaurants when at work or running errands, and on making healthy choices when presented with a variety of healthy and unhealthy foods. Suggestions for overcoming physical activity barriers focused on exercising with a friend or with a group and encouragement to examine the area around the home or workplace for physical activity venues (e.g., parks, trails).

The facilitators and barriers to using nutrition and physical activity resources mentioned most often in the qualitative interviews were similar to those mentioned by Community Advisory Board members, and included various aspects of the accessibility of the resource (e.g., convenience of hours, location, cost) and the social and physical atmosphere of the resource (e.g., quality of produce offered, quality of equipment, crowded or stressful environment, safety, and scenery). These facilitators and barriers were addressed in the final drafts of the intervention tools: Resources that were the most accessible to women were included in the Community Resource Guide. For instance, we included a local produce market and the food bank because they were mentioned by women in qualitative interviews as places to obtain inexpensive or free produce. Local middle school and University tracks and 2 popular walking routes were also included because they were mentioned as safe areas where women were likely to walk. Because all participants reported shopping at large chain grocery stores, these were not included in the Guide. We included two moderately-priced, all-women’s gyms because qualitative interviews revealed that expensive membership fees and exercising with men were barriers to using gyms. Overall, we included 10 nutrition
resources and 20 physical activity resources in the Community Resource Guide. The finalized intervention tools are included in Appendix B.

*Intervention Applications:*

The intervention tools described here can be incorporated into a multi-component intervention to help participants support and maintain healthier environmental interactions. For example, in the WISEWOMAN Project, the Neighborhood Assessment was administered to all participants, and women in the enhanced intervention group collaborated with the Health Counselor to set goals to make healthier choices regarding their interactions with the nutrition and physical activity environments. The Health Counselor used the Tip Sheets to counsel and encourage participants and referred them to the Community Resource Guide for resources to help them overcome barriers and achieve goals set using the Neighborhood Assessment. In one WISEWOMAN group session, the Health Counselor asked participants to choose a resource from the Guide to explore and report back to the group about at the next session. In motivational phone calls, Community Health Advisors encouraged participants to use community resources, and asked about their progress on Neighborhood Assessment goals.

**IV.E. Discussion**

Our experience designing and using new community-specific intervention tools in the WISEWOMAN Project should provide insight for others designing health-promotion materials to address community-level factors within clinic-based prevention and treatment programs. We encountered challenges in designing and implementing the tools in a multi-component intervention, and provide recommendations for addressing these challenges below.
First, it is difficult to identify the most appropriate resources for the intervention population when working in an unfamiliar community. While we found some important resources on the Internet and in the phone book, the field visits to community resources and the qualitative interviews with community members were both vital steps to learn of barriers, to identify unknown resources, and to ensure the relevance and cultural-appropriateness of the intervention tools. For example, a large park was identified on the Internet, but the park’s popularity and the barrier of perceived crime in the park were not fully understood until after talking with women and visiting the park. Thus, we recommend that the development of similar tools be informed by talking with community members and by visiting resources.

Second, integrating community-focused intervention tools into a multi-component intervention can be challenging because program participants have many competing demands on their time and energy, making it difficult to prioritize using health-promoting resources. Thus, we recommend anticipating competing demands and building them into the intervention tools. For instance, if participants are likely to be caring for children, it may be more effective to include parks with a playground in the Community Resource Guide, emphasizing the fact that children can play while the caregiver walks. We also recommend that the person(s) who will implement the intervention visit community resources, so that he or she can have firsthand knowledge about resources when recommending them.

Third, the notion that environmental factors influence health behaviors was abstract to some participants. Therefore, we recommend crafting an understandable introduction to the tools, giving clear examples of how environmental and community factors can influence individual’s behaviors (e.g., stray animals in the neighborhood may make one less apt to
walk). Building this idea into other program components (e.g., group sessions) also helped address this abstraction.

Finally, creating community-focused intervention tools is challenging, because they must be prepared quickly in order to be ready for program participants, and much time and energy are required to make the resource tools specific to the study area. To address this challenge, interventionists are encouraged to use the description of the process presented here. They may also use a manual we are developing as a guide for creating similar intervention tools (Appendix G), which incorporates insights gained from the WISEWOMAN intervention and was designed for practitioners working in busy public health settings.

VI.F. Conclusions:

Overall, triangulation of several data sources (i.e., literature review, Internet and telephone book searches, field visits, Community Advisory Board meeting, and qualitative interviews) resulted in comprehensive and tailored community-focused intervention tools. The qualitative data reinforced what was learned in the initial literature review. For example, the abundance of fast food restaurants, lack of supermarkets in rural and inner-city areas, and unhealthy food at home, work, and religious and social gatherings were barriers to a healthy diet, while heavy traffic, crime in local parks, and the paucity of affordable fitness centers were barriers to a physically active lifestyle. Women who successfully overcame many of these barriers offered helpful tips and new resources, which we included in the community-focused intervention tools.

We found two other studies that evaluated the effect of similar intervention tools on use of resources: One evaluated a community-specific physical activity directory for mothers
of young children, and found increased awareness but little effect on use of physical activity resources. The other used community resource materials in the maintenance phase of a diabetes self-management intervention that targeted healthier dietary practices. Use of community resources was an intervention outcome, measured using a validated Chronic Illness Resources Survey. The intervention produced modest, yet significant favorable changes in healthful dietary practices, clinical measures, and use of community resources. Against expectations, participants who received the community resource materials did not report significantly greater increases in use of resources compared to those who did not. The intervention tools described in the current paper were used in a randomized trial of the WISEWOMAN Project. Women who received the multi-component intervention reported significantly greater increases in knowledge and self-reported use of PA resources, and in self-reported use of nutrition resources, compared to women in the control group (Chapter 7).

Although structural environmental changes to encourage physical activity and healthy eating are important, such changes may not be feasible to implement in a clinic-based intervention. Environmental change approaches may not be sufficient to promote lasting behavior change by themselves. To support and maintain behavior change, individuals must be aware of the barriers to healthy living that the environment poses, and believe they can overcome these barriers. Individuals also need to know about community resources and have the confidence and motivation to use them. The intervention tools described here were designed to address these needs. When used as a part of a multi-component intervention, we are hopeful that such tools will help support lasting behavior change to lower the risk of chronic disease.
Table 6.1. Steps in the Process of Developing the Neighborhood Assessment, Tip Sheets, and Community Resource Guide

<table>
<thead>
<tr>
<th>Step</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Literature review</td>
<td>• To determine environmental barriers to healthy behaviors specific to the study population, to include as items on the Neighborhood Assessment and to address on accompanying Tip Sheets</td>
</tr>
<tr>
<td>2. Exploration of study area</td>
<td></td>
</tr>
<tr>
<td>3. Internet and telephone book searches</td>
<td>• To compile community resources germane to the priority population for inclusion in the Community Resource Guide</td>
</tr>
</tbody>
</table>
| 4. Field visits or phone calls to each resource on the Community Resource Guide | • To confirm the business status of resources  
• To gather helpful information to include in the Guide (e.g., hours open, special rates) |
| 5. Pilot testing with community members   | • To improve understandability of the tools  
• To tailor Tip Sheets to include advice from community members  
• To ensure the appropriateness of resources included in the Guide  
• To learn about unknown resources  
• To learn of barriers to the use of resources to be addressed in the intervention tools |
<table>
<thead>
<tr>
<th>Community Resources</th>
<th>Facilitators</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Access to nutritionists via physician referral</td>
<td>• The “Buddy System”: Exercising in a group or with one friend, for motivation and accountability</td>
<td></td>
</tr>
<tr>
<td>• Mall for walking</td>
<td>• Low or no cost</td>
<td>• Fast food restaurants</td>
</tr>
<tr>
<td>• Local parks</td>
<td>• Easily accessible (public transportation to resource, parking available at resource)</td>
<td></td>
</tr>
<tr>
<td>• Popular walking route near the beach</td>
<td></td>
<td>• Fear of crime, animals</td>
</tr>
<tr>
<td>• Local community gym</td>
<td></td>
<td>• Cost of gyms</td>
</tr>
<tr>
<td>• Senior Center</td>
<td></td>
<td>• Need for childcare</td>
</tr>
<tr>
<td>• Church physical activity programs</td>
<td></td>
<td>• Lack of knowledge about whether or not the public can use school tracks</td>
</tr>
<tr>
<td>• Local middle school, high school, University tracks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Health Department</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nutrition barrier</td>
<td>Participant’s advice or encouragement to hypothetical friend</td>
<td>Advice or encouragement as worded on the Tip Sheets</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Excessive fast food</td>
<td>“…there are so many fast food restaurants…when you’re shopping it’s so much easier to grab this or grab that instead of taking it with you. I brought a big cooler to put in the van…so we can take our stuff with us when we are going somewhere…”</td>
<td>“Take quick snacks, like apples or carrot sticks, when running errands, so that you are not hungry when you pass a fast food place.”</td>
</tr>
<tr>
<td>Rarely visits produce stand, pick-your-own farm</td>
<td>“I think truly the farmers market…the people there are so pleasant and nice…Sometimes I wish we just had neighborhood grocery stores again because of the personal aspect of it.”</td>
<td>“Farmer’s markets and produce stands can give you the small-town feel in a larger city.”</td>
</tr>
<tr>
<td>Unhealthy food at work</td>
<td>“…at work, I would just say you really just need to get yourself a cooler…to put your food in and make an effort to bring something healthy…”</td>
<td>“Bring food from home—buy foods you enjoy, like sandwiches, canned fruit, or a salad.”</td>
</tr>
<tr>
<td>Physical activity barrier</td>
<td>Participant’s advice or encouragement to hypothetical friend</td>
<td>Advice or encouragement as worded on the Tip Sheets</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Difficult to access school facilities</td>
<td>“I asked about it a couple of years ago and the principal said that he welcomed people to walk.”</td>
<td>“Call schools near you to find out if they allow the public to use their facilities.”</td>
</tr>
<tr>
<td>Does not use local park or trail</td>
<td>“But you also have a playground where children can play, so if you had a small child…I have taken my neighbor’s children with me to the park and let them play …while I walk.”</td>
<td>“Take a family trip to a park for the day. Walk around the playground while your children play on the equipment.”</td>
</tr>
<tr>
<td>Cost of fitness centers</td>
<td>“You can always go in and talk to them [private gyms] and they’ll give you 3 months free or whatever.”</td>
<td>“Ask about a trial membership, so you can see if you’d really enjoy it. Take a friend with you and try it out!”</td>
</tr>
<tr>
<td>Does not want to walk alone</td>
<td>“Get one woman to rise up… Set little walking parties and see how many you can get to join in.”</td>
<td>“Start a walking group in your neighborhood.”</td>
</tr>
</tbody>
</table>
CHAPTER 7
INCREASING USE OF NUTRITION AND PHYSICAL ACTIVITY COMMUNITY RESOURCES AMONG UNDERSERVED WOMEN

VII.A. Abstract

Background: Few interventions have evaluated the effect of providing community resource tools on the use of nutrition and physical activity (PA) resources (e.g., produce stands, walking trails). Thus, the purpose of this study was to examine whether a multi-component intervention, which included tools addressing community and environmental factors related to a healthy lifestyle, significantly increased self-reported use of resources. We also examined whether this effect was mediated by knowledge of or self-efficacy for accessing resources.

Methods: Data were collected from 236 women, ages 40-64 years, enrolled in a 12-month randomized intervention trial as part of the WISEWOMAN Project in southeastern North Carolina. Community resource intervention tools included a Neighborhood Assessment with corresponding tip sheets and a Community Resource Guide. One survey administered to participants in the intervention group only assessed whether or not each resource in the Guide was used and barriers to use. A separate survey measured use of resources and potential mediators. Multiple linear regression models were used to estimate the association between the intervention and change in use of resources. Mediation was examined using Baron and Kenny criteria and the Sobel test.
**Results:** Community resources most often used were produce stands and farmer’s markets, walking programs, parks and trails, and affordable fitness centers. Frequently mentioned barriers were lack of time, lack of motivation, and lack of perceived need to use the resource. Among urban participants, the intervention was associated with statistically significant increases in use of nutrition resources compared to urban control participants (p = 0.02). There was a marginally significant intervention effect on change in use of physical activity resources (p = 0.06), potentially mediated by knowledge (Sobel test statistic = 1.50, p = 0.13).

**Conclusions:** The greater intervention effect on use of nutrition resources in urban participants may indicate that there are fewer resources available in rural areas. The Baron and Kenny criteria and the Sobel test are important tools to evaluate mediation. Enhancing intervention participants’ knowledge about community resources may increase use of these resources and ultimately facilitate healthful lifestyle behavior changes.

**VII.B. Background**

Health promotion interventions have broadened their focus to include both individual and environmental approaches to support healthful behavior changes. Environmental strategies previously used in interventions to encourage initiation and maintenance of behavior change include: lowering prices of healthy vending machine options, building walking trails, and adding signs in buildings to encourage stair use. However, when working within the context of a clinic-based prevention program, implementing interventions to produce such environmental and community changes can be challenging. Clinic-based programs have limited resources and the staff minimal training to make environmental
changes of this magnitude. Such programs are also traditionally individually-focused. Because of these challenges, environmental intervention approaches are less likely within the context of clinic-based programs. However, it is possible for such programs to connect participants to existing health-promoting community resources, such as produce stands, parks, and county-funded gyms. While such resources may exist, community members may be unaware of them. Thus, a potentially effective strategy for clinic-based interventions is to provide staff with tools to help patients or program participants identify and address environmental and community-level barriers and facilitators to a healthy diet and physical activity (PA) by increasing participants’ knowledge of and self-efficacy for accessing local community resources. This could lead to increased use of such resources, facilitating healthy lifestyle changes. In addition, increasing participants’ awareness of environmental barriers and/or inequities to a healthy diet and PA could lead to participant advocacy for community changes.

One study employed such a strategy, using a pre- post- design to evaluate the effectiveness of a PA directory for older adults. While showing small increases in awareness and use of local PA opportunities, a causal relationship between the PA directory and resource use could not be demonstrated due to the study design (not randomized). Previous randomized controlled intervention trials with multiple components have provided study participants with a list of local nutrition and/or PA resources to support attempts at behavior change. Only one of these trials examined use of resources as an outcome. None of the intervention trials evaluated the intervention effect on change in use of resources with possible mediation by psychosocial variables specific to resource use. It is important to study
such variables so that future intervention and policy efforts can target the constructs most likely to affect behavior change.

Thus, we examined the nutrition and PA community resources used most commonly by program participants in a clinic-based cardiovascular disease risk reduction program, as well as the most frequently reported barriers to the use of each resource. This provided contextual detail for the main purpose of the study, which was to examine whether the cardiovascular disease risk reduction intervention, which included community resource intervention tools, significantly increased self-reported use of nutrition and PA resources, and to examine whether this effect was mediated by knowledge of or self-efficacy for accessing resources.

**VII.C. Methods**

*The North Carolina WISEWOMAN Project:*

Data for this study were collected as a part of a 12-month randomized intervention trial of the WISEWOMAN (Well-Integrated Screening and Evaluation for Women Across the Nation) Project\(^21\) in southeastern North Carolina. Participants (n = 236) were underinsured women between the ages of 40 and 64 years. They were randomized to either an intervention group or a control group. Control group participants received two mailed pamphlets on heart-healthy nutrition and PA practices. Participants in the intervention group received individual and group counseling sessions with a health counselor, follow-up mailings, and phone contacts from a community health advisor. Participants were enrolled, and completed baseline, 6-, and 12-month measures at a local community health center. The study was approved by the School of Public Health Institutional Review Board on Research Involving Human Subjects at the University of North Carolina at Chapel Hill.
Women in the intervention group also received community resource intervention tools developed using qualitative research with women similar to WISEWOMAN participants in age, race, and area of residence. Two tools were developed: (1) a Neighborhood Assessment with corresponding tip sheets; and (2) a Community Resource Guide. The Neighborhood Assessment was administered as part of the 6- and 12-month measures and helped women identify environmental barriers and facilitators to healthy eating and PA. Women then worked with the health counselor to set personal goals, which included overcoming environmental and community-level barriers and using community resources. The health counselor used corresponding tip sheets to encourage the participant to achieve her goals. The Community Resource Guide listed local nutrition and PA resources, including local produce stands, public parks, and affordable gyms. The Guide was given to participants at the second individual counseling session, was incorporated into a group session activity, and was consistently referred to on the Neighborhood Assessment tip sheets.

Survey Measures:

As part of 12-month follow-up measures, a survey was administered to participants in the intervention group, to assess recollection of receiving the Guide, use of specific resources (response options were yes and no), and barriers to resource use. The response rate was 96.6% (114/118). Potential barriers (reasons for not using the resource) are in Table 7.1. Participants were asked to select all barriers that applied from the same list of barriers each time they reported not using a particular resource.

A separate survey was administered to all participants as a part of baseline and 12-month measures. At follow-up, the survey response rate was 89.4% (211/236). Dependent variables were changes in self-reported use of nutrition and PA resources. Use of nutrition
and PA resources was measured using 1 item for each: “How much would you say you
currently make use of what your community has to offer in terms of [healthy food options?
being more physically active?]” Response options were on a 10-point Likert scale where 10 =
“a great deal” and 1 = “not at all.” Change in use was calculated by subtracting self-reported
use at baseline from self-reported use at follow-up.

Assessment of Potential Mediators:

Potential mediators examined were change in knowledge of nutrition and PA
resources and change in self-efficacy for accessing and regularly using nutrition and PA
resources. Knowledge and self-efficacy were measured at baseline and 12-months.
Knowledge was chosen as a potential mediator because a participant would not be able to use
a resource if she were unaware of it. Previous work also demonstrates that community
members’ knowledge of community resources may be lacking.65 Participants responded to
two items about their knowledge of nutrition resources and two items about their knowledge
of PA resources: “How much do you know about: [classes or sessions you could attend to
learn how to eat healthier? where to shop to get fruits and vegetables for the least amount of
money? affordable exercise places where you could join classes or use equipment? parks,
walking trails, or tracks where you could get more exercise?]” Response options were on a
10-point Likert scale where 10 = “know a lot” and 1 = “know nothing.” Two knowledge
variables were created by separately summing the responses related to knowledge of nutrition
resources and those related to knowledge of PA resources. Change in knowledge was
calculated by subtracting the value of the knowledge variable at baseline from that of the
knowledge variable at follow-up.
Self-efficacy, or confidence in one’s ability to perform a behavior, was also a potential mediator because it has been found to be a mediator in previous studies,"\textsuperscript{67,137,138} and is a psychosocial construct commonly targeted in interventions. Participants’ self-efficacy for finding out about and regularly using nutrition and PA resources was assessed using pairs of items with the following structure: “I can get myself to: [find out what classes about good nutrition are available; find out what exercise places are affordable and offer the kinds of things that are right for me; learn more about parks, walking trails, and tracks;]” and “I can get myself to: [attend at least 3 classes or programs a year about good nutrition; join an affordable exercise place and attend class or use the equipment at least once a week; start using parks, walking trails, or tracks on a regular basis].” Response options ranged from 10 = “very sure” to 1 = “not very sure.” Two self-efficacy variables were created by separately summing responses related to nutrition and those related to PA. Change in self-efficacy was calculated by subtracting the self-efficacy variable at baseline from the self-efficacy variable created from the 12-month responses. The Cronbach coefficient alpha, a measure of internal consistency, for the two-item scale to measure self-efficacy for accessing nutrition resources was 0.65 and for the 4-item scale regarding self-efficacy for accessing PA resources was 0.79.

*Covariate Selection and Assessment:*

Variables that might affect women’s use of community resources were chosen as potential covariates. These included urbanicity, income, age, body mass index (BMI), education, and race. The community health center where the intervention trial was based is located in a moderately-sized town, with a U.S. census bureau population estimate for July 1, 2004 of 93,292."\textsuperscript{139} However, many women from surrounding rural areas also enrolled. Thus,
urbanicity was defined as urban if the participant’s address was in the moderately-sized town and rural if elsewhere. Annual household income was self-reported at enrollment, with participants choosing one of six response options (less than $10,000; $10,000 - $29,999; $30,000 - $49,999; $50,000 - $69,999; greater than $70,000; prefer not to answer). Income was dichotomized based on the participant’s total annual household income, greater than or equal to $10,000 versus less than $10,000. Highest grade completed (0 – 17+), and race were also self-reported at the enrollment visit. Education was dichotomized based on 12 or more grades completed, and for race, white versus other. Height was measured using a Schorr portable height board (Schorr Productions, Olney, MD) and weight was measured using a Detecto balance beam scale (Detecto, Webb City, MO). BMI was calculated by dividing weight in kilograms by height in meters squared. Age in years was calculated using self-reported birth date. Age and BMI were treated as continuous variables.

**Statistical Analysis:**

For the dichotomous covariates (urbanicity, income, education, race), chi-squared tests were used to evaluate differences between groups. For continuous variables, t-tests were used to examine differences between groups. The intervention effect on change in use of nutrition and PA resources was assessed using multiple linear regression models. An interaction term was added to regression models, to examine potential effect modification by the six covariates. A covariate was declared an effect modifier if the p-value for the b-weight (the unstandardized regression coefficient) for the interaction term was < 0.05. Covariates that were not modifiers were added to the model using forward selection. A 10% change in the b-weight for the intervention effect was required for a variable to be retained in the model.
as a confounder. All statistical analyses were conducted using SAS Version 8.2 (Cary, NC).

We used the Baron and Kenny criteria\textsuperscript{67,85} and the Sobel Test\textsuperscript{87} for mediation analyses. Baron and Kenny\textsuperscript{85} suggest four criteria to establish that a variable mediates the effect of an independent variable on a dependent variable: (1) the independent variable is a cause of the dependent variable (Figure 7.1, path \( \tau \)); (2) the independent variable is a cause of the mediating variable (Figure 7.1, path \( \alpha \)); (3) the mediating variable is a cause of the dependent variable (Figure 7.1, path \( \beta \)); and (4) the effect of the independent variable on the dependent variable is attenuated when controlling for the mediating variable. However, there is no criterion for how much the intervention effect must be attenuated. Therefore, we also used the Sobel test, which is a significance test of mediation wherein the t-test value of the mediated effect is calculated using the following formula: 
\[
Z = \frac{\alpha \beta}{\sqrt{\alpha^2 \sigma^2_{\beta} + \beta^2 \sigma^2_{\alpha}}},
\]
where \( \alpha \) indicates the relation between the independent and mediating variables and \( \beta \) indicates the relation between the mediating and dependent variables after adjusting for the effect of the independent variable.\textsuperscript{87} The Sobel test statistic and accompanying p-value, the ratio of the indirect to direct effects (\( \alpha \beta: \tau \), see Figure 7.1), and the percent of the total effect that was mediated were generated using a SAS program written by Dudley, Benuzillo, and Carrico.\textsuperscript{141}

**VII.D. Results**

Table 7.2 compares intervention to control group participants on several variables at baseline. Income was the only variable that differed significantly between groups, with more women in the control group having an average annual household income of less than $10,000 compared to women in the intervention group (\( p = 0.06 \)).
Seventy-five percent (85/114) of participants in the intervention group who responded to the Community Resource Guide Survey remembered receiving the Guide. Table 7.3 lists resources in the Guide, the percent of women who reported using each resource, and the top three barriers to the use of each resource. The resources used the most were produce stands and farmer’s markets, walking programs, parks and trails, and affordable fitness centers. Frequently mentioned barriers were lack of time, lack of motivation, and lack of perceived need to use the resource. Barriers mentioned as “other” were lack of interest in using the resource, health problems, and the use of other resources.

Table 7.4 shows the overall effect of the intervention on change in self-reported use of nutrition resources. Effect modification was examined first. For change in nutrition resource use, the only covariate found to be a significant effect modifier was urbanicity. Model 2 indicates that, on average, intervention group participants residing in urban areas significantly increased their use of nutrition resources from baseline to 12-month follow-up compared to control group participants living in urban areas (b-weight = 1.08, p = 0.02). There was not a significant intervention effect among rural women. The other five covariates were examined for effect modification, but none were found to be modifiers. Potential confounding by the five remaining covariates was then assessed, and income was the only confounder. After controlling for income, the significant effect of the intervention on change in use of nutrition resources among urban participants remained (b-weight = 0.92, p = 0.04).

Baron and Kenny criteria for the potential mediators of change in knowledge of and self-efficacy for accessing nutrition resources are shown in Table 7.5. Because the significant effect for change in nutrition resource use was found only among urban participants, only urban residents’ data were used in the analysis to examine potential mediation by knowledge
of and self-efficacy for accessing nutrition resources. Although the intervention had a significant effect on change in use of nutrition resources, the intervention was not associated with change in knowledge of nutrition resources \((p = 0.53)\). Table 7.5 also demonstrates that among urban participants, the intervention was not associated with average changes in self-efficacy for accessing nutrition resources \((p = 0.80)\). Therefore, neither knowledge of nor self-efficacy for accessing nutrition resources were mediators of the significant intervention effect on increased nutrition resource use among urban participants.

Table 7.4 also shows the overall effect of the intervention on change in self-reported use of PA resources. The six covariates were examined as potential effect modifiers, and none were modifiers. Potential confounding by the covariates was assessed, and income was the only confounder. The intervention effect on change in use of PA resources almost met the 0.05 significance level in the crude model \((b\text{-weight} = 0.76, p = 0.06)\), and this effect attenuated when adjusted for income \((b\text{-weight} = 0.67, p = 0.11)\).

Using the crude model in Table 7.4 for the intervention’s effect on change in use of PA resources, the intervention had a borderline significant association with change in knowledge of PA resources \((p = 0.07)\). Change in knowledge and change in use of PA resources were significantly associated, and there was an 18% decrease in the b-weight when change in knowledge was included in the final model (Table 7.5). The Sobel test statistic was 1.50 \((p = 0.13)\). While this test statistic is not statistically significant, the ratio of the indirect to direct effect was 0.33 and 25% of the total intervention effect was mediated by knowledge of PA resources. Table 7.5 shows that the intervention was not associated with average changes in self-efficacy for accessing PA resources \((p = 0.26)\). Thus, self-efficacy for
accessing and regularly using PA resources did not mediate the effect of the intervention on the use of PA resources.

While the intervention was associated with increases in self-reported use of nutrition resources among urban participants and increases in knowledge and use of PA resources, this did not translate into significant increases in self-reported fruit and vegetable consumption or moderate to vigorous physical activity (MVPA) at 12-months. Table 7.6 shows that self-reported use of nutrition resources at 12-months was significantly correlated with fruit and vegetable consumption at 12-months, yet change in use of resources was not significantly correlated with change in fruit and vegetable consumption. Table 7.6 also shows the correlation between use of PA resources at 12-months and MVPA, and change in use of PA resources and change in MVPA (baseline to 12 months). Neither correlation coefficient was statistically significant. Thus, it seems that increased use of nutrition and PA resources was not associated with downstream behavior changes (produce consumption and MVPA).

**VII.E. Discussion**

One purpose of this study was to examine the nutrition and PA community resources used by the most participants. We also examined barriers to the use of each type of resource. Nutrition and PA resources used the most in the current study were produce stands and farmer’s markets, walking programs, parks and trails, and affordable fitness centers. The major barriers to use of resources were on the individual level. These included lack of time, lack of perceived need, and lack of motivation to use resources. It is noteworthy for future work that for almost every resource, lack of time was the barrier reported by the most women, which suggests the need for built environment strategies to help women accrue more PA as a part of daily life.
There are few studies evaluating the effectiveness of health promotion directories and resource guides.\textsuperscript{63-65} To address this gap, we assessed the overall intervention effect on community resource use and examined potential mediators specific to the use of community resources. We found that the intervention was associated with significantly greater increases in self-reported use of nutrition resources among urban participants only, perhaps because the Community Resource Guide included resources that were mostly located in the moderately-sized town where the study was based, while there are relatively few such resources available in rural areas. There was a marginally statistically significant intervention effect on increased use of PA resources, which was possibly mediated by knowledge. Knowledge has been found to be a mediator in previous studies.\textsuperscript{137,142} Self-efficacy for accessing resources was not found to be a mediator in our study; however, it was a mediator in other studies\textsuperscript{67,74} and is a promising psychosocial construct which should be explored in future work. Income was a confounder in both analyses. A possible explanation for this is that fewer intervention group participants had an annual household income of less than $10,000 compared to control group participants, and income is likely to have an effect on the use of community resources.

Several randomized trials of multi-component interventions have included community resource materials similar to those described in this paper. For example, Marcus et al.\textsuperscript{66} gave participants a resource manual describing options for PA in the community. At the study’s conclusion, participants who received the multi-component intervention were significantly more active than those in the control group. A randomized trial conducted as a part of the Harvard Cancer Prevention Program\textsuperscript{68} gave participants in the intervention arm of the trial information about resources in the local community that could facilitate their behavior change goals. Results indicated that participants who received the intervention had
significantly greater favorable changes in fruit and vegetable consumption, red meat consumption, and multivitamin intake relative to the control group. Miller et al.\textsuperscript{67} used a PA directory that provided information about local PA opportunities in a multi-component intervention to increase PA among women with young children. They found that the intervention had a significant effect on PA, and that self-efficacy and partner support for PA were mediators of PA behavior change. While these three studies showed favorable intervention effects on important outcomes, there were no reports on change in use of community resources as an effect of the community resource tools.

Glasgow et al.\textsuperscript{69} used a community resources enhancement to a basic intervention compared to a telephone follow-up enhancement and measured use of community resources using a validated instrument.\textsuperscript{71} The community resources enhancement consisted of a three-ring binder of resources related to nutrition and diabetes management; eight newsletters with information on multiple resources to support healthy eating patterns; and goal-setting for community nutrition support activities in face-to-face meetings. Almost all participants (98\%) reported reading newsletters specific to using community resources. However, the community resources enhancement did not produce meaningful incremental changes in important outcomes compared to the basic intervention, and community resource use did not differ significantly between groups. In a non-randomized study, Miller and Miller\textsuperscript{64} evaluated the effectiveness of a PA directory to raise awareness and encourage older adults to participate in local PA options. Results indicated that 93\% remembered receiving the PA directory, 51\% reported that it increased their awareness of options, 7\% reported calling a number in the PA directory, and 5\% attended a class or session in the past 6 weeks. Haber and Looney\textsuperscript{65} also evaluated a health promotion directory and found that 63\% of African
American respondents contacted a resource in the directory, while only 22% of a group of mostly Anglo American participants contacted a resource. In our study, 43% of intervention participants reported using farmer’s markets or produce stands, and between 10 and 14% reported using various PA resources. Both Haber and Looney\textsuperscript{65} and Miller and Miller\textsuperscript{64} concluded that randomized designs should be used to determine the effectiveness of future health promotion guides and directories.

The one randomized trial\textsuperscript{69} that evaluated the effect of the intervention on change in use of resources did not find a significant intervention effect. We found a significant intervention effect but it seems that increases in self-reported use of resources did not translate into downstream behavior changes. Although change in use of resources was not associated with change in either behavioral outcome (MVPA, fruit and vegetable consumption), if participants in the current study truly did increase their use of resources, there may be a lag time before there is evidence of an effect on these downstream health behaviors. Another possible reason for these results is that increased use of resources did not appreciably change the overall behavior patterns of participants (PA accrued or fruit and vegetables consumed). A final explanation is that women in the intervention group answered in socially desirable ways at follow-up, or that the measurement instruments did not accurately tap into women’s true knowledge and resource use. Taken together, this body of work suggests the need for further evaluation of community resource tools used in interventions, which are potentially effective for increasing participants’ use of resources, ultimately to facilitate healthier dietary and PA practices.

\textbf{VII.F. Conclusions}
Although we included some rural resources, most nutrition resources included in the Community Resource Guide were located in the urban area; more specifically, we included a popular produce market, located in the urban area. The resource category used by the most participants was produce stands and farmer’s markets. Future community resource tools should include information about rural resources, if available, and interventionists should look for opportunities to enhance and expand availability of rural resources. Our results regarding the biggest barriers to resource use suggest that individual-level factors may be more important than environmental-level factors in behavior change related to the use of community resources. Women in our study reported lack of time as a barrier to the use of several resources. Interventions should address this barrier by recognizing time limitations and providing tips for overcoming this barrier. For example, materials might encourage visiting a farmer’s market while running errands, or suggest ways to incorporate physical activity into the daily routine. In addition, to maximize time, changes to the physical environment can help women obtain physical activity as a natural part of daily life.

The current study is limited in that it used self-reported measures of use of resources. Measures for knowledge of resources and self-efficacy for accessing and regularly using resources were not previously tested for validity or reliability. In the current study, we assessed change in use (dependent variable) and change in knowledge and self-efficacy (evaluated mediators) over the same time period, making causality difficult to establish. Use of resources may have increased women’s knowledge of resources, rather than knowledge leading to increased use. Future studies should ensure appropriate timing of measures, which is important to adequately assess mediation. A final limitation is that our study was a multi-component randomized intervention trial and we were not able to separate out the effects of
various intervention components. We used mediation analyses to try to tease out these effects. Previous studies have employed analytic techniques such as structural equation modeling, or factorial research designs to examine effects of separate components. A strength of our analysis is that we used Baron and Kenny criteria coupled with the Sobel test, which tests the overall significance of the intervening variable pathway. Mediation analyses using both approaches should be considered in the future.

In conclusion, community members may have little knowledge of local health-promoting opportunities. For instance, even when community trails are close to survey participants’ homes, they often do not know about them and/or do not use them for PA. Our results suggest that knowledge is a potentially helpful mediator to target in future interventions. Neighborhoods with primarily low SES or minority residents may have fewer resources to facilitate a healthy diet and physically active lifestyle. However, most communities do have some health-promoting opportunities. Thus, increasing participants’ awareness of resources that can facilitate a healthy diet and PA and increasing their motivation and confidence for using such resources is a potentially effective strategy, which should continue to be studied.
Table 7.1. Potential Barriers to Use of each Nutrition and Physical Activity Resource in the Community Resource Guide (only assessed among intervention participants)

<table>
<thead>
<tr>
<th>Potential Barrier</th>
</tr>
</thead>
<tbody>
<tr>
<td>“I do not need to use the resource”</td>
</tr>
<tr>
<td>“I did not have enough time to use the resource”</td>
</tr>
<tr>
<td>“The resource was in an inconvenient location”</td>
</tr>
<tr>
<td>“The resource had inconvenient hours”</td>
</tr>
<tr>
<td>“The resource was too expensive for me to use”</td>
</tr>
<tr>
<td>“I was not motivated enough to use the resource”</td>
</tr>
<tr>
<td>“The resource was too crowded for me to use”</td>
</tr>
<tr>
<td>“The location of the resource has a lot of crime”</td>
</tr>
<tr>
<td>“There is no childcare at the resource”</td>
</tr>
<tr>
<td>“I did not like the activities offered by the resource”</td>
</tr>
<tr>
<td>“other” – participant specified a barrier not on the list</td>
</tr>
</tbody>
</table>
Figure 7.1. Baron and Kenny Model for Mediation

![Diagram of Baron and Kenny Model for Mediation]

Independent variable \[ \rightarrow \] Mediating variable \[ \alpha \] \[ \rightarrow \] Dependent variable \[ \tau \]

\[ \beta \]
Table 7.2. Participant Characteristics at Baseline, by Randomization Group.

<table>
<thead>
<tr>
<th>Participant Characteristics (baseline)</th>
<th>Intervention group (n = 105)</th>
<th>Control group (n = 105)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urbanicity (number (%) of rural participants)</td>
<td>36 (34%)</td>
<td>32 (30%)</td>
<td>0.55</td>
</tr>
<tr>
<td>Income (number (%) of participants with income &lt; $10,000)</td>
<td>32 (30%)</td>
<td>44 (42%)</td>
<td>0.06</td>
</tr>
<tr>
<td>Education (number (%) of participants with &lt; high school education)</td>
<td>20 (19%)</td>
<td>25 (24%)</td>
<td>0.40</td>
</tr>
<tr>
<td>Race (number (%) of non-white participants)</td>
<td>44 (42%)</td>
<td>44 (42%)</td>
<td>1.00</td>
</tr>
<tr>
<td>Age (mean, years)</td>
<td>53.1</td>
<td>52.3</td>
<td>0.42</td>
</tr>
<tr>
<td>BMI (mean, kg/m²)</td>
<td>31.2</td>
<td>30.8</td>
<td>0.73</td>
</tr>
<tr>
<td>Baseline use of nutrition resources (mean)</td>
<td>4.8</td>
<td>4.8</td>
<td>0.92</td>
</tr>
<tr>
<td>Baseline use of PA resources (mean)</td>
<td>2.9</td>
<td>2.9</td>
<td>0.92</td>
</tr>
<tr>
<td>Baseline knowledge of nutrition resources (mean)</td>
<td>9.8</td>
<td>9.9</td>
<td>0.96</td>
</tr>
<tr>
<td>Baseline knowledge of PA resources (mean)</td>
<td>9.9</td>
<td>10.1</td>
<td>0.86</td>
</tr>
<tr>
<td>Baseline self-efficacy for accessing nutrition resources (mean)</td>
<td>12.9</td>
<td>12.7</td>
<td>0.76</td>
</tr>
<tr>
<td>Baseline self-efficacy for accessing PA resources (mean)</td>
<td>25.8</td>
<td>24.8</td>
<td>0.43</td>
</tr>
</tbody>
</table>
Table 7.3. Resources listed in the Community Resource Guide, Reported Use of each Resource, and Barriers to the Use of each Resource (n = 114)

<table>
<thead>
<tr>
<th>Resource</th>
<th>Self-reported use of resource (%)</th>
<th>Top 3 barriers to the use of the resource</th>
<th>Reported that each was a barrier (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nutrition resources</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Produce stands or farmers’ markets</td>
<td>43</td>
<td>-I did not have enough time to use the resource</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I do not need to use the resource</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I was not motivated enough to use the resource</td>
<td>2</td>
</tr>
<tr>
<td>Cooking or nutrition classes</td>
<td>4</td>
<td>-I did not have enough time to use the resource</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I do not need to use the resource</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I was not motivated enough to use the resource</td>
<td>6</td>
</tr>
<tr>
<td>Van rides to the grocery store</td>
<td>1</td>
<td>-I do not need to use the resource</td>
<td>39</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I did not have enough time to use the resource</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-People like me do not use the resource</td>
<td>11</td>
</tr>
<tr>
<td>Gleaning program</td>
<td>1</td>
<td>-I do not need to use the resource</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I did not have enough time to use the resource</td>
<td>21</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-People like me do not use the resource</td>
<td>9</td>
</tr>
<tr>
<td><strong>Physical activity resources</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walking programs (e.g., at the mall or track)</td>
<td>14</td>
<td>-I did not have enough time to use the resource</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I do not need to use the resource</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I was not motivated enough to use the resource</td>
<td>9</td>
</tr>
<tr>
<td>Parks or trails</td>
<td>14</td>
<td>-I did not have enough time to use the resource</td>
<td>32</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I was not motivated enough to use the resource</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I do not need to use the resource</td>
<td>9</td>
</tr>
<tr>
<td>Affordable health clubs (e.g., YMCA, Senior Center)</td>
<td>10</td>
<td>-I did not have enough time to use the resource</td>
<td>26</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-The resource was too expensive for me to use</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I do not need to use the resource</td>
<td>10</td>
</tr>
<tr>
<td>Exercise programs offered by the local recreation department</td>
<td>8</td>
<td>-I did not have enough time to use the resource</td>
<td>34</td>
</tr>
<tr>
<td>------------------------------------------------------------</td>
<td>---</td>
<td>-----------------------------------------------</td>
<td>----</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-I do not need to use the resource</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-The resource had inconvenient hours</td>
<td>9</td>
</tr>
</tbody>
</table>
Table 7.4. Overall Intervention Effect on Change in Self-reported Use of Nutrition and Physical Activity Resources

<table>
<thead>
<tr>
<th>Model</th>
<th>Independent variables</th>
<th>B-weight for intervention effect (95% CI(^1))</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Self-reported use of nutrition resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 – Crude model</td>
<td>-Randomization group(^2)</td>
<td>0.43 (-0.29, 1.15)</td>
<td>0.25</td>
</tr>
<tr>
<td>(n = 208)</td>
<td>-Baseline use of nutrition resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 – Urban (n = 138)</td>
<td>-Randomization group</td>
<td>1.08 (0.21, 1.95)</td>
<td>0.02</td>
</tr>
<tr>
<td>Rural (n = 70)</td>
<td>-Baseline use of nutrition resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Randomization group</td>
<td>-0.81 (-2.06, 0.44)</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>-Baseline use of nutrition resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 – Urban (n = 133)</td>
<td>-Randomization group</td>
<td>0.92 (0.04, 1.81)</td>
<td>0.04</td>
</tr>
<tr>
<td>Rural (n = 68)</td>
<td>-Baseline use of nutrition resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Randomization group</td>
<td>-0.63 (-1.92, 0.66)</td>
<td>0.34</td>
</tr>
<tr>
<td></td>
<td>-Baseline use of nutrition resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Income</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Self-reported use of PA resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 – Crude model</td>
<td>-Randomization group</td>
<td>0.76 (-0.03, 1.56)</td>
<td>0.06</td>
</tr>
<tr>
<td>(n = 208)</td>
<td>-Baseline use of PA resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 – Adjusted model</td>
<td>-Randomization group</td>
<td>0.67 (-0.15, 1.49)</td>
<td>0.11</td>
</tr>
<tr>
<td>(n = 201)</td>
<td>-Baseline use of PA resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>-Income</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^1\) CI = confidence interval

\(^2\) Participants in the control group received a value of 0 and those in the intervention group a value of 1.
Table 7.5. Baron and Kenny Criteria for Mediation by Knowledge of and Self-efficacy for Accessing Resources

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Dependent variable</th>
<th>Independent variables</th>
<th>Knowledge of nutrition resources, urban (n = 138)</th>
<th>Self-efficacy for accessing nutrition resources, urban (n = 138)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>B-weight p-value</td>
<td>B-weight p-value</td>
</tr>
<tr>
<td>(1) (\tau) = The independent variable is a cause of the dependent variable</td>
<td>-Change in use of nutrition resources</td>
<td>-Randomization group(^3)</td>
<td>1.08</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Baseline use of nutrition resources</td>
<td>1.08</td>
</tr>
<tr>
<td>(2) (\alpha) = The independent variable is a cause of the mediating variable</td>
<td>-Change in mediator</td>
<td>-Randomization group</td>
<td>0.46</td>
<td>0.53</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Baseline mediator</td>
<td>-0.20</td>
</tr>
<tr>
<td>(3) (\beta) = The mediating variable is a cause of the dependent variable</td>
<td>-Change in use of nutrition resources</td>
<td>-Change in mediator</td>
<td>0.24</td>
<td>(&lt; 0.0001)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.10</td>
</tr>
<tr>
<td>(4) The effect of the independent variable on the dependent variable is attenuated when controlling for the</td>
<td>-Change in use of nutrition resources</td>
<td>-Randomization group</td>
<td>1.01(^4)</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-Baseline use of nutrition resources</td>
<td>1.10(^5)</td>
</tr>
</tbody>
</table>

\(^3\)Participants in the control group received a value of 0 and those in the intervention group a value of 1.

\(^4\)6% change in b-weight

\(^5\)2% change in b-weight
<table>
<thead>
<tr>
<th>mediator</th>
<th>Criterion</th>
<th>Dependent variable</th>
<th>Independent variables</th>
<th>Knowledge of PA resources (n = 208)</th>
<th>Self-efficacy for accessing PA resources (n = 208)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>B-weight</td>
<td>p-value</td>
<td>B-weight</td>
</tr>
<tr>
<td>(1) $\tau$ = The independent variable is a cause of the dependent variable</td>
<td>-Change in use of PA resources</td>
<td>-Randomization group</td>
<td>0.76</td>
<td>0.06</td>
<td>0.76</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Baseline use of PA resources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(2) $\alpha$ = The independent variable is a cause of the mediating variable</td>
<td>-Change in mediator</td>
<td>-Randomization group</td>
<td>1.22</td>
<td>0.07</td>
<td>1.42</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Baseline mediator</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(3) $\beta$ = The mediating variable is a cause of the dependent variable</td>
<td>-Change in use of PA resources</td>
<td>-Change in mediator</td>
<td>0.45</td>
<td>&lt;0.0001</td>
<td>0.08</td>
</tr>
<tr>
<td>(4) The effect of the independent variable on the dependent variable is attenuated when controlling for the mediator</td>
<td>-Change in use of PA resources</td>
<td>-Randomization group</td>
<td>0.62(^6)</td>
<td>0.12</td>
<td>0.68(^7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Baseline use of PA resources</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>-Change in mediator</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^6\)18\% change in b-weight

\(^7\)11\% change in b-weight
Table 7.6. Pearson Correlation Coefficients (r) between Use of Physical Activity (PA) or Nutrition Resources and Moderate to Vigorous Physical Activity (MVPA) and Fruit and Vegetable (FV) Consumption

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>r</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>FV consumption(^8) (12m)</td>
<td>110</td>
<td>4.8</td>
<td>-0.35</td>
<td>0.0002</td>
</tr>
<tr>
<td>Use of nutrition resources (12m)</td>
<td>110</td>
<td>6.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in FV consumption (baseline to 12m)</td>
<td>110</td>
<td>0.19</td>
<td>-0.15</td>
<td>0.12</td>
</tr>
<tr>
<td>Change in use of nutrition resources (baseline to 12m)</td>
<td>109</td>
<td>1.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MVPA (12m)</td>
<td>183</td>
<td>112.0</td>
<td>0.00</td>
<td>0.98</td>
</tr>
<tr>
<td>Use of PA resources (12m)</td>
<td>209</td>
<td>4.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change in MVPA (baseline to 12m)</td>
<td>172</td>
<td>-5.5</td>
<td>-0.02</td>
<td>0.81</td>
</tr>
<tr>
<td>Change in use of PA resources (baseline to 12m)</td>
<td>208</td>
<td>1.3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\(^8\)All nutrition analyses were conducted with urban participants only.
CHAPTER 8
ASSOCIATION BETWEEN PHYSICAL ACTIVITY AND PERCEIVED AND
OBJECTIVELY MEASURED ACCESS TO PHYSICAL ACTIVITY RESOURCES
AMONG LOW-INCOME, MIDLIFE WOMEN

VIII.A. Abstract

Introduction: Access to physical activity (PA) community resources is associated with physical activity levels. However, the nature of the association between perceived and objectively measured access to community resources is unclear. The relative association between the two measures of access and PA is also unclear. Clarification of these associations is important so that future programs and policies can target the most influential measure of access. Therefore, the first aim of this study was to examine the correlation between perceived and objectively measured access to PA resources. The second aim was to examine the association between the two measures of access and objectively measured moderate to vigorous physical activity (MVPA).

Methods: This study used 12-month follow-up data from a randomized intervention trial of a cardiovascular disease risk reduction program for low-income, midlife women. Perceived access to PA resources (parks, gyms, and schools) was measured using surveys. Access was objectively measured using Geographic Information Systems (GIS) and included road network distance to the closest resource and existence of resources in 1- and 2-mile buffers surrounding participants’ homes. MVPA was measured using accelerometers. Pearson’s and
intraclass correlation coefficients were used to examine the association between perceived and objectively measured distance. Kappa coefficients and percent agreement were used to assess agreement between perceived and objectively measured existence of resources in neighborhoods. The dependent variable in multiple linear regression models was the natural log of MVPA minutes per day. Perceived and objectively measured access were independent variables.

**Results:** Pearson correlation coefficients between perceptions of distance and objectively measured distance ranged from 0.40 to 0.54, while intraclass correlation coefficients ranged from 0.20 to 0.33. There was slight to fair agreement between perceived and objectively measured existence of resources in neighborhoods. Perceived distance to gyms and number of schools in 1-mile GIS buffers were negatively associated with MVPA.

**Conclusions:** Results indicate that interventions aimed at the level of perceptions (e.g., to increase awareness of resources) and at the environmental level (e.g., to enhance access to resources) are needed.

**VIII.B. Introduction**

Physical activity (PA) is an important health behavior for chronic disease control and prevention. Residents of the rural U.S. and Southern U.S. are more likely to be inactive than those in other areas of the country. Racial and ethnic minorities are less likely to have met recommendations for moderate or vigorous-intensity leisure time PA relative to the national average. Access to PA facilities and resources can support individuals’ efforts to be physically active. It is important to study the relationship between access to resources and moderate to vigorous physical activity (MVPA) in rural, low-income, and racial minority
communities because they may have less access to supportive PA resources, potentially exacerbating existing health disparities.

Perceived and objectively measured access to PA resources have been associated with adult PA levels in several studies. It is likely that the two measures of access are correlated, yet research findings conflict as to the nature of the correlation. Sallis et al. found no significant correlations between individuals’ perceptions of the convenience of PA facilities and objectively measured density of facilities. However, another study found a moderate correlation between self-reported distance and Geographic Information Systems (GIS) network distance to a community trail. Kirtland et al. reported fair agreement between neighborhood survey items and corresponding GIS neighborhood measures. Therefore, the first aim of this study was to examine the correlation between perceived and objectively measured access to PA resources among low-income, midlife women. Resources included were public parks, gyms and recreation centers, and public schools, because these are resources that midlife women are likely to use.

Measuring PA objectively is important to avoid bias due to inaccurate participant recall or social desirability. King et al. found that residents who reported living within walking distance to a park, trail, or department, discount, or hardware store (perceived access) had higher numbers of steps, objectively measured by pedometer. Another recent study revealed that GIS-measured proximity to a golf course and post office was associated with more pedometer-measured PA. There have been three additional studies of the association between environmental variables and objectively measured PA. Saelens et al. used accelerometers to validate an environment scale, finding that residents of more walkable neighborhoods had significantly more minutes of objectively measured PA. Two
other studies have linked perceived\textsuperscript{83} and objectively measured\textsuperscript{84} neighborhood walkability with objectively measured PA. However, we found no studies examining the relationship between objectively measured distance to and density of resources and accelerometer-measured PA among midlife women.

Little is known about the relative influence of perceived versus objectively measured access to PA resources on MVPA. If perceived access is more strongly associated with MVPA, intervening on perceptions of access may be most effective. If objectively measured access is more influential, environmental interventions are likely needed. Therefore, the second aim of this study was to examine the association between objectively measured MVPA and perceived and objectively measured access to PA resources among low-income, midlife women from southeastern North Carolina. Because perceived access includes a combination of both objectively measured access to resources in addition to perceptual barriers related to the use of PA resources (e.g., fear of crime), it was hypothesized that perceived access would be more strongly associated with MVPA.

\textbf{VIII.C. Methods}

This study used follow-up data from a clinic-based, federally-funded, randomized controlled trial of a cardiovascular disease risk reduction intervention for underinsured, midlife women (the WISEWOMAN Project),\textsuperscript{21} described in detail elsewhere.\textsuperscript{123} All perceived access and accelerometer data used in this study were collected at participants’ 12-month follow-up visits. Participants in the current study were under or uninsured, midlife (40-64 years) women from three southeastern North Carolina counties: New Hanover (n = 179), Brunswick (n = 26), and Pender (n = 14). Participants excluded from these analyses were those who either lived in other counties, were not geocoded (because they provided a
post office box for an address), and those who did not have the 12-month data necessary for these analyses. This project was approved by the School of Public Health Institutional Review Board on Research Involving Human Subjects at the University of North Carolina at Chapel Hill.

Perceived Access Measurement:

Survey measures of perceived access were administered at follow-up after the 12-month intervention, which included individual and group sessions with a health counselor, contacts with a community health advisor, and mailings. The intervention also included community resource tools designed to increase women’s awareness and use of local physical activity and nutrition resources. Three items were used to assess perceived distance to the closest PA resource: “How close to your home, in miles, is the closest [school/ gym or recreation center/ park]?” Responses were in miles and treated continuously. The response rate for this survey was 76.3% (180/236). Of the 180 women who completed a survey, 100 had complete perceived distance data (i.e., had answered all three items). Those with complete data had worn the accelerometer significantly longer (p = 0.06) and were less likely to have an average annual income of less than $10,000 (p = 0.07) compared to the 136 women with missing data.

In addition, a Neighborhood Assessment was administered, which defined neighborhood as a 10-minute drive from home. Three items measured perceived existence of PA resources in the participant’s neighborhood: “Is there a [school/ gym or recreation center/ park or trail] where you could exercise in your neighborhood?” Response options were “yes”, “no”, and “don’t know”, and were dichotomized to indicate presence (yes) or absence (no, don’t know) of a resource in the neighborhood. The 12-month response rate was 89.4%
Although survey measures were not validated, previous work has demonstrated that similar items have moderate to high reliability. Moderate test-retest reliability was found for items about the availability of private recreational facilities (ICC = 0.60 (95% CI = 0.46, 0.71)); availability of public recreation facilities, ICC = 0.51 (0.36, 0.64); and availability of public school recreational facilities ICC = 0.39 (0.21, 0.55). For a question asking participants whether or not their neighborhood had public recreation facilities available, Kirtland et al. calculated a Kappa coefficient of 0.30 between GIS measures and perceived availability, and a reliability (Spearman rank correlation) coefficient of 0.52.

Geographic Information Systems (GIS) Database:

Participants’ home addresses, parks, gyms and recreation centers, and public schools that allowed the public to use PA facilities were geocoded in ArcGIS Version 9.1 (Environmental Systems Research Institute Inc., 2005). Participants’ home addresses were mapped as points and the resulting attribute included a score based on various accuracy parameters (accuracy score). Ten percent of all participants’ addresses with the lowest accuracy scores were checked against the appropriate road network file. Only one address was identified as incorrectly mapped. The point was deleted and the correct address was manually geocoded. Of the 236 women randomized, 199 were geocoded. Women who were geocoded reported living significantly closer to the community health center where the trial was based (p < 0.0001) and were more likely to be classified as urban (p < 0.0001).

Triangulation of data sources has been suggested to further explore quantitative associations between environmental variables and PA. Therefore, qualitative data were also analyzed and used in the current study to identify resources women currently used, previously used, or knew of a friend or relative who used. Because the WISEWOMAN
intervention included tools to increase participants’ awareness and use of local physical activity and nutrition resources, in-depth interviews with women from the study area were conducted before the intervention trial began, to pilot test the tools and to learn about community factors related to physical activity and nutrition. Participants in the qualitative study were similar to WISEWOMAN participants in age, area of residence, and socioeconomic status, but were not enrolled in the WISEWOMAN randomized trial. Because qualitative data were from women similar to WISEWOMAN participants, resources they mentioned were thought to be representative of those that WISEWOMAN participants would be most likely to use. Interview transcripts used for this study were from New Hanover County residents from urban and suburban areas (n = 15) and those who lived in rural areas but worked in more urban areas (n = 8). Resources that women either currently used, previously used, or knew of a friend or relative who used were geocoded, and included 2 school tracks, 1 mall, 4 city or county-funded recreation centers, and 8 parks.

Park addresses from the 3 counties were obtained using the Internet and by contacting each county’s Parks and Recreation Department to request information. Internet search terms included “parks in New Hanover County North Carolina,” and returns included sites such as the New Hanover County Parks page (www.nhcgov.com/PRK/PRKmain.asp) and the Insider’s Guide to North Carolina’s Southern Coast and Wilmington (www.insiders.com/wilmington/main-sports6.htm). Although park size is associated with use, all parks, regardless of size, were geocoded because small parks may be part of an overall aesthetically pleasing neighborhood environment. Parks included were state, county, or city-maintained mini-parks, neighborhood parks, community parks, large urban parks, sports complexes, and natural resource areas. In the qualitative interviews, women
mentioned driving to use PA resources. Thus, the parking areas associated with parks were geocoded. A total of 107 park points were geocoded. Gyms and recreation centers in each county were identified using the Internet and by requesting information from Parks and Recreation Departments and the Department on Aging. Fifty-seven gyms and recreation centers were mapped, and included 19 city or county funded centers (city gyms, community centers, Senior centers) and 38 commercial, fee-for-use gyms. A list of all public schools in each county was obtained from the Internet (e.g., http://www.nhcs.k12.nc.us/elementary.htm). Each school was contacted to see if the public was allowed to use PA facilities. Facilities available for public use at schools ranged from open fields, to tracks, to tennis courts. Only those schools that allowed the public to use their facilities without obtaining special permission were geocoded. One university, 6 high schools, 4 middle schools, and 11 elementary schools were geocoded. The number of each type of resource per county is in Table 8.1.

*Objectively Measured Access:*

The distance from each participant’s home address to the closest PA resource along the road network (network distance) was calculated using the ArcGIS Network Analyst extension. The number of PA resources in the neighborhood was calculated by creating 1- and 2-mile Euclidean (“as the crow flies”) buffers, chosen to represent participants’ neighborhoods. The number of each type of PA resource in the buffers was calculated using the Network Analyst intersect tool. Attribute tables generated in ArcGIS were exported into Excel, and then imported into SAS Version 8.2 (Cary, NC) for further analyses.

*Objectively Measured Moderate to Vigorous Physical Activity (MVPA):*
MVPA was measured using the ActiGraph (Shalimar, FL, formerly known as CSA WAM 7164 Activity Monitor) accelerometer, shown to produce valid and reliable measures of moderate-intensity physical activity in the field. Participants were instructed to wear the accelerometer for 7 consecutive days (with wear time starting the day after the 12-month follow-up clinic visit) during all waking hours and to mail it to the research office in a postage paid box. The ActiGraph measures uniaxial acceleration over user-defined time intervals or epochs (defined as 1 minute in this study). The ActiProcess data reduction program (Catellier, 2004) was used to determine valid wearing time and to generate variables for use in subsequent analyses. Epochs contained within strings of 20 or more minutes of consecutive zeros were eliminated because this indicated time the accelerometer was not worn. The minimum criterion for days worn was 4 days. Days were valid if the accelerometer was worn a minimum of 6 valid hours. At 12-months, 78% (184/236) of the original intervention cohort had valid PA data. The average wearing time for these 184 participants was 11.2 hours per day and 5.7 days worn. Participants with valid PA data were significantly older (p = 0.03) and lived closer to the health center (p = 0.05) compared to those without valid PA data.

Average minutes of MVPA were calculated by dividing the sum of total MVPA minutes by the total number of days worn. Minutes of moderate and vigorous-intensity physical activity were generated by imposing count cutpoints from Swartz et al., which define moderate PA as 574 – 4944 accelerometer counts per minute, and vigorous PA as greater than or equal to 4945 counts per minute. These cutpoints were used because participants in the Swartz et al. study were the most similar to WISEWOMAN participants in body mass index (BMI) and age, and the activities performed by study participants were
similar to those likely to be done by WISEWOMAN participants at a park, recreation center, or school.

Urbanicity:

Urbanicity was a potential effect modifier in this study. The WISEWOMAN randomized trial was based in the town of Wilmington in southeastern North Carolina. Wilmington is a moderately-sized town surrounded by smaller coastal towns and agricultural areas. The July 1, 2004 census bureau annual estimate of the population for Wilmington was 93,292 and population estimates for the least and most populated surrounding incorporated places where participants lived ranged from 483 to 5192. Therefore, if a participant reported a Wilmington address, she was classified as urban, and if she lived in a surrounding small town, she was classified as rural.

Covariates:

Randomization group status was examined as a covariate because this study used follow-up data from an intervention that aimed to increase participants’ PA. The following additional covariates were examined because of their previously established independent association with PA or because they were potential confounders of the relationship between access to resources and PA: age in years, calculated from self-reported birth date (continuous); BMI, measured as weight in kilograms divided by height in meters squared (continuous); education (dichotomized by high school graduation), self-reported annual household income (greater than or equal to $10,000 and less than $10,000), self-reported race (white and non-white), and smoking status at baseline (dichotomous). A dichotomous variable that indicated whether or not participants had medical problems that limited their ability to walk briskly was also examined as a potential covariate. Models were not adjusted
for neighborhood socioeconomic status because it is likely to be a variable that precedes access to PA resources on the assumed causal pathway from resource access to PA. The number of PA resources in each GIS buffer was not adjusted for population density because population density is also a factor that precedes PA resource access, rather than a potential confounder.

**Statistical Analysis:**

Intraclass correlation coefficients (ICC) and Pearson’s correlation coefficients (r) were used to assess agreement between GIS network distance to closest PA resource and perceived distance to closest resource. Correlation coefficients were classified as small if 0.1 – 0.3, moderate if 0.30 – 0.50, and large if greater than 0.50. A SAS macro written by Robert Hamer was used to calculate the ICC for perceived and objectively measured distance to parks, gyms, and schools. The two-way mixed model was used such that the two ‘judges’ were perceived and GIS network distance (fixed effects) and the target ratings were individual distances to PA resources (random effects). The Kappa coefficient and percent agreement were used to assess agreement between perceived and objectively measured existence of PA resources in the neighborhood. Kappa coefficients less than or equal to 0 were considered poor agreement, 0.01 – 0.20, slight agreement, 0.21 – 0.40, fair agreement, 0.41 – 0.60, moderate, and 0.61 – 0.80, substantial. All correlations and measures of agreement were calculated for the total sample, and then calculated separately for urban and rural participants, and for participants with MVPA minutes above and below the median, because previous work suggests that perceptions of the neighborhood environment may differ based on urbanicity or physical activity levels. Correlations and measures of
agreement were also stratified by intervention group status because the intervention included tools designed to increase awareness and use of local PA and nutrition community resources.

In order to examine the association between perceived and objectively measured access to PA resources and objectively measured MVPA minutes per day, the following independent variables were used: objectively measured (GIS network) distance to the closest resource; perceived distance to the closest resource; number of resources in GIS buffers; perceived existence of resources in the neighborhood; and objectively measured distance to the closest PA resource that was mentioned in qualitative interviews (for New Hanover County participants only, n = 132). Because MVPA minutes were skewed, MVPA was transformed using the natural log and used as the continuous dependent variable in multiple linear regression models. The association between urbanicity and GIS network distance was examined by comparing mean distance to each type of resource for urban versus rural participants. The mean distance to each type of resource was significantly greater for women with rural addresses compared to those with urban addresses. (Table 8.2) Because urbanicity was associated with GIS network distance, it was not examined as a moderator. The remaining covariates were retained in the final model if they had either an independent relationship with MVPA (p-value for the parameter estimate < 0.05) or were confounders (changed the parameter estimate for the independent variable > 10%). Model parsimony was a goal.

**VIII.D. Results**

Table 8.3 shows characteristics of participants who were geocoded and had valid PA data as well as differences among those with complete versus incomplete perceived distance data. Participants’ average age was 53 years, average BMI was 31 kg/m², and the majority of
participants were urban, high school graduates, non-smokers, and had annual incomes of greater than $10,000. (Table 8.3) Participants with complete perceived distance data were significantly younger (p = 0.03), significantly less likely to have annual incomes less than $10,000 (p = 0.01), had worn the accelerometer longer, and were more likely to be high school graduates. There were no significant differences between groups on objective measures of access to PA resources. Table 8.3 also shows that participants tended to overestimate the distance to the closest PA resource for each type of resource. Participants with valid 12-month accelerometer data (n=184) averaged 111.4 minutes per day of moderate-intensity PA and 0.56 minutes of vigorous PA per day (data not shown).

Table 8.4 shows Pearson’s correlation coefficients and intraclass correlation coefficients between perceived and objectively measured distance to closest resources. Pearson’s correlations between perceived and objectively measured distance to all resources were moderate to large, ranging from 0.40 to 0.54. Intraclass correlation coefficients ranged from moderate for parks (0.33) to small for gyms and schools (0.23, 0.20 respectively). Correlations were generally higher for rural participants and for those in the intervention group.

Table 8.5 shows Kappa coefficients and percent agreement for the dichotomous perceived and objective measures of existence of PA resources in the neighborhood. There was slight to fair agreement between the perceived and objective measures. Kappa coefficients (1-mile buffer) ranged from 0.14 for gyms and 0.15 for schools to 0.39 for parks. The majority of disagreements for parks and gyms resulted from women who reported there was no park or gym in the neighborhood when the GIS measure indicated that there was one in the buffer representing her neighborhood. However, for rural women, the majority of
disagreements occurred when the woman perceived there was a park or gym in her neighborhood, but the GIS measure indicated that there was not one. The majority of disagreements for schools were from women who reported having a school in the neighborhood when there was not one in the GIS buffer representing her neighborhood. In general, rural participants had higher Kappa coefficients and percent agreement relative to urban participants. Based on Kappa coefficients and percent agreement for parks and gyms, the GIS measures using the 1-mile buffer yielded greater agreement compared to using the 2-mile buffer. For schools, there was greater agreement using the 2-mile buffers, compared to 1-mile buffers.

There was a positive, though not statistically significant association between distance to resources identified through qualitative interviews and MVPA minutes, adjusting for age and BMI (standardized parameter estimate for GIS network distance = 0.06, p = 0.45, n = 132). That is, of two women of the same age (53 years) and BMI (31 kg/m²), the one who lived 2 miles from the closest resource identified through qualitative interviews performed 2.1 more MVPA minutes per day compared to one who lived only 1 mile from the closest resource.

Table 8.6 shows crude and adjusted parameter estimates for the 12-month cross-sectional associations between natural log-transformed MVPA minutes and perceived and objectively measured distance to parks, gyms, schools, and the combination of all resources. The only statistically significant association was for perceived distance to gyms when both perceived and objectively measured distance were included in the model. Perceived distance to gyms and schools had standardized parameter estimates that were larger in magnitude compared to objectively measured distance, such that greater perceived distance was
associated with less MVPA. Final models adjusted for age and BMI accounted for 8 – 15% variation in MVPA.

Table 8.7 shows crude and adjusted models of the 12-month cross-sectional associations between natural log-transformed MVPA minutes and perceived and objectively measured access to PA resources, where objectively measured access was defined using counts of resources in 1-mile buffers. In all models, the number of resources in the buffer was inversely related to MVPA, against the expectation that a greater number of facilities would be associated with more activity. There was a statistically significant association between number of schools in 1-mile buffers and MVPA, such that of 2 women of the same age (53 years) and BMI (31 kg/m²), the one with no school in her 1-mile buffer averaged 105.3 minutes per day of MVPA compared to 83.2 minutes for the one with 2 schools in her 1-mile buffer (p = 0.04). Variance explained by the models adjusted for age and BMI ranged from 8-11%.

Women who wore the accelerometer 7 days had lower average BMI than those who wore it 4, 5, or 6 days (p = 0.006, data not shown). Thus, we stratified the two models demonstrating statistically significant associations by days the accelerometer was worn (7 days versus 4-6 days). The association between number of schools in 1-mile buffers and MVPA minutes was statistically significant for the women who had worn the accelerometer 7 days compared to those who wore it fewer days (standardized parameter estimate = -0.39, p < 0.01, n = 44 versus standardized parameter estimate = -0.08, p = 0.36, n = 111) and the effect attenuated when all women were included in the same model.

**VIII.E. Discussion**
In the current study, we measured the correlation between perceived and objectively measured distance to the closest PA resource, finding Pearson’s correlation coefficients between 0.40 for gyms and schools and 0.54 for parks. These findings are consistent with a previous study that found that self-reported distance to a community trail and GIS network distance to the trail were correlated \( (r = 0.46) \).\textsuperscript{34} In our analyses, correlations were higher among rural women, perhaps because they were more aware of distances due to frequently driving to more urban areas. Women in the intervention group also had higher correlations between perceived and objectively measured distance. This may be due to increased awareness of resources as a result of intervention tools used in the WISEWOMAN Project to increase participants’ awareness and use of local resources. On average, perceived distance to the closest resource was greater than GIS-measured distance, perhaps because participants were unaware of existing resources or did not perceive that a resource was accessible due to high cost or other barriers to use.

There was slight to fair agreement between women’s perceived existence of PA resources in the neighborhood and GIS-measured existence of resources in 1- and 2-mile buffers. Kirtland et al.\textsuperscript{73} reported fair agreement for an item about neighborhood availability of public recreation facilities (Kappa = 0.30), with lower agreement between perceptions and GIS measures among inactive compared to active respondents (Kappa = 0.16, 0.35 respectively). In the current study, we did not find that Kappa coefficients were consistently higher for more active participants. However, rural participants generally had higher Kappa coefficients and percent agreement compared to urban participants. This was due to the fact that few resources were located in rural areas so that most rural women reported that there
were no resources in their neighborhoods, and the corresponding GIS measure indicated the same.

One reason for the disagreements between the perceived existence of resources in the neighborhood and the GIS-buffer measure is that participants may have had different perceptions of where neighborhood boundaries were relative to investigator-defined boundaries (1- or 2-mile buffers). Many participants lived in an urban, downtown area, and may have considered their neighborhood to be a much smaller area than a 1-mile radius from the home, as previous research has demonstrated that urban residents perceive smaller neighborhood boundaries than rural residents.\textsuperscript{107} This is a limitation of investigator-defined neighborhood boundaries and suggests that resident-defined boundaries will more accurately capture neighborhood exposures.\textsuperscript{106} An additional limitation of the current study is that Euclidean buffers were used rather than road network buffers. Road network buffers may offer a more precise reflection of women’s exposure to PA resources because they may have been more likely to drive to a PA resource.

Another reason for the disagreements may be that participants considered and reported as available only those resources they would consider using (e.g., parks where they felt safe exercising or gyms they could afford). Conversely, participants may have reported that a school was available, when although present in the neighborhood, the schools’ PA facilities were not open for public use. This is supported by the observation that the majority of disagreements for schools occurred when women said there was a school in the neighborhood, but one did not exist in the GIS buffer.

In the current study, women from rural areas were further from resources, on average, than were urban women, consistent with qualitative and quantitative research indicating that
women in rural areas have less access to PA resources.\textsuperscript{152-155} However, this finding may also be due to measurement error associated with the fact that PA resources in rural areas may be less formal and thus less likely to be found through the Internet or Parks and Recreation departments. Our findings suggest that access to PA resources may be one factor contributing to differences in PA between urban and rural residents, indicating the need to provide more PA resources in rural areas. This was successfully done in the Bootheel Heart Health Project, where trails were constructed and promoted in rural communities.\textsuperscript{135}

Healthy levels of PA can be achieved and supported through the use of existing resources such as walking trails or school tracks. Previous studies have found associations between perceived accessibility to PA resources and activity levels.\textsuperscript{30;32} In the current study, perceived distance to gyms and MVPA were associated, such that lower perceived distance was associated with more MVPA minutes. This result is in agreement with other findings that perceived and objectively measured proximity\textsuperscript{34;35;81} to resources are associated with MVPA.

There was a statistically significant, negative association between number of schools in 1-mile GIS buffers and MVPA. This unexpected finding could be explained in that schools are primarily located in less pedestrian-friendly areas, which are less conducive to walking.\textsuperscript{84} This finding could also be due to chance. Our results are consistent with those of Booth et al.,\textsuperscript{156} who found that public housing residents with more PA resources in their neighborhoods reported fewer minutes walked per day.

A limitation of the current study is that it was a cross-sectional analysis, so causality cannot be assumed. For example, more active women may perceive that gyms are closer because they frequently walk in the neighborhood and thus are exposed to the community
environment. The study sample was a small number of lower-income, midlife, Southern women, thus limiting the generalizability of results and the power to detect an effect. Additionally, uniaxial accelerometers cannot distinguish between types of activity, such as leisure or transportation activity. When stratified by days worn, the relationship between number of schools in 1-mile buffers and MVPA was stronger and statistically significant for women who had worn the accelerometer 7 days compared to those who had worn it 4-6 days. If there truly is an association between number of schools in 1-mile buffers and MVPA, inclusion of women who wore the accelerometer for fewer days may have introduced noise into the PA measure, thus decreasing the likelihood of detecting the association.

This study had several sources of missing data. Women who were not geocoded were more likely to be rural and lived further from the health center than those who were geocoded. Participants with incomplete 12-month MVPA data also lived further from the health center. Because our results indicate that rural women have less access to PA resources, future research should increase efforts for correct address ascertainment (e.g., when a participant reports an address as a post office box, the physical address should also be obtained) and increased participant adherence to accelerometer wear time criteria, to ensure that these associations are adequately studied among rural women.

While the small sample size was a limitation, it was also a strength because it allowed collection of detailed, individual-level data (e.g., objective measures of access to resources and physical activity). Additionally, these analyses were conducted in an understudied population of lower-income women, who may have fewer resources to overcome environmental barriers to physical activity.
Taken together, these results indicate the need for both individual and environmental intervention strategies. One individual-level strategy is to increase participants’ awareness of existing resources. This has been done previously using community-specific resource directories, which listed local PA opportunities, programs, and resources.\textsuperscript{64,65,123}

Environmental strategies include enhancing access to PA resources (e.g., creating new walking trails or supplementing the cost of a gym) or decreasing barriers to use of existing resources (e.g., increasing police patrolling in parks). More work is needed to determine the most effective individual and environmental level strategies that will result in increased physical activity in low-income, midlife women.
Table 8.1. Physical Activity Resources in each County

<table>
<thead>
<tr>
<th>Physical activity resources</th>
<th>New Hanover County(^1)</th>
<th>Brunswick County(^2)</th>
<th>Pender County(^3)</th>
<th>3-county area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parks</td>
<td>63</td>
<td>33</td>
<td>11</td>
<td>107</td>
</tr>
<tr>
<td>Gyms</td>
<td>33</td>
<td>20</td>
<td>4</td>
<td>57</td>
</tr>
<tr>
<td>Schools</td>
<td>15</td>
<td>5</td>
<td>2</td>
<td>22</td>
</tr>
<tr>
<td>Total resources/10,000 persons</td>
<td>6.4</td>
<td>6.9</td>
<td>3.8</td>
<td>6.1</td>
</tr>
</tbody>
</table>

\(^1\)Population estimate for July 1, 2004 = 173,554

\(^2\)Population estimate for July 1, 2004 = 84,575

\(^3\)Population estimate for July 1, 2004 = 45,117
Table 8.2. Mean Network Distance, in Miles, (95% Confidence Interval) to Physical Activity Resources by Urban / Rural Status

<table>
<thead>
<tr>
<th>Participant address</th>
<th>Mean distance to closest park (95% CI)</th>
<th>Mean distance to closest gym (95% CI)</th>
<th>Mean distance to closest school (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban (Wilmington)</td>
<td>1.0 (0.9, 1.2)</td>
<td>1.4 (1.3, 1.5)</td>
<td>1.9 (1.7, 2.1)</td>
</tr>
<tr>
<td>Rural (Non-Wilmington)</td>
<td>3.5 (2.7, 4.2)</td>
<td>4.6 (3.7, 5.5)</td>
<td>5.8 (4.8, 6.8)</td>
</tr>
</tbody>
</table>
Table 8.3. Characteristics of Participants with Valid Accelerometer Data Who were Geocoded and Comparison of Those with Complete versus Incomplete Perceived Distance Data

| Participant characteristic | Participants with valid PA data who were geocoded (n = 155) | Among participants with valid PA data who were geocoded (n = 155) | Complete perceived distance data (n = 74) | Incomplete perceived distance data (n = 81) | p  
|---------------------------|-------------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------|--------------------------------------------|----  
| Age in years (SD)         | 53.3 (6.9)                                                  | 52.1 (6.9)                                                    | 54.5 (6.9)                                | 0.03                                       |     
| BMI in kg/m² (SD)         | 31.0 (7.8)                                                  | 31.6 (8.3)                                                    | 30.4 (7.3)                                | 0.32                                       |     
| Mean MVPA minutes (SD)    | 112.8 (59.0)                                                | 117.8 (59.6)                                                  | 108.2 (58.3)                              | 0.31                                       |     
| Mean total days accelerometer was worn (SD) | 5.7 (1.1)                                                  | 5.9 (1.0)                                                    | 5.6 (1.1)                                | 0.07                                       |     
| Mean distance from health center (SD) | 8.8 (8.2)                                                  | 9.7 (9.7)                                                    | 8.0 (6.5)                                | 0.19                                       |     
| % Urban                   | 77.4                                                       | 73.0                                                         | 81.5                                     | 0.21                                       |     
| % High school graduates   | 78.7                                                       | 85.1                                                         | 72.8                                     | 0.06                                       |     
| % White                   | 55.5                                                       | 55.4                                                         | 55.6                                     | 0.99                                       |     
| % Non-smokers             | 76.1                                                       | 78.4                                                         | 74.1                                     | 0.53                                       |     
| % Income < $10K²          | 37.6                                                       | 27.4                                                         | 47.4                                     | 0.01                                       |     
| % Intervention group      | 54.8                                                       | 59.5                                                         | 50.6                                     | 0.27                                       |     
| % No car                  | 12.3                                                       | 8.1                                                          | 16.1                                     | 0.13                                       |     
| Mean GIS network distance to closest park, in miles (SD) | 1.5 (1.8)                                                  | 1.7 (2.0)                                                    | 1.4 (1.7)                                | 0.25                                       |     
| Mean perceived distance to closest park, in miles (SD) | 3.6 (4.9)                                                  | --                                                           | --                                       | --                                         |     

²Six participants were missing income data.
| Mean number of parks in 1-mile buffer (SD) | 3.3 (3.9) | 3.1 (4.0) | 3.5 (3.9) | 0.53 |
| Mean network distance to closest gym, in miles (SD) | 2.1 (2.0) | 2.2 (2.2) | 1.9 (1.9) | 0.28 |
| Mean perceived distance to closest gym, in miles (SD) | 5.0 (7.0) | -- | -- | -- |
| Mean number of gyms in 1-mile buffer (SD) | 1.1 (1.3) | 1.1 (1.3) | 1.0 (1.3) | 0.88 |
| Mean network distance to closest school, in miles (SD) | 2.6 (2.4) | 2.7 (2.7) | 2.6 (2.2) | 0.70 |
| Mean perceived distance to closest school, in miles (SD) | 4.9 (10.5) | -- | -- | -- |
| Mean number of schools in 1-mile buffer (SD) | 0.5 (0.7) | 0.5 (0.7) | 0.4 (0.7) | 0.65 |
Table 8.4. Pearson’s Correlation (r) and Intraclass Correlation Coefficients (ICC) between Perceived and Objectively Measured Distance to Physical Activity Resources

<table>
<thead>
<tr>
<th>Physical activity resource</th>
<th>n</th>
<th>r</th>
<th>ICC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parks</td>
<td>123</td>
<td>0.54</td>
<td>0.33</td>
</tr>
<tr>
<td>Urban</td>
<td>97</td>
<td>0.26</td>
<td>0.12</td>
</tr>
<tr>
<td>Rural</td>
<td>26</td>
<td>0.60</td>
<td>0.40</td>
</tr>
<tr>
<td>MVPA at or above median</td>
<td>62</td>
<td>0.37</td>
<td>0.15</td>
</tr>
<tr>
<td>MVPA below median</td>
<td>61</td>
<td>0.75</td>
<td>0.60</td>
</tr>
<tr>
<td>Intervention group</td>
<td>67</td>
<td>0.61</td>
<td>0.36</td>
</tr>
<tr>
<td>Control group</td>
<td>56</td>
<td>0.47</td>
<td>0.31</td>
</tr>
<tr>
<td>Gyms and Recreation Centers</td>
<td>120</td>
<td>0.40</td>
<td>0.23</td>
</tr>
<tr>
<td>Urban</td>
<td>90</td>
<td>0.13</td>
<td>0.04</td>
</tr>
<tr>
<td>Rural</td>
<td>30</td>
<td>0.27</td>
<td>0.15</td>
</tr>
<tr>
<td>MVPA at or above median</td>
<td>60</td>
<td>0.35</td>
<td>0.22</td>
</tr>
<tr>
<td>MVPA below median</td>
<td>60</td>
<td>0.42</td>
<td>0.23</td>
</tr>
<tr>
<td>Intervention group</td>
<td>69</td>
<td>0.58</td>
<td>0.41</td>
</tr>
<tr>
<td>Control group</td>
<td>51</td>
<td>0.24</td>
<td>0.10</td>
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<tr>
<td>Schools</td>
<td>79</td>
<td>0.40</td>
<td>0.20</td>
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<tr>
<td>Urban</td>
<td>57</td>
<td>0.18</td>
<td>0.11</td>
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<td>Rural</td>
<td>22</td>
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<tr>
<td>MVPA at or above median</td>
<td>40</td>
<td>0.54</td>
<td>0.47</td>
</tr>
<tr>
<td>MVPA below median</td>
<td>39</td>
<td>0.39</td>
<td>0.17</td>
</tr>
<tr>
<td>Intervention group</td>
<td>46</td>
<td>0.44</td>
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</tr>
<tr>
<td>Control group</td>
<td>33</td>
<td>0.42</td>
<td>0.17</td>
</tr>
<tr>
<td>All resources</td>
<td>74</td>
<td>0.61</td>
<td>0.34</td>
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<td>Urban</td>
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<tr>
<td>-------------------------------</td>
<td>--------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>MVPA at or above median</td>
<td>37</td>
<td>0.65</td>
<td>0.43</td>
</tr>
<tr>
<td>MVPA below median</td>
<td>37</td>
<td>0.59</td>
<td>0.31</td>
</tr>
<tr>
<td>Intervention group</td>
<td>44</td>
<td>0.82</td>
<td>0.54</td>
</tr>
<tr>
<td>Control group</td>
<td>30</td>
<td>0.49</td>
<td>0.25</td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>Gym/ recreation center</td>
<td>Park</td>
</tr>
<tr>
<td>------------------</td>
<td>------</td>
<td>------------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Kappa (95% CI)</td>
<td>Kappa (95% CI)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>% Agrmt</td>
<td>% Agrmt</td>
</tr>
<tr>
<td>1-mile buffer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All participants</td>
<td>155</td>
<td>0.14 (-0.02, 0.29)</td>
<td>0.39 (0.24, 0.53)</td>
</tr>
<tr>
<td>Urban</td>
<td>120</td>
<td>0.07 (-0.10, 0.24)</td>
<td>0.31 (0.14, 0.48)</td>
</tr>
<tr>
<td>Rural</td>
<td>35</td>
<td>0.26 (-0.08, 0.60)</td>
<td>0.31 (-0.02, 0.64)</td>
</tr>
<tr>
<td>MVPA at or above median</td>
<td>78</td>
<td>0.14 (-0.08, 0.35)</td>
<td>0.39 (0.18, 0.60)</td>
</tr>
<tr>
<td>MVPA below median</td>
<td>77</td>
<td>0.14 (-0.08, 0.35)</td>
<td>0.39 (0.19, 0.59)</td>
</tr>
<tr>
<td>Intervention group</td>
<td>85</td>
<td>0.29 (0.09, 0.49)</td>
<td>0.37 (0.17, 0.56)</td>
</tr>
<tr>
<td>Control group</td>
<td>70</td>
<td>-0.05 (-0.28, 0.19)</td>
<td>0.42 (0.20, 0.63)</td>
</tr>
<tr>
<td>2-mile buffer</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All participants</td>
<td>155</td>
<td>0.09 (0.00, 0.19)</td>
<td>0.16 (0.04, 0.27)</td>
</tr>
<tr>
<td>Urban</td>
<td>120</td>
<td>-0.02 (-0.08, 0.05)</td>
<td>0.02 (-0.07, 0.11)</td>
</tr>
<tr>
<td>Rural</td>
<td>35</td>
<td>0.34 (0.01, 0.67)</td>
<td>0.23 (-0.05, 0.52)</td>
</tr>
<tr>
<td>MVPA at or above median</td>
<td>78</td>
<td>0.10 (-0.04, 0.23)</td>
<td>0.06 (-0.09, 0.22)</td>
</tr>
<tr>
<td>MVPA below median</td>
<td>77</td>
<td>0.08 (-0.06, 0.23)</td>
<td>0.24 (0.07, 0.41)</td>
</tr>
<tr>
<td>Intervention group</td>
<td>85</td>
<td>0.07 (-0.06, 0.20)</td>
<td>0.12 (-0.03, 0.27)</td>
</tr>
<tr>
<td>Control group</td>
<td>70</td>
<td>0.11 (-0.04, 0.26)</td>
<td>0.21 (0.03, 0.40)</td>
</tr>
</tbody>
</table>
Table 8.6. Crude and Adjusted Models of Associations between Natural Log of Minutes of Moderate to Vigorous Physical Activity and Perceived and Objectively Measured Distance to Physical Activity Resources

<table>
<thead>
<tr>
<th>Independent variable(s)</th>
<th>n</th>
<th>Standardized parameter estimate (crude)</th>
<th>Adjusted R² for model</th>
<th>Standardized parameter estimate (adjusted)</th>
<th>Adjusted R² for model</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) GIS network distance to closest park</td>
<td>129</td>
<td>-0.06</td>
<td>-0.005</td>
<td>-0.05</td>
<td>0.10</td>
</tr>
<tr>
<td>(2) Perceived distance to closest park</td>
<td>123</td>
<td>0.01</td>
<td>-0.008</td>
<td>0.02</td>
<td>0.10</td>
</tr>
<tr>
<td>(3) GIS network distance to closest park Perceived distance to closest park</td>
<td>123</td>
<td>-0.06</td>
<td>-0.014</td>
<td>-0.07</td>
<td>0.09</td>
</tr>
<tr>
<td>(4) GIS network distance to closest gym</td>
<td>129</td>
<td>0.08</td>
<td>-0.002</td>
<td>0.05</td>
<td>0.10</td>
</tr>
<tr>
<td>(5) Perceived distance to closest gym</td>
<td>120</td>
<td>-0.17⁶</td>
<td>0.02</td>
<td>-0.13</td>
<td>0.14</td>
</tr>
<tr>
<td>(6) GIS network distance to closest gym Perceived distance to closest gym</td>
<td>120</td>
<td>0.18</td>
<td>0.04</td>
<td>0.13</td>
<td>0.15</td>
</tr>
<tr>
<td>(7) GIS network distance to closest school</td>
<td>129</td>
<td>0.07</td>
<td>-0.003</td>
<td>0.06</td>
<td>0.10</td>
</tr>
<tr>
<td>(8) Perceived distance to closest school</td>
<td>79</td>
<td>-0.20</td>
<td>0.03</td>
<td>-0.18</td>
<td>0.11</td>
</tr>
<tr>
<td>(9) GIS network distance to closest school</td>
<td>79</td>
<td>0.08</td>
<td>0.02</td>
<td>0.09</td>
<td>0.10</td>
</tr>
</tbody>
</table>

⁵Adjusted for age and body mass index (BMI) with the exception of models with distance to schools as independent variable (adjusted for BMI only).

⁶Indicates p-value = 0.06.

⁷Indicates p-value < 0.05.
<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived distance to closest school</td>
<td>-0.23</td>
<td></td>
<td></td>
<td>-0.22</td>
</tr>
<tr>
<td>(10) Combined GIS network distance to closest resource</td>
<td>129</td>
<td>0.04</td>
<td>-0.006</td>
<td>0.03</td>
</tr>
<tr>
<td>(11) Combined perceived distance to closest resource</td>
<td>74</td>
<td>-0.16</td>
<td>0.012</td>
<td>-0.15</td>
</tr>
<tr>
<td>(12) Combined GIS network distance to closest resource</td>
<td>74</td>
<td>0.12</td>
<td>0.008</td>
<td>0.08</td>
</tr>
<tr>
<td>Combined perceived distance to closest resource</td>
<td></td>
<td>-0.23</td>
<td></td>
<td>-0.20</td>
</tr>
</tbody>
</table>
Table 8.7. Crude and Adjusted Models of Associations between Natural Log of Minutes of Moderate to Vigorous Physical Activity and Perceived and Objectively Measured Access to Physical Activity Resources. (n = 155)

<table>
<thead>
<tr>
<th>Independent variable(s)</th>
<th>Standardized parameter estimate (crude)</th>
<th>Adjusted R² for model</th>
<th>Standardized parameter estimate (adjusted⁸)</th>
<th>Adjusted R² for model</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Number of parks in 1-mile buffer</td>
<td>-0.08</td>
<td>-0.0004</td>
<td>-0.06</td>
<td>0.08</td>
</tr>
<tr>
<td>(2) Perceived existence of park in neighborhood</td>
<td>0.11</td>
<td>0.005</td>
<td>0.08</td>
<td>0.09</td>
</tr>
<tr>
<td>(3) Number of parks in buffer</td>
<td>-0.09</td>
<td>0.008</td>
<td>-0.08</td>
<td>0.09</td>
</tr>
<tr>
<td>Perceived existence of park</td>
<td>0.12</td>
<td></td>
<td>0.09</td>
<td></td>
</tr>
<tr>
<td>(4) Number of gyms in 1-mile buffer</td>
<td>-0.10</td>
<td>0.003</td>
<td>-0.06</td>
<td>0.08</td>
</tr>
<tr>
<td>(5) Perceived existence of gyms in neighborhood</td>
<td>-0.02</td>
<td>-0.006</td>
<td>-0.04</td>
<td>0.08</td>
</tr>
<tr>
<td>(6) Number of gyms in buffer</td>
<td>-0.09</td>
<td>-0.004</td>
<td>-0.06</td>
<td>0.08</td>
</tr>
<tr>
<td>Perceived existence of gyms</td>
<td>-0.02</td>
<td></td>
<td>-0.04</td>
<td></td>
</tr>
<tr>
<td>(7) Number of schools in 1-mile buffer</td>
<td>-0.16⁹</td>
<td>0.02</td>
<td>-0.16⁹</td>
<td>0.11</td>
</tr>
<tr>
<td>(8) Perceived existence of schools in neighborhood</td>
<td>0.07</td>
<td>-0.002</td>
<td>0.04</td>
<td>0.08</td>
</tr>
<tr>
<td>(9) Number of schools in buffer</td>
<td>-0.18⁹</td>
<td>0.02</td>
<td>-0.17⁹</td>
<td>0.10</td>
</tr>
</tbody>
</table>

⁸ All models adjusted for age and BMI (body mass index).

⁹ Indicates p-value < 0.05.
<table>
<thead>
<tr>
<th>Perceived existence of schools</th>
<th></th>
<th></th>
<th>0.06</th>
</tr>
</thead>
<tbody>
<tr>
<td>(10) Number of all resources in 1-mile buffer</td>
<td>-0.11</td>
<td>0.0064</td>
<td>-0.09</td>
</tr>
<tr>
<td>(11) Perceived existence of all resources in neighborhood</td>
<td>0.08</td>
<td>0.0001</td>
<td>0.04</td>
</tr>
<tr>
<td>(12) Number of all resources in buffer</td>
<td>-0.13</td>
<td>0.01</td>
<td>-0.10</td>
</tr>
<tr>
<td>Perceived existence of all resources</td>
<td>0.10</td>
<td></td>
<td>0.06</td>
</tr>
</tbody>
</table>
CHAPTER 9
SUMMARY AND RECOMMENDATIONS

IX.A. Summary of Findings

Aim 1:

From the formative phase of this project, four major themes emerged. The first was that there are differences in access to community food sources between rural and urban areas. Women from urban areas reported easier access to chain supermarkets and also reported being inundated with fast food restaurants compared to rural women. Urban women also reported less access to produce markets and local gardens, while these resources were frequently mentioned by rural women. The second theme was the influence of the workplace social and physical environment on food choice. Women reported the common occurrence of free, unhealthy snacks (e.g., doughnuts) at office functions and a social and surrounding community nutrition environment conducive to eating lunch at local fast food or soul food restaurants. Participants often used the commute between work and home for purchasing breakfast or dinner from a fast food restaurant, or grocery shopping at a produce market or supermarket.

Two additional themes emerged, which influenced women’s interactions with community food sources: one was the influence of family, and the other was the influence of personal health. Children’s desires for unhealthy food made it hard for women to withstand temptations to buy such foods when out in the community environment. Yet women with children at home were highly motivated to provide them with healthy food. This conflict was
often reconciled by women’s personal health concerns. While women who felt healthy did not see the need to make healthier food choices, those with health concerns (e.g., high blood pressure, diabetes) were strongly influenced to make healthy food choices by the desire to prevent or manage chronic disease. The influences of children and personal health concerns highlight the importance of recognizing where women are in the midlife transition, whether recently divorced or widowed, caring for grandchildren, or diagnosed with a chronic disease. Each life circumstance presents different barriers and opportunities to make healthy living a priority. Overall, intrapersonal and social and physical environmental influences combined to influence the foods chosen in different settings, consistent with the social ecological framework. This was noted in various anecdotes women provided, and highlights the need to focus on several spheres of influence when designing programs and policies.

The community resource intervention tools (Neighborhood Assessment with Tip Sheets and Community Resource Guide, Appendix B) were designed using qualitative data collected for the first aim of this project. The steps for creating the tools were compiled into a manual designed to guide creation of similar community-specific intervention tools (Appendix G). Participants and Community Advisory Board members noted barriers to the use of resources, included in Tables 4.2 and 6.2. These included intrapersonal barriers (e.g., embarrassment about weight) and resource-specific barriers (e.g., abundance and low cost of fast food). Women also noted ways they overcame barriers, such as going with a friend to exercise at a park or taking snacks when on road trips to avoid stopping for fast food. These participant-generated tips were included in the community resource intervention tools, to increase their salience to the priority population.
Aim 2:

Results of the second aim of this project indicated that women in the intervention group increased their use of physical activity community resources more than women in the control group; this effect was possibly mediated by increased knowledge of physical activity resources. Income was a significant covariate, with women who reported less than $10,000 annual household income increasing their use of physical activity resources more than women with higher incomes. This is not surprising given that only low- or no-cost physical activity resources were included in the intervention tools in anticipation of participants’ financial limitations.

Use of nutrition resources increased significantly more among urban women in the intervention group compared to urban women in the control group; there was no effect in rural women. However, there was no evidence that this outcome was mediated by knowledge of or self-efficacy for accessing nutrition resources. The increased use of nutrition resources among only the urban women could be attributed to the WISEWOMAN Project health counselors’ involvement in a farmer’s market in Wilmington. This result may also be due to urban women having a wider range of resource options from which to choose. Again, income was a significant covariate, yet in this case, lower-income urban women increased their use of nutrition resources less than did higher-income urban women. This may have been because while many of the physical activity resources were free-for-use, fewer nutrition resources were free-for-use.

The intervention did not result in significant increases in physical activity or fruit and vegetable consumption at 12-months, so there was no intervention effect to be mediated by use of resources (Aim 2b).
**Aim 3:**

In the third aim of this study, perceived distance and objectively measured distance to physical activity resources were significantly correlated. These correlations were of greater magnitude for rural women as compared to urban women, and for women in the intervention group versus those in the control group (Table 8.4). There was slight to fair agreement between perceived and objectively measured existence of resources in the neighborhood (Table 8.5). Disagreements between perceptions and the objective measure are likely due to one of two factors: (1) Women perceive their neighborhood boundaries differently than the boundaries used for the objective measure (1-mile radius); and (2) there are a variety of reasons (e.g., high cost of gyms, crime at a park) why women may not have considered a resource accessible and thus not perceived the resource.

Greater perceived distance to gyms was significantly associated with less MVPA, yet only 11% of women reported using gyms (Table 4.4). There was also a statistically significant association between objectively measured number of schools in a 1-mile buffer and MVPA, but this was in the opposite direction of what was expected, such that greater numbers of schools in the buffer was associated with less MVPA. This finding may be due to chance, or it may be that more schools in buffers indicate a less pedestrian-oriented neighborhood.

**IX.B. Conclusions**

Over the course of this project, two main ideas surfaced. The first is that there are disparities in the distribution of resources (such as supermarkets and gyms) in the rural study
areas compared to the urban area\textsuperscript{1} In qualitative interviews, rural women noted the lack of access to several types of physical activity resources and to supermarkets. Aim 2 analyses indicated that the intervention resulted in significantly greater increases in self-reported use of nutrition resources among urban women only. Not only do rural women perceive they are far away from resources, but objectively-measured distance data collected for Aim 3 also indicated that rural women were further away from the closest PA resources. Rural women’s reported distances to the closest resource were more strongly correlated with objectively measured distance, perhaps because rural women were so far away from resources: longer distances may be easier to estimate than shorter ones, or rural women may be so accustomed to driving to the urban area (Wilmington) that they can easily estimate the distance to the nearest resources (often located in or near Wilmington). The finding that WISEWOMAN participants in areas with high land-use mix and more fitness facilities per 1000 people had significantly lower body mass index and coronary heart disease risk\textsuperscript{157} suggests a potentially serious detrimental health impact of disparities in access to resources. Thus, while community resource intervention tools may be effective in increasing knowledge and use of resources, this effect is likely to persist only in areas where adequate resources exist. In areas without accessible resources, such tools are of minimal use and efforts should focus on environmental change strategies (e.g., building parks). Yet all areas have supportive community resources – women from rural communities mentioned resources such as produce

\textsuperscript{1}In Aims 2 and 3 of this study, if a participant reported a Wilmington address, she was classified as urban, and if she lived in a surrounding small town, she was classified as rural. This classification is defensible because the July 1, 2004 census bureau annual estimate of the population for Wilmington was 93,292 and population estimates for the least and most populated surrounding incorporated places where participants lived ranged from 483 to 5192.\textsuperscript{139}
stands and senior centers. Thus, tools can highlight each community’s resource offerings, while advocacy efforts can address the creation of more resources.

The second main theme deals with the relative influence of individual-level versus environmental level factors on health behaviors. In the qualitative data, individual-level factors (e.g., health status) were more prominent in women’s descriptions of food choice than were community- and environmental-level influences. However, women personified fast food, describing it as “calling you,” “grabbing onto you,” and being “hypnotic.” Women also reported being constrained by limited access to healthy options for lunch at work. Results of Aim 2 (Table 7.3) indicate the top barriers to using various resources were lack of time, lack of felt need, and lack of motivation. These are all individual-level barriers, despite inclusion of resource-specific barriers on the measures. In the third aim of this study, we found that perceived distance to gyms (individual-level factor) was more strongly related to MVPA than was objectively measured distance (Table 8.6). Yet this was not the case for perceived existence of resources in the neighborhood. Objectively measured number of schools in 1-mile buffers (environmental factor) was negatively associated with MVPA, while perceived existence of resources was not statistically significantly associated with MVPA (Table 8.7).

Taken together, these results substantiate the notion that action should be taken on all levels of the intervention continuum, from the individual-level to the environmental-level, and from active to passive. Active environmental approaches (e.g., signs encouraging stair use) require high levels of individual choice, while passive environmental approaches (e.g., vehicle air bags) do not require individuals to make a decision. Public health professionals tend to gravitate toward passive approaches because they have a high potential population impact. Yet we know that some level of individual choice is required for most approaches.
With other health-related behaviors, individuals often overcome seemingly insurmountable environmental barriers to achieve a goal if it is a high enough priority. Thus, health promotion approaches should span the intervention continuum, from active to passive, and include both individual-level and environmental interventions.

**IX.C. Improvements and Recommendations for Future Work**

This study could be improved in several ways. First, though it is difficult to anticipate the communities from which program participants will come, a more in-depth, ethnographic study of the resources in rural communities should be conducted, including formal observations of resource users to assess how they interact in each resource environment, and by intercept interviews with users. This would increase the level of tailoring required for community resource intervention tools, but would make them more appropriate for the priority population. Use of interview guides specifically designed to gather data to develop a conceptual framework of how women perceive and interact with the nutrition environment (“people-environment transactions”) would be another improvement. To examine how individuals’ choices affect different food sources, grocery store managers and restaurant owners could be interviewed. To evaluate the intervention’s effect on use of resources (Aim 2), objective measures of use should be considered, such as observations of users. Infrared counters could measure use of trails, while accelerometers and global positioning system (GPS) units could be connected to provide objective information about PA intensity and where program participants are being active. To assess mediation more thoroughly, potential mediators and outcomes should be measured at appropriate time points to demonstrate that change in the mediator preceded change in the outcome. In Aim 3, resident-defined neighborhood boundaries could be used to assess the correlation between perceived
and objectively measured access to PA resources. When perceived distance data are collected, items should inquire as to which resource the participant is estimating the distance (e.g., “Gym X is 5 miles from my home”). Population-specific cutpoints for accelerometer data would increase the precision and interpretability of objective physical activity data. In future studies, probing for physical street addresses would increase the number of participants able to be geocoded and ensure that rural women are not systematically excluded from analyses. In the analysis for Aim 3 of this study, it is possible that some information regarding women's access to PA resources was lost, because only the distance to the closest PA resource was used (versus distance to all resources). In the future, multi-level modeling strategies using distance to all resources nested within each participant would minimize this loss of data. Additional efforts should be made to motivate participants to adhere closely to accelerometer wear time criteria. Longitudinal analyses of the associations between perceived and objectively measured access to PA resources and MVPA are needed to provide evidence of causality. Finally, sample size calculations for future research should be based on the appropriate outcomes (expected change in use of resources for Aim 2, or the expected influence of perceived environment on MVPA for Aim 3).

If time and money were not constraints, the intervention would be improved by tailoring resources suggested in counseling to women’s preferences for physical activity (e.g., inside or outside, with a group or alone). Then, taking cost, distance, and safety barriers into account, GIS could be used to map a participant’s workplace, home address, and the most feasible physical activity options specific to her activity space, preferences, and barriers. Group field trips to a resource would also improve the intervention.
Qualitative interview respondents in this study noted the effects of suburban sprawl, and seemed to prefer pedestrian-friendly neighborhoods. One urban participant noted:

“…everything nowadays is stretched out. Years ago it wasn’t. Everything was centered around the neighborhood. But now everything is pushed out. So you have to go a mile or some ways from your home to get stuff.”

Another described her frustration living in a rural area where she had to drive to work and to do errands, contrasting this to her experience living in a German village:

“I live out in the country and I live away from my job so it’s not physically possible for me to walk to work or to ride a bike. I have to drive a car. And I think a lot of people are in that same situation… But I think it’s much easier when you can walk to work and you can even have many little shops close to your home you can walk to…We lived in a little German village. They had a little bakery… a butcher shop…the church …there were a lot of things that were community oriented and we didn’t have to drive.”

Given that over 50% of study participants said they were active on neighborhood streets in the past month (Table 4.4), and 47% said that heavy traffic was a problem for them in getting more physical activity (Appendix A), future research efforts should focus on the most effective ways to improve neighborhood walkability. Because such strategies will require community support to be effective, study and facilitation of community advocacy efforts may be one of the best approaches to make neighborhoods more pedestrian-friendly. Pleasant streetscapes and convenient commercial destinations are important dimensions of walkability. Thus, community advocacy and community change efforts should also include efforts to increase the availability of affordable community food sources, such as supermarkets and produce stands, to facilitate healthier dietary choices. This approach should increase women’s feelings of community ownership and empowerment, and would hopefully sustain individual and collective motivation to consume a healthier diet and to be more physically active.
APPENDICES

APPENDIX A: Linking Clinical Care to Community Resources for Cardiovascular Disease Prevention: The North Carolina Enhanced WISEWOMAN Project


APPENDIX C: Qualitative Interview Guides

APPENDIX D: Qualitative Codebook

APPENDIX E: Environmental Survey

APPENDIX F: Validation of a Brief Dietary Assessment to Guide Counseling For Cardiovascular Disease Risk Reduction in the Underserved (DRAFT)

APPENDIX G: Linking Clinical Care to Community Resources for Cardiovascular Health: A Guide for WISEWOMAN Projects and other Community-based Health Promotion Projects
APPENDIX A: Linking Clinical Care to Community Resources for Cardiovascular Disease Prevention: The North Carolina Enhanced WISEWOMAN Project
LINKING CLINICAL CARE TO COMMUNITY RESOURCES FOR CARDIOVASCULAR DISEASE PREVENTION: THE NORTH CAROLINA ENHANCED WISEWOMAN PROJECT

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Stephanie B. Jilcott, BS, nutrition doctoral student, Department of Nutrition, Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill

Thomas C. Keyserling, MD, MPH, Associate Professor of Medicine, Department of Medicine, Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill

Carmen D. Samuel-Hodge, PhD, MS, RD, Research Assistant Professor, Department of Nutrition, Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill

Wayne Rosamond, PhD, Professor, Department of Epidemiology, University of North Carolina at Chapel Hill

Beverly Garcia, MPH, Social Research Associate, Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill

Julie C. Will, PhD, MPH, Team Leader, WISEWOMAN, Centers for Disease Control and Prevention1

Rosanne P. Farris, PhD, Applied Research Team Leader, Cardiovascular Health Branch, Centers for Disease Control and Prevention1

Alice S. Ammerman, DrPH, RD, Associate Professor, Department of Nutrition; Director, Center for Health Promotion and Disease Prevention, University of North Carolina at Chapel Hill

Corresponding author:
Stephanie B. Jilcott, Center for Health Promotion and Disease Prevention
1700 Martin Luther King, Jr Blvd, CB# 7426
Chapel Hill, NC 27599-7426
Email: jilcott@email.unc.edu; Phone: (919) 843-0595; Fax: (919) 966-3374

1 The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.
ABSTRACT

Introduction: The WISEWOMAN (Well-Integrated Screening and Evaluation for Women Across the Nation) Project addresses the need for effective cardiovascular disease prevention among underserved, midlife women. We describe an enhanced intervention (EI) that addressed environmental and individual factors within the context of a clinic-based intervention. We also present the study design and baseline results of the randomized trial to evaluate the EI. Methods: The multi-component behavior change intervention addressed many elements of the Chronic Care Model, including the community resources and policy element, wherein EI participants were encouraged to overcome environmental barriers to a healthy lifestyle by using community resources. Study participants were enrolled at one community health center: all were low-income, underinsured, midlife (40-64 years) women.

Results: A total of 236 participants were randomized to receive the EI or the minimum intervention. At baseline, over three-fourths of the participants were overweight or obese. Participants reported a variety of problematic neighborhood characteristics including a paucity of restaurants with healthy food choices (41% reported as a problem); not enough farmer’s markets or produce stands (50%); not enough affordable exercise places (52%); not enough PA programs that met women’s needs (42%); heavy traffic (47%); and speeding drivers (53%). Overall, women knew little about affordable exercise venues and nutrition classes. Conclusions: In this clinic-based intervention, we addressed environmental factors related to a healthy lifestyle. Results indicate the need for effective and feasible intervention strategies to address the environments in which individuals are making behavior changes. The effectiveness of the WISEWOMAN EI will be assessed in a randomized trial.

Key words: underserved women, Chronic Care Model, diet, physical activity, community
INTRODUCTION

In the United States, cardiovascular disease (CVD) is a leading cause of death. The risk of developing CVD is increased by a physically inactive lifestyle, high saturated and trans fat intake, and low fruit and vegetable consumption. The occurrence of these adverse behavioral risk factors and the rate of CVD are highest among low-income and minority populations, suggesting the importance of effective prevention programs for this group. Such efforts are especially needed among midlife women, because they are often unaware of their risk for CVD and are gatekeepers of family members’ health behaviors.

To address this need, the WISEWOMAN (Well-Integrated Screening and Evaluation for Women Across the Nation) Program is a Centers for Disease Control and Prevention (CDC)-sponsored CVD risk reduction program for under- and uninsured women ages 40-64 years. The goal of WISEWOMAN is to implement interventions to improve diet, increase physical activity (PA), and promote smoking cessation, thus decreasing clinical CVD risk factors and optimizing participants’ health. The program currently funds 15 projects in 14 states, including North Carolina, which launched its first WISEWOMAN project in 1995.

In order to lower participants’ CVD risk, the North Carolina WISEWOMAN Project employs one-on-one behavior change counseling. This project, as well as WISEWOMAN projects in other states, have produced generally favorable results, including reductions in blood pressure, cholesterol, and weight. However, the more intensive lifestyle intervention’s effects on clinical risk factors evaluated in prior WISEWOMAN studies have shown only small improvements compared to less intensive intervention, suggesting a need for more effective interventions. Because individuals are making lifestyle choices surrounded by differing cultural, physical, and social contexts, interventions that address both individual and
environmental factors are likely to be most effective, according to many theoretical paradigms.\textsuperscript{11-14} The importance of addressing environmental determinants, which has not specifically been done in prior WISEWOMAN intervention studies, is also supported by mounting empirical evidence.\textsuperscript{15-17} Environmental determinants include factors such as proximity to supermarkets,\textsuperscript{18} walking trails and other physical activity resources.\textsuperscript{19,20}

In busy health care settings, such as those in which WISEWOMAN has been implemented, community- and environmental-level factors that act to facilitate or hinder healthy behaviors are rarely addressed. This is due to both the traditional focus of clinic-based prevention programs on individual-level attitudes and behaviors, and the limited resources for preventive care. Moreover, rather than focusing on the treatment and management of chronic medical problems, modern health care systems have been molded by methods to diagnose and treat acute medical conditions. To address the deficiencies of the acute-care model in managing chronic diseases, Wagner and colleagues developed the Chronic Care Model (CCM) (Figure 1).\textsuperscript{21} Although conceptualized primarily as a disease management tool, the CCM is useful to inform preventive efforts\textsuperscript{22} and adds a community-level orientation to clinical prevention programs that focus primarily on individuals. Although the CCM optimizes chronic disease management and preventive care by integrating elements of the health care organization with community resources and policies, we know little about the best practices to effectively foster and support behavior change. In this paper, we use the CCM as a framework to describe Enhanced Intervention (EI) components in the North Carolina WISEWOMAN Project, which expands the clinical one-on-one approach to also address environmental and community factors. We also describe the
design of the study, the purpose of which is to evaluate the intervention’s effectiveness, and present baseline findings.

MATERIALS AND METHODS

Intervention Conceptual Framework

According to the CCM (Figure 1), the success of chronic disease prevention and management efforts depends on effective interactions between informed, activated patients and prepared, proactive practice teams. Such interactions are facilitated by: (1) community resources and policies, or social-environmental supports related to preventive behaviors; (2) self-management support, wherein the participant plays an active role in setting achievable lifestyle change goals and acquires the skills needed to make healthy changes; (3) decision support, providing the health care team with adequate knowledge of evidence-based guidelines for prevention; (4) delivery system design, or sufficient follow-up for behavior change; and (5) clinical information systems, used to relay participant status information.23

The Enhanced Intervention

The 12-month EI (Figure 2) consists of an intensive phase (months 1-5) and a maintenance phase (months 6-12). During the intensive intervention, participants attend 2 individual counseling sessions, receive 1 follow-up mailing, attend 3 group sessions, receive monthly telephone calls, and are given a Community Resource Guide. The maintenance intervention consists of 3 mailings to support behavior changes, continued monthly phone contacts, and 1 face-to-face counseling visit using a Neighborhood Assessment and the Community Resource Guide. All EI components were designed to contribute to effective interactions between informed participants and a prepared preventive health care team that includes the primary care clinician, the WISEWOMAN health counselors, and community
health advisors (described in detail below). The intervention components are presented within the framework of the CCM in greater detail in Table 1.

**Community Resources and Policies**

The use of community programs and community-based preventive services is vital to adoption and maintenance of healthy behavior changes made as a result of prevention programming in clinical settings (Table 1). To increase participants’ use of community resources, the WISEWOMAN Project gave EI participants a Community Resource Guide which included names and contact information for local healthy eating and PA resources (e.g., produce stands, YMCA), and the contact information needed to make community improvements related to PA (e.g., sidewalk repair). At individual visits with health counselors participants were first, encouraged to use resources described in the Guide. Second, EI participants were challenged to explore and report on at least one resource from the Guide at a group session. Third, all participants completed a Neighborhood Assessment (NA) at their 6- and 12-month follow-up visits, at which time EI participants collaborated with the health counselor to set goals to overcome unhealthy environmental factors (e.g., excessive fast food) and use community resources. Finally, to foster further community engagement, WISEWOMAN participants and health counselors demonstrated healthy cooking at a farmer’s market, a local cooperative extension agent provided cooking lessons at group sessions, and a women’s fitness center offered participants reduced enrollment fees.

A body of research now indicates the effectiveness of community health workers/lay advisors on enhancing education of patients and improving quality of care and health outcomes. The EI included community health advisors (CHAs) in a variety of roles, including monthly phone contacts with participants to offer support for behavior changes;
follow-up on healthy eating and activity goals; problem-solving with the participant; and linking the participant to community resources. With characteristics similar to those of WISEWOMAN participants and residing in the local community, CHAs were employed as members of the study team and trained over the course of 1 month (4 weekly sessions, each 4 hours in length) in the areas of motivational interviewing techniques, listening skills, cardiovascular disease risk reduction, making phone contacts, record keeping, and other study-related responsibilities.

Self-Management Support

This CCM element involves collaborative goal-setting, identification of an individual’s behavior change barriers and supports, and development of individualized problem-solving strategies (Table 1). Self-management support was addressed in the WISEWOMAN intervention by having each EI participant work with a WISEWOMAN health counselor to assess current diet and PA lifestyle choices. Current practices were measured using the Dietary Risk Assessment (DRA) and Physical Activity Assessment (PAA) from the New Leaf, Choices for Healthy Living manual. Used extensively in North Carolina WISEWOMAN Projects, the New Leaf manual is a theory-based diet and PA assessment and tailored counseling program designed for use in clinical settings serving lower-income populations. It facilitates collaborative goal-setting and individualized counseling on barriers and supports for healthy behaviors. After identifying unhealthy diet or PA practices using the New Leaf assessments, women collaborated with the health counselor to set goals to overcome unhealthy practices. After identifying unhealthy diet or PA practices using the New Leaf assessments, women collaborated with the health counselor to set goals to overcome unhealthy practices. To track their progress on the primary behavior change
goals of the study, participants also used self-monitoring sheets to record their daily fruit and vegetable intake, minutes of physical activity, and/or number of steps taken, as recorded by a pedometer. (Pedometers were given as a self-monitoring intervention tool and not used for data collection.)

**Decision Support**

The decision support element of the CCM uses evidence-based prevention guidelines to prompt providers to initiate preventive service and action (Table 1). In the WISEWOMAN EI, the health counselor identified participants’ high risk behaviors with a series of assessment tools from the *New Leaf* manual. The DRA, for example, includes response options designed to uncover an atherogenic eating pattern; similarly, the PAA can detect physically inactive lifestyle practices, and the Neighborhood Assessment can find environmental interactions that could contribute to unhealthy diet or physical inactivity. The health counselor then used these assessments to evaluate whether or not participants were meeting recommendations for a healthy diet and PA, and provided behavior change counseling to address high-risk behaviors. If participants were identified as having high blood pressure, blood glucose, or cholesterol, they were referred to a primary care clinician for follow-up.

**Delivery System Design**

This element of the CCM facilitates the delivery of preventive services by involving non-physician members of the health care team in the delivery process. This element also uses culturally-appropriate, low literacy materials (Table 1). The WISEWOMAN intervention used several delivery system design strategies. First, counseling and coordinated preventive care were provided by the WISEWOMAN health counselor. Second, to reinforce
and support healthy behavior changes, participants received mailings and phone calls from the CHAs. These mailings and phone calls included reminders to use community resources. Third, to address cultural appropriateness, the New Leaf counseling materials were designed for southern populations with low-literacy. We strengthened the cultural appropriateness of the Community Resource Guide and Neighborhood Assessment by conducting qualitative interviews with women similar to WISEWOMAN participants and incorporating their feedback into the materials.

**Clinical Information Systems**

The clinical information systems element of the CCM uses patient status summaries to prompt preventive care (Table 1). Documents completed as part of the New Leaf intervention were used to track participants’ progress on setting and achieving lifestyle change goals, and prompted health counselors to initiate further preventive counseling. In addition, all WISEWOMAN projects use an agreed-upon set of minimum data elements that include participant demographics and physiologic measures to track the effectiveness of the national WISEWOMAN Program.

**Study Design**

To evaluate the effectiveness of the WISEWOMAN EI, we conducted a randomized trial from May 2003 to December 2004 (Figure 2). (This paper reports only baseline results; study outcomes will be reported in subsequent publications.) Participants were enrolled at one community health center, which primarily serves low-income and minority patients, located in a mid-sized city in southeastern North Carolina. Many participants resided in the inner-city neighborhood near the health center, some lived in suburban neighborhoods, and others lived in surrounding rural areas. Those who completed baseline measures were
randomized to receive either the EI or the minimum intervention (MI). The MI consisted of a one-time mailing of two American Heart Association pamphlets about healthy diet and physical activity practices. The study was approved by the School of Public Health Institutional Review Board on Research Involving Human Subjects at the University of North Carolina, Chapel Hill.

Participants

Potential participants were contacted by telephone and screened for WISEWOMAN eligibility. Participants were female, aged 40 to 64 years (inclusive), with incomes at or below 200% of the federal poverty level, little or no health insurance, and accessible by phone. Women were excluded if they had a medical condition for which the intervention would not be appropriate, were pregnant or lactating, or had any acute medical problem that would alter baseline measures. After giving informed consent, participants completed baseline measures during two enrollment visits and one telephone interview.

Study Outcomes, Sample Size, and Randomization

The primary study outcome was change in moderate intensity PA as measured by accelerometer, assessed by comparing baseline PA to activity measured at 6 and 12 months. Secondary outcomes included change in dietary intake as assessed by a food frequency questionnaire, and change in a variety of physiological and psychosocial variables. We used data from a prior diet and physical activity intervention study of African American women with type 2 diabetes\(^{25}\) to calculate sample size. To detect a similar change (44 kilocalories/day) in moderate intensity physical activity, as observed in the prior study, a total sample size of 204 participants was required, assuming a two-sided test, alpha = 0.05, and power of 80%. After baseline data were collected, we used computer-generated random
numbers to assign participants to a study group. We generated standard descriptive statistics for baseline comparisons using SAS software (SAS Institutes, Cary, NC). Wilcoxon’s rank sum test for the median was used for baseline PA comparisons. Reported p-values are two-sided.

**Measures and Data Collection**

*Physical activity* – PA was objectively assessed by the Actigraph (Shalimar, FL, formerly known as CSA WAM 7164 Activity Monitor), a small, uniaxial accelerometer worn on the waist. Others have evaluated the validity of the Actigraph monitor and have reported satisfactory correlations between the monitor and other measures of PA.²⁸,²⁹ During the enrollment visit, participants were instructed to wear the accelerometer during waking hours for 1 week, except when bathing or in water, and to return the monitor by mail at the conclusion of this period. Accelerometer data were used if the monitor was worn a minimum of 4 days, at least 6 hours per day. Accelerometer data were classified into moderate and vigorous intensity physical activity using cutpoints established by Swartz, et al.³⁰ A self-reported measure of PA (Physical Activity Assessment, PAA) was also collected over the phone, for both self-reported intensity and type of PA, including activities done as a part of daily life, such as at work, in household chores, or for leisure.²⁵

To identify possible safety issues related to participation in a program designed to increase moderate intensity PA, participants were screened at the enrollment visit using a modified version of the Physical Activity Readiness Questionnaire (PAR-Q).³¹ In addition, all participants were referred to a primary care clinician for a recommendation on appropriate PA intensity. Participants with a positive PAR-Q screen who did not complete a visit with a
primary care clinician for the purpose of receiving a recommendation for exercise intensity
did not participate in the PA component of the enhanced intervention.

_Dietary intake_ – We assessed dietary intake in several ways. All participants
completed the Dietary Risk Assessment (DRA) by phone. The DRA is a brief 42-item food
frequency questionnaire, previously validated,\(^{32}\) and used in other studies with low-income
participants.\(^{26,27}\) In addition, dietary biomarkers, including blood carotenoids and erythrocyte
membrane fatty acids, were obtained from a fasting blood specimen. To revalidate the
updated DRA and obtain more detailed dietary information, the Fred Hutchinson Cancer
Research Center’s 12-page FFQ, previously validated in a sample of women including
African Americans,\(^{33}\) was administered to a sub-sample of participants (n = 104) who
volunteered to complete the 30 - 45 minute telephone survey. Estimates of fruit and
vegetable consumption for the sub-sample were generated using two summary questions.\(^{34}\)

_Physiologic measures_ included blood lipids, blood glucose, blood pressure, body
mass index (BMI), and body composition. Fasting blood was drawn at the community health
center to test blood lipid and glucose levels. Blood was collected in a serum separator tube
and transported daily to a regional LabCorp (Laboratory Corporation of America, Burlington,
NC) facility. Total cholesterol, high-density lipoprotein cholesterol (HDL-C), and
triglycerides were determined by automated enzymatic methods on a Roche/Hitachi 717
analyzer (Indianapolis, IN). Low-density lipoprotein cholesterol (LDL-C) was calculated
using the Friedewald Formula.\(^{35}\) Blood glucose was measured using the Accu-Check
Advantage Glucometer (Hoffman-La Roche, Basel, Switzerland).

The Omron HEM-907 automated blood pressure (BP) monitor (Omron Healthcare,
Inc., Vernon Hills, IL) was used to measure BP.\(^{36,37}\) After the participant was seated for 5
minutes, three BP measures were obtained at 60-second intervals and the average was recorded. BMI was calculated using weight measured with a Detecto balance beam scale (Detecto, Webb City, MO), and height measured with a Schorr portable height board (Schorr Productions, Olney, MD). Weight and height were measured with outer clothes removed and no shoes. A Tanita TBF-310 analyzer (Tanita, Arlington Heights, IL) was used to assess body composition.38

*Psychosocial Measures* – Face-to-face surveys were conducted to measure quality of life39 (SF-8™, Quality Metric, Inc., Lincoln, RI), social support, demographic data, and health histories. We also developed and administered an environmental survey, which measured (1) neighborhood barriers to PA and healthy eating, (2) participant knowledge of, use of, and self-efficacy for accessing and regularly using local PA and nutrition community resources, and (3) participant willingness to advocate for beneficial community changes related to PA or diet. Coefficient alpha (internal reliability) for the scale assessing self-efficacy for accessing nutrition resources was 0.65, for accessing PA resources was 0.80, and for getting started on advocating for community change was 0.78.

**RESULTS**

Of the 258 women who came to the first screening visit, 236 were randomized; 22 did not complete screening and were not randomized for the following reasons: 9 women withdrew, 2 were not randomized due to medical or psychological illness, and 11 were lost to follow-up. Table 2 shows baseline participant characteristics. Approximately 60% of participants were non-Hispanic whites. Most had an annual household income of less than $30,000. Over three-fourths had completed high school or the equivalent, and nearly all participants lacked health insurance. Women in the EI group reported living significantly...
closer to the health center than participants in the MI group (p = 0.04). Approximately a quarter of participants lived alone.

The average BP among MI participants was higher than that of EI participants. The difference between groups in diastolic BP was statistically significant (p = 0.02). Fewer participants had known diabetes than the number with a single fasting blood glucose value of at least 126 mg/dL (the cut-off for diagnosis of diabetes mellitus). Participants in both groups had high body fat levels (average = 41%); based on BMI cutpoints, approximately three-fourths were overweight or obese. About one-fourth currently smoked.

The difference in the numbers of EI and MI participants who reported taking cholesterol-lowering medications was significant (p = 0.04). Only a small percentage of women reported being seen by a dietitian, diabetes counselor, nurse, or health educator for diet counseling in the previous year. Over 40% of women reported following a low-salt diet, versus 20% who were on a diet to lose weight. At baseline, women achieved approximately 100 minutes of moderate physical activity per day.

Table 3 shows that the sub-sample of women (n = 104) who completed the Fred Hutchinson Cancer Research Center FFQ reported consuming approximately 1670 kilocalories per day. Participants’ saturated fat consumption supplied slightly more than 10% of their total energy intake, and trans fat consumption accounted for a little over 2%. Women also reported low fruit and vegetable consumption (compared to recommendation of 5-9 servings per day).

Participants completed the PAR-Q (a score of 1 or more means a positive screen and suggests the need for further evaluation before participating in a PA program), and most received an evaluation from a clinician regarding PA limitations. One participant with a
negative PAR-Q score was given a clinician recommendation for non-weight bearing exercise only. Of the 56 participants with a PAR-Q score ≥ 1 and a clinician’s recommendation for PA, 48 were cleared for moderate-intensity PA. Six were allowed non-weight bearing activity only, and 2 women received a recommendation of complete abstinence from PA; 15 participants were not evaluated by a clinician concerning PA limitations.

Study participants were asked to rate specific neighborhood characteristics as a “problem” or “not a problem” for facilitating or limiting their ability to obtain a healthy diet or PA (Table 4). The neighborhood characteristics rated by more than 40% of women as problems for healthy eating included not enough restaurants with healthy food choices, not enough farmer’s markets or fruit stands, and no place to buy a quick, healthy breakfast to go. As problems with physical activity, more than 40% of women listed not enough affordable exercise places, not enough PA programs that met women’s needs, heavy traffic, and speeding drivers.

Table 5 shows participants’ baseline knowledge of, use of, and self-efficacy (or confidence) for accessing local diet and PA community resources. Women generally did not know how to access classes to learn about either healthier eating or affordable exercise options. They reported using diet resources more often than PA resources. Women generally had higher confidence in their ability to learn about PA resources than in their ability to regularly use these resources. The opposite pattern was seen for classes on good nutrition: on average, women were less confident of their ability to learn about classes than of their ability to regularly attend a class.
Table 6 shows WISEWOMAN participants’ self-efficacy and willingness to advocate for a beneficial community change to make the neighborhood more supportive of PA or a healthful diet. In general, women were at best only somewhat sure how to learn to make various neighborhood improvements, but generally considered themselves more likely to advocate for beneficial community or neighborhood changes. Participants were more willing to sign a petition or write a letter, than to organize a group of friends to visit a city official or to speak at a city council meeting.

DISCUSSION AND CONCLUSIONS

Linking individual patients managed in clinical settings with community resources to facilitate behavior change presents major challenges. First, addressing community-level factors is outside the norm of clinic-based prevention and treatment programs, which are traditionally focused on individual knowledge, attitudes, and behaviors. Second, health care providers have limited time, training, and experience related to developing and using community and public health resource materials tailored to local communities. In this paper, we describe how these challenges were addressed by using the framework of the Chronic Care Model to describe an enhanced WISEWOMAN intervention linking clinical care with community resources.

To address the challenges of linking individuals in a clinic-based prevention program to community resources, we developed a Neighborhood Assessment with corresponding tip sheets and a linked community resource guide. The Neighborhood Assessment and tip sheets were designed to be similar in format to the New Leaf intervention materials, and facilitated health counseling by providing tailored recommendations to address specific environmental and community-level barriers. In turn, these recommendations can be reinforced by
community health advisors. The intervention also includes group session activities and mailings designed to encourage participants to use a variety of community resources.

To assess community-level and environmental factors that may be impediments to a healthy lifestyle, we measured participants’ perceptions of neighborhood barriers to being physically active and eating well. Participants indicated that heavy traffic, speeding drivers, and lack of affordable and appropriate PA programs and facilities were significant barriers to being physically active. These findings are consistent with other studies demonstrating that such environmental factors influence PA. Our results regarding nutrition barriers are also in agreement with other studies. Participants reported not having a place to buy a healthy breakfast and not having enough restaurants with healthy food choices were barriers to healthy eating. Block, et al found that predominantly African American neighborhoods had a significantly higher density of fast food restaurants when compared to predominantly white neighborhoods. Similarly, research in Los Angeles County demonstrated that restaurants in poorer neighborhoods with a high proportion of African American residents had fewer healthy options compared to those in more affluent areas. Thus, when designing multilevel interventions to address community-level barriers to increasing PA and improving dietary habits, strategies might include efforts to identify and/or establish safe and convenient walking venues, affordable gyms, and culturally appropriate PA programs, as well as identifying and supporting restaurants with healthy options.

Environmental and policy changes may have a greater impact if they result from community-level advocacy efforts. Although participants in our study generally reported low confidence in their ability to make neighborhood improvements, many indicated a willingness to work with others to achieve change. However, training and support would
likely be necessary for advocacy efforts that require community organizing and public speaking. Ultimately, if given the necessary tools and support, program participants in studies such as ours may prove to be catalysts for community and environmental changes.

Although structural factors that disproportionately affect low-income communities can be obstacles to healthy living, all communities possess assets that can be identified and strengthened. Taking advantage of these assets to provide long-term support for healthy behavior changes may be a feasible strategy for clinical prevention programs. Currently, we are evaluating the enhanced WISEWOMAN intervention in a randomized trial. If shown to be effective, our findings may provide additional support for the importance of linking patients managed in clinical settings with community resources to foster improved physical activity and dietary behaviors.
ACKNOWLEDGEMENTS:

This study was supported by cooperative agreement # U48/CCU409660 with the Centers for Disease Control and Prevention. The authors would also like to gratefully acknowledge the contributions made by many individuals: the WISEWOMAN study participants; WISEWOMAN health counselors Sara Lindsley and Kathryn Bramble; WISEWOMAN community health advisors; Carolyn Townsend, Jim Higgins, and Warren Freas from the North Carolina Department of Health and Human Services; Administrators and staff at the New Hanover Community Health Center; Claire Viadro, for her helpful editorial and content reviews; Sola Park and the Biostatistical support unit at the UNC Center for Health Promotion and Disease Prevention; and the research team at the UNC Center for Health Promotion and Disease Prevention.
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Figure 1. Chronic Care Model. Figure from Wagner EH. Chronic Disease Management: What will it take to improve care for chronic illness? *Effective Clinical Practice* 1998;1:2-4. (Used with permission)
Figure 2. WISEWOMAN Study Flow Diagram

**Standardized Screening** (N = 258)
Diet, physical activity, blood lipids, blood pressure, smoking, red blood cell membrane fatty acids, plasma carotenoids, BMI, BIA, health history, psychosocial measures

236 randomized

22 not randomized

Enhanced *New Leaf* Intervention (n = 118)

Intensive Intervention

Health Counselor

Month 1-2
2 individual counseling visits & 1 week follow-up mailing

Health Center/Community

3 group sessions (90 min. each)
Monthly CHA-delivered phone contacts (15 min. each, beginning month 3)
Community resource linkages

Minimum Intervention (n = 118)

American Heart Association pamphlets on diet and physical activity mailed to participants

6-month follow-up data: diet, physical activity, blood lipids, blood pressure, smoking, red blood cell membrane fatty acids, plasma carotenoids, BMI, BIA, health history, psychosocial measures

Maintenance Intervention

3 reinforcement mailings
Monthly CHA-delivered phone contacts
Community resource linkages

12-month follow-up data: diet, physical activity, blood lipids, blood pressure, smoking, BMI, BIA, health history, psychosocial measures

*BMI indicates body mass index; BIA, bioelectrical impedance; CHA, community health advisor*
Table 1. Chronic Care Model Elements and Examples from the WISEWOMAN Enhanced Intervention.

<table>
<thead>
<tr>
<th>Chronic Care Model Element</th>
<th>Key Features</th>
<th>Strategies to Support Behavior Change</th>
<th>Examples from the WISEWOMAN Enhanced Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Community resources &amp; policies</td>
<td>• Encourage participation in community programs and preventive services delivered by community and voluntary agencies and civic programs</td>
<td>• Linkages to community programs and services</td>
<td>• Counselors used Community Resource Guide and Neighborhood Assessment with Tips to help participants evaluate and overcome environmental barriers and use community resources</td>
</tr>
<tr>
<td>Self-management support</td>
<td>• Support patient’s self-care role (collaborate in goal-setting, identify)</td>
<td>• Telephone counseling • Mailings</td>
<td>• Assigned homework at group session to visit one community resource • WISEWOMAN staff and participants demonstrated healthy cooking at farmer’s market • Local Cooperative Extension Agent offered healthy cooking lessons at group sessions • Women’s fitness center offered participants reduced enrollment fees • Community Health Advisor contacts</td>
</tr>
<tr>
<td>Decision support</td>
<td>Delivery system design</td>
<td></td>
<td></td>
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<tr>
<td>------------------</td>
<td>------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Use evidence-based recommendations and prevention guidelines to prompt preventive action</td>
<td>• Non-physician members of health care team deliver preventive services</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• System prompts and reminders to initiate preventive action</td>
<td>• Group visits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Health Counselors used Dietary Risk Assessment and Physical Activity Assessment to evaluate compliance with evidence-based recommendations for physical activity and a healthy diet</td>
<td>• Telephone counseling</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Neighborhood Assessment prompted Health Counselors to identify environmental barriers and possible solutions</td>
<td>• Tailored</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Participants completed self-monitoring sheets</td>
<td>• Health Counselors provided counseling and coordinated preventive care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Community Health Advisors made phone calls to encourage participants to achieve goals and use of community resources</td>
<td>• Used project mailings and Community Health Advisor phone calls to support</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Counselors used New Leaf materials to identify strategies for overcoming individual-level barriers, and used Neighborhood Assessment to develop individualized strategies to overcome environmental barriers and use community resources.
| Clinical information systems | - Develop culturally appropriate and low-literacy materials to increase understanding and salience | - Provide support and prompting for preventive care | - Summarize data to track and plan care | mailings | - Patient status summaries of preventive services | behavior changes | - Used New Leaf materials (low-literacy and culturally sensitive) | - Conducted qualitative interviews with community women to increase the cultural appropriateness of the Community Resource Guide and Neighborhood Assessment | - Used New Leaf assessments to track goal-setting and progress | - Centers for Disease Control and Prevention tracks participant risk factors using minimum data elements |
Table 2. Baseline Participant Characteristics (Data shown are percentages, means with standard error, and for minutes of physical activity per day, median and interquartile range)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>EI (N = 118)</th>
<th>MI (N = 118)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Demographics</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, years</td>
<td>53.6 (0.66)</td>
<td>52.2 (0.64)</td>
<td>0.17</td>
</tr>
<tr>
<td>Race (% white)</td>
<td>58.5</td>
<td>58.5</td>
<td>1.00</td>
</tr>
<tr>
<td>Total household income(^1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$&lt;$ 10,000/year (%)</td>
<td>32.5</td>
<td>43.4</td>
<td></td>
</tr>
<tr>
<td>$10,000 - $30,000/year (%)</td>
<td>63.2</td>
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<td>$&gt;$ 30,000/year (%)</td>
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<td></td>
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<tr>
<td>Completed grade 12/ GED (%)</td>
<td>80.5</td>
<td>78.0</td>
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<tr>
<td>No health insurance (%)</td>
<td>95.8</td>
<td>94.9</td>
<td>0.76</td>
</tr>
<tr>
<td>Currently employed (%)</td>
<td>61.0</td>
<td>56.8</td>
<td>0.51</td>
</tr>
<tr>
<td>Average miles to health center from home</td>
<td>10.0 (0.78)</td>
<td>12.9 (1.18)</td>
<td>0.04</td>
</tr>
<tr>
<td>Living with spouse or someone like spouse (%)</td>
<td>41.5</td>
<td>44.9</td>
<td>0.60</td>
</tr>
<tr>
<td>Living alone (%)</td>
<td>28.0</td>
<td>24.6</td>
<td>0.55</td>
</tr>
<tr>
<td><strong>Cardiovascular disease (CVD), diabetes, and risk factors for CVD</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Known cardiovascular disease (%)</td>
<td>11.0</td>
<td>5.08</td>
<td>0.09</td>
</tr>
<tr>
<td>Positive family history for coronary heart disease (male or female relative) (%)</td>
<td>29.3</td>
<td>20.51</td>
<td>0.12</td>
</tr>
<tr>
<td>Prior diagnosis of high blood pressure (%)</td>
<td>50.0</td>
<td>45.8</td>
<td>0.51</td>
</tr>
<tr>
<td>Systolic blood pressure, mmHg</td>
<td>125.2 (1.82)</td>
<td>129.1 (1.91)</td>
<td>0.15</td>
</tr>
<tr>
<td>Diastolic blood pressure, mmHg</td>
<td>76.3 (1.05)</td>
<td>80.0 (1.13)</td>
<td>0.02</td>
</tr>
<tr>
<td>Prior diagnosis of high cholesterol (%)</td>
<td>36.3</td>
<td>31.0</td>
<td>0.40</td>
</tr>
</tbody>
</table>

\(^1\)Nine participants did not answer.
<table>
<thead>
<tr>
<th>Measure</th>
<th>Group A</th>
<th>Group B</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total cholesterol, mg/dL</td>
<td>206.4 (4.16)</td>
<td>215.4 (3.32)</td>
<td>0.09</td>
</tr>
<tr>
<td>LDL cholesterol, mg/dL</td>
<td>122.8 (3.40)</td>
<td>130.1 (3.07)</td>
<td>0.11</td>
</tr>
<tr>
<td>HDL cholesterol, mg/dL</td>
<td>56.1 (1.28)</td>
<td>56.2 (1.36)</td>
<td>0.97</td>
</tr>
<tr>
<td>Triglycerides, mg/dL</td>
<td>151.0 (24.09)</td>
<td>154.4 (10.18)</td>
<td>0.90</td>
</tr>
<tr>
<td>Physician diagnosis of diabetes (%)</td>
<td>15.3</td>
<td>7.6</td>
<td>0.09</td>
</tr>
<tr>
<td>Blood glucose, mg/dL</td>
<td>106.9 (3.15)</td>
<td>116.6 (5.45)</td>
<td>0.12</td>
</tr>
<tr>
<td>Blood glucose ≥ 126 mg/dL (%)</td>
<td>17.0</td>
<td>15.3</td>
<td>0.72</td>
</tr>
<tr>
<td>Percent body fat (BIA)</td>
<td>40.5 (0.93)</td>
<td>40.6 (0.83)</td>
<td>0.95</td>
</tr>
<tr>
<td>BMI, kg/m²</td>
<td>31.2 (0.75)</td>
<td>31.0 (0.75)</td>
<td>0.87</td>
</tr>
<tr>
<td>Underweight (&lt; 18.5) (%)</td>
<td>2.5</td>
<td>0.9</td>
<td>0.62</td>
</tr>
<tr>
<td>Normal weight (≥ 18.5 to &lt; 25) (%)</td>
<td>24.6</td>
<td>21.2</td>
<td>0.54</td>
</tr>
<tr>
<td>Overweight (≥ 25 to &lt; 30) (%)</td>
<td>21.2</td>
<td>31.4</td>
<td>0.08</td>
</tr>
<tr>
<td>Obese (≥ 30 to ≤ 40) (%)</td>
<td>35.6</td>
<td>30.5</td>
<td>0.41</td>
</tr>
<tr>
<td>Severe/morbidly obese (&gt; 40) (%)</td>
<td>16.1</td>
<td>16.1</td>
<td>1.00</td>
</tr>
<tr>
<td>Current smoker (%)</td>
<td>22.0</td>
<td>28.0</td>
<td>0.64</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Baseline self-reported medical care and self-care to reduce</th>
<th>EI (N = 118)</th>
<th>MI (N = 118)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cholesterol checked in past (%)</td>
<td>76.3</td>
<td>70.3</td>
<td>0.45</td>
</tr>
<tr>
<td>Taking cholesterol-lowering medication (%)</td>
<td>22.0</td>
<td>12.0</td>
<td>0.04</td>
</tr>
<tr>
<td>Ever told by doctor, nurse or dietitian to lower cholesterol (%)</td>
<td>40.9</td>
<td>35.1</td>
<td>0.37</td>
</tr>
<tr>
<td>Taking blood pressure-lowering medication (%)</td>
<td>44.9</td>
<td>38.9</td>
<td>0.36</td>
</tr>
<tr>
<td>Ever told by doctor, nurse or dietitian to follow an exercise program (%)</td>
<td>60.7</td>
<td>56.0</td>
<td>0.47</td>
</tr>
<tr>
<td>Been seen by a dietitian, diabetes counselor, nurse, or health educator for diet counseling in last year (%)</td>
<td>7.6</td>
<td>5.9</td>
<td>0.60</td>
</tr>
<tr>
<td>Following low cholesterol or low saturated fat diet (%)</td>
<td>34.7</td>
<td>32.2</td>
<td>0.68</td>
</tr>
<tr>
<td>Following low-salt diet (%)</td>
<td>44.9</td>
<td>41.5</td>
<td>0.60</td>
</tr>
<tr>
<td></td>
<td>EI</td>
<td>MI</td>
<td>p</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----</td>
<td>-----</td>
<td>------</td>
</tr>
<tr>
<td>Following diet to lose weight (%)</td>
<td>19.5</td>
<td>19.5</td>
<td>1.00</td>
</tr>
<tr>
<td>Currently taking aspirin 3+ times/week (%)</td>
<td>33.3</td>
<td>26.3</td>
<td>0.24</td>
</tr>
<tr>
<td><strong>Physical activity as assessed by accelerometer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>(N = 109)</strong></td>
<td><strong>(N = 105)</strong></td>
<td><strong>p</strong></td>
<td></td>
</tr>
<tr>
<td>Number of days monitor worn</td>
<td>6.16 (0.10)</td>
<td>6.05 (0.10)</td>
<td>0.43</td>
</tr>
<tr>
<td>Minutes moderate activity (≥ 3 to &lt; 6 METs) per day, median (IQR)</td>
<td>89.3</td>
<td>108.5</td>
<td>0.13</td>
</tr>
<tr>
<td>Minutes vigorous activity (≥ 6 METs) per day, median (IQR)</td>
<td>0 (0-0.2)</td>
<td>0 (0-0.2)</td>
<td>0.09</td>
</tr>
</tbody>
</table>
Table 3. Dietary intake as assessed by Food Frequency Questionnaire

<table>
<thead>
<tr>
<th>Dietary intake</th>
<th>EI (N = 47)</th>
<th>MI (N = 57)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total kilocalories/day</td>
<td>1667 (118.9)</td>
<td>1675 (108.0)</td>
<td>0.96</td>
</tr>
<tr>
<td>Macronutrient consumption, % of total kilocalories</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>50.3 (1.39)</td>
<td>49.4 (1.26)</td>
<td>0.62</td>
</tr>
<tr>
<td>Protein</td>
<td>15.5 (0.57)</td>
<td>16.0 (0.51)</td>
<td>0.49</td>
</tr>
<tr>
<td>Total Fat</td>
<td>35.7 (1.03)</td>
<td>35.5 (0.93)</td>
<td>0.86</td>
</tr>
<tr>
<td>Monounsaturated fat</td>
<td>13.7 (0.45)</td>
<td>13.8 (0.41)</td>
<td>0.86</td>
</tr>
<tr>
<td>Polyunsaturated fat</td>
<td>8.5 (0.28)</td>
<td>7.8 (0.25)</td>
<td>0.06</td>
</tr>
<tr>
<td>Saturated fat</td>
<td>10.6 (0.42)</td>
<td>11.0 (0.38)</td>
<td>0.50</td>
</tr>
<tr>
<td>Trans fat</td>
<td>2.2 (0.12)</td>
<td>2.2 (0.11)</td>
<td>0.61</td>
</tr>
<tr>
<td>Fruit and vegetable servings/day</td>
<td>3.9 (0.32)</td>
<td>3.3 (0.29)</td>
<td>0.17</td>
</tr>
</tbody>
</table>
Table 4. Baseline perceptions of neighborhood characteristics that are barriers to healthy eating and physical activity.

<table>
<thead>
<tr>
<th>Neighborhood problems</th>
<th>Not a problem (%)</th>
<th>Problem (%)</th>
<th>Don't know (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not enough sidewalks</td>
<td>63.9</td>
<td>28.0</td>
<td>8.1</td>
</tr>
<tr>
<td>Not enough bikelanes</td>
<td>63.1</td>
<td>29.7</td>
<td>7.2</td>
</tr>
<tr>
<td>Too many fast food restaurants</td>
<td>74.1</td>
<td>24.6</td>
<td>1.3</td>
</tr>
<tr>
<td>Not enough parks, gyms, tracks for walking</td>
<td>59.6</td>
<td>38.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Not enough affordable exercise places</td>
<td>44.5</td>
<td>52.1</td>
<td>3.4</td>
</tr>
<tr>
<td>Not enough physical activity programs that meet your needs</td>
<td>51.1</td>
<td>42.1</td>
<td>6.8</td>
</tr>
<tr>
<td>Too much crime</td>
<td>69.1</td>
<td>30.5</td>
<td>0.4</td>
</tr>
<tr>
<td>No streetlights</td>
<td>78.8</td>
<td>20.8</td>
<td>0.4</td>
</tr>
<tr>
<td>Unattended dogs</td>
<td>69.2</td>
<td>30.3</td>
<td>0.4</td>
</tr>
<tr>
<td>Not enough food stores with affordable fruits and vegetables</td>
<td>73.3</td>
<td>25.9</td>
<td>0.8</td>
</tr>
<tr>
<td>Not enough restaurants with healthy food choices</td>
<td>55.7</td>
<td>41.3</td>
<td>3.0</td>
</tr>
<tr>
<td>Not enough farmer’s markets or fruit stands</td>
<td>48.5</td>
<td>49.8</td>
<td>1.7</td>
</tr>
<tr>
<td>Heavy traffic</td>
<td>52.6</td>
<td>47.0</td>
<td>0.4</td>
</tr>
<tr>
<td>Bad air from cars or factories</td>
<td>79.6</td>
<td>18.7</td>
<td>1.7</td>
</tr>
<tr>
<td>Verbal abuse from people on the street</td>
<td>91.9</td>
<td>6.8</td>
<td>1.3</td>
</tr>
<tr>
<td>Speeding drivers</td>
<td>46.2</td>
<td>53.4</td>
<td>0.4</td>
</tr>
<tr>
<td>No place to buy a quick, healthy breakfast to go</td>
<td>56.8</td>
<td>40.2</td>
<td>3.0</td>
</tr>
</tbody>
</table>

2 Participants reported each characteristic as a “problem,” “not a problem,” or “don’t know” when asked how each characteristic affected healthy eating or physical activity.
Table 5. Participants’ baseline knowledge of, use of, and self-efficacy for finding out about and using existing diet and PA community resources.

<table>
<thead>
<tr>
<th>Knowledge of existing community resources</th>
<th>Know little to nothing (1-3)</th>
<th>Know some (4-7)</th>
<th>Know a lot (8-10)</th>
<th>Mean (SE)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes/sessions to learn how to eat healthier (%)</td>
<td>74</td>
<td>16</td>
<td>9</td>
<td>2.7 (0.16)</td>
<td>1</td>
</tr>
<tr>
<td>Where to shop to get fruits and vegetables for the least amount of money (%)</td>
<td>16</td>
<td>24</td>
<td>60</td>
<td>7.3 (0.19)</td>
<td>8</td>
</tr>
<tr>
<td>Affordable exercise places where you could join classes or use equipment (%)</td>
<td>61</td>
<td>17</td>
<td>22</td>
<td>4.0 (0.21)</td>
<td>3</td>
</tr>
<tr>
<td>Parks, walking trails, tracks where you could go to get more exercise (%)</td>
<td>33</td>
<td>23</td>
<td>44</td>
<td>6.0 (0.21)</td>
<td>6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Use of existing community resources</th>
<th>Uses rarely/never (1-3)</th>
<th>Uses some (4-7)</th>
<th>Uses a great deal (8-10)</th>
<th>Mean (SE)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Currently makes use of community healthy food options/resources (%)</td>
<td>43</td>
<td>32</td>
<td>25</td>
<td>4.7 (0.19)</td>
<td>4</td>
</tr>
<tr>
<td>Currently makes use of physical activity resources (%)</td>
<td>72</td>
<td>21</td>
<td>7</td>
<td>2.9 (0.16)</td>
<td>2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Self-efficacy or confidence for finding out about</th>
<th>Not</th>
<th>Some-</th>
<th>Very</th>
<th>Mean</th>
<th>Median</th>
</tr>
</thead>
</table>

3 Participants responded on a scale from 1 to 10; 1 = “I know nothing,” 10 = “I know a lot.” Item stem: “How much do you feel you know about what kinds of things are in your community to help you eat healthier or exercise more? Please tell me how much you know about the following things in your community.”

4 Participants responded about their use of resources on a scale from 1 to 10; 1 = “not at all” and 10 = “a great deal.” Item stem: “How much would you say you currently make use of what your community has to offer in terms of being more physically active/healthy food options?”
Participants responded about their self-efficacy on a scale from 1 to 10; 1 = “not very sure” and 10 = “very sure.” Item stem: “First, I’m going to ask you how sure you are that you could get yourself to find out more about what is available in your community. Then I will ask you some questions about how sure you are that you could get yourself to start using these resources.”

<table>
<thead>
<tr>
<th></th>
<th>very sure (1-3)</th>
<th>what sure (4-7)</th>
<th>sure (8-10)</th>
<th>(SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Finding out about classes on good nutrition are available (%)</td>
<td>28</td>
<td>28</td>
<td>43</td>
<td>6.2</td>
</tr>
<tr>
<td>(0.20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attending at least three programs or classes a year about good nutrition (%)</td>
<td>24</td>
<td>23</td>
<td>53</td>
<td>6.7</td>
</tr>
<tr>
<td>(0.20)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finding out what exercise places are affordable and offer the kinds of things that are right for me (%)</td>
<td>20</td>
<td>34</td>
<td>46</td>
<td>6.6</td>
</tr>
<tr>
<td>(0.18)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Joining an affordable exercise facility and attending class or using equipment at least once a week (%)</td>
<td>35</td>
<td>23</td>
<td>42</td>
<td>5.8</td>
</tr>
<tr>
<td>(0.21)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learning about parks, walking trails, and tracks (%)</td>
<td>18</td>
<td>32</td>
<td>50</td>
<td>6.8</td>
</tr>
<tr>
<td>(0.17)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Using parks, walking trails, and tracks (%)</td>
<td>26</td>
<td>33</td>
<td>40</td>
<td>6.0</td>
</tr>
<tr>
<td>(0.18)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 6. Participant self-efficacy for and likelihood of advocating for beneficial community changes

<table>
<thead>
<tr>
<th>Self-efficacy for learning to make neighborhood improvements</th>
<th>Not very sure (1-3)</th>
<th>Someewhat sure (4-7)</th>
<th>Very sure (8-10)</th>
<th>Mean (SE)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Get the sidewalks fixed in your neighborhood so it would be safer for walking (%)</td>
<td>48</td>
<td>14</td>
<td>38</td>
<td>4.9</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Start a Farmer’s Market in your neighborhood (%)</td>
<td>74</td>
<td>12</td>
<td>14</td>
<td>2.9</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Get the local high school to open their gym for community classes on the weekend (%)</td>
<td>50</td>
<td>18</td>
<td>31</td>
<td>4.6</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Get the city to build a walking trail (%)</td>
<td>59</td>
<td>18</td>
<td>23</td>
<td>4.1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Likelihood of advocating for beneficial community changes</th>
<th>Not very likely (1-3)</th>
<th>Someewhat likely (4-7)</th>
<th>Very likely (8-10)</th>
<th>Mean (SE)</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign a petition to city officials in support of beneficial change (%)</td>
<td>5</td>
<td>10</td>
<td>85</td>
<td>9.0</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ask friends and neighbors to sign a petition (%)</td>
<td>9</td>
<td>11</td>
<td>80</td>
<td>8.6</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Write a letter to city officials in support of beneficial change (%)</td>
<td>17</td>
<td>23</td>
<td>60</td>
<td>7.4</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ask your friends to write letters to city officials</td>
<td>14</td>
<td>23</td>
<td>63</td>
<td>7.5</td>
<td>9</td>
</tr>
</tbody>
</table>

6Participants responded about their self-efficacy on a scale from 1 to 10; 1 = “not very sure” and 10 = “very sure.” Item stem = “How sure are you that you would know how to get started if you wanted to…?”

7Participants responded about the likelihood of advocating at various levels on a scale from 1 to 10; 1 = “not very likely” and 10 = “very likely.” Item stem = “Thinking about something you feel would be important to change in your neighborhood, how likely are you to do the following?”
<table>
<thead>
<tr>
<th>Activity</th>
<th>Favorability</th>
<th>Support</th>
<th>Participation</th>
<th>Volition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Go by yourself to visit a city official to discuss</td>
<td>33</td>
<td>15</td>
<td>52</td>
<td>6.3</td>
</tr>
<tr>
<td>your ideas (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Go with others to visit a city official to discuss</td>
<td>10</td>
<td>15</td>
<td>75</td>
<td>8.3</td>
</tr>
<tr>
<td>your ideas (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organize a group of friends and neighbors to</td>
<td>35</td>
<td>22</td>
<td>43</td>
<td>5.8</td>
</tr>
<tr>
<td>visit a city official (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attend a city council meeting in support of</td>
<td>13</td>
<td>13</td>
<td>74</td>
<td>8.1</td>
</tr>
<tr>
<td>beneficial change (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speak at a city council meeting in support of</td>
<td>42</td>
<td>21</td>
<td>37</td>
<td>5.3</td>
</tr>
<tr>
<td>beneficial change (%)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Volition values in parentheses.
<table>
<thead>
<tr>
<th><strong>If you want to...</strong></th>
<th><strong>Talk to...</strong></th>
<th><strong>Information you should know...</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn more about creative, healthy cooking!</td>
<td>Dianne Gatewood, 452-6393 Cooperative Extension Agency</td>
<td>Dianne teaches classes on the Dietary Guidelines, and “Dining with Diabetes” (Free or $25/ class, if food is provided)</td>
</tr>
<tr>
<td></td>
<td>Trish Snyder, 763-4419 Diabetes Coalition</td>
<td>Free diabetes classes at the CHC and low-cost classes at Cape Fear Community College</td>
</tr>
<tr>
<td></td>
<td>Carol Bottoms, 343-6545 Health Department, Nutrition education</td>
<td>Carol will do individual or group counseling sessions.</td>
</tr>
<tr>
<td>Get low-cost fresh fruits and vegetables</td>
<td>Country Fresh Produce, 2069 Carolina Beach Road, Wilmington, 763-6122</td>
<td>Go by the market and get fresh fruits and vegetables at bargain prices.</td>
</tr>
<tr>
<td></td>
<td>Wilmington Food Bank, 1314 Marsteller Street, Wilmington, 251-1465</td>
<td>Get free produce from local farms! Call to see what’s available. Open Mon – Thurs., 8:30 – 3:30</td>
</tr>
<tr>
<td></td>
<td>Lewis Farms, 6517 Gordon Rd., Wilmington, 452-9659</td>
<td>Pick your own berries or buy them by the quart! April – Mid July, Mon-Sat., 8 am - 6 pm, &amp; Sun. 1 - 6 pm.</td>
</tr>
<tr>
<td></td>
<td>Leroy Sullivan, 791-8650 Farmer's Market, Hanover Center</td>
<td>Come see what local farmers have to offer! The Farmer’s Market is open from 6:30-noon on Tuesday, Thursday, and Saturday.</td>
</tr>
<tr>
<td>Farm fresh fruits and vegetables</td>
<td>Dianne Bittikofer, 919-683-3011 Wilmington Area, St. Andrews’ Gleaning</td>
<td>Gleaning is the traditional Biblical practice of gathering crops that would otherwise be left in the fields to rot after the harvest. Volunteer to work and get free fruits and vegetables for yourself and to share with people in need.</td>
</tr>
<tr>
<td></td>
<td>The Gleaning Network is a project of the Society of St. Andrew, which coordinates volunteers, growers, and distribution agencies to collect food left in local fields.</td>
<td></td>
</tr>
<tr>
<td>Shop for healthy food at lower prices at larger grocery stores.</td>
<td>Wanda Campbell, 341-7866 Martin Luther King Community Center</td>
<td>Van rides to grocery stores are offered every two weeks. Call to find out more!</td>
</tr>
<tr>
<td></td>
<td>Valerie Smith, 452-6400 New Hanover Senior Center</td>
<td>Van rides offered to people 60+ for grocery shopping, and other needs.</td>
</tr>
</tbody>
</table>
## Physical Activity

<table>
<thead>
<tr>
<th>If you want to...</th>
<th>Talk to...</th>
<th>Information you should know...</th>
</tr>
</thead>
</table>
| Start a walking program | Williston Middle School track, 401 S. 10th St, Wilmington, 815-6906  
UNC-Wilmington track, Joe Simon, Assistant Athletic Director/ facilities manager, 962-3235 | Use the track for walking after school hours. Think about using the track at another school near your home.  
Call UNC-W to find out the hours the track is available. |
|                    | Customer Service Desk, 392-1776 Westfield Shoppingtown Independence Mall | Mall-walkers must register to receive a mall-walking badge, and can come into the mall as early as 7am to walk.  
There is a free breakfast monthly for all registered mall-walkers! |
| Learn about parks and trails near you | City of Wilmington Parks Department, 341-7852  
New Hanover County Parks Department, 341-7198 | Enjoy the tranquility of the outdoors at a park near you. Call the Parks Department to learn about parks near your home or workplace. Take the kids and watch them play while you walk around, so that everyone gets exercise and fresh air! Try Greenfield Lake, Ogden Park, Empie Park, Summer's Rest Trail, or Hugh McRae park. |
| Learn more about exercise programs offered by the Wilmington Recreation Department | Robert Garrison, 431-6025  
New Hanover Community Services-Recreation Intervention Division | There are community centers throughout New Hanover County that offer opportunities for exercising—call to find the one closest to you!  
Free childcare is offered at all centers, and aerobics tapes are available at the Derick Davis Center. |
|                    | John Rank, 341-7855  
The Wilmington Recreation Division | The Wilmington Recreation Division offers opportunities to participate in athletic programs such as volleyball, tennis, basketball, & softball. |
<table>
<thead>
<tr>
<th>Learn about affordable health clubs</th>
<th>Jessie (Andre') Thompson, Boxing Center, 302 N 10th Street, Wilmington, 341-7837 or 341-7872</th>
<th>The Boxing Center offers strength training, low &amp; high impact aerobics classes, kickboxing, funky jazz, and Tae Bo classes. $40/year for city residents and $75/year for non-city residents.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mary Jones, Senior Center, 2222 S College Road, Wilmington, 341-7253</td>
<td>The Senior Center offers aerobics, volleyball, tennis, a nature trail, softball, and water aerobics, for people 55+. Contact Mary Jones to learn more about these programs.</td>
</tr>
<tr>
<td></td>
<td>YMCA, 2710 Market Street, Wilmington, 251-9622 YWCA, 2815 S College Road, Wilmington, 799-6820</td>
<td>Sign up for a Y membership on site. Ask about opportunities for a reduced membership fee. The YWCA offers aerobics, pilates, yoga, and water aerobics classes.</td>
</tr>
<tr>
<td>Ask for safer traffic patterns in your neighborhood</td>
<td>Gene Johnson, 341-0300 Department of Transportation, Traffic Services</td>
<td>Call to make suggestions about ways to make your neighborhood safer for walking or riding a bike.</td>
</tr>
<tr>
<td>Get a sidewalk repaired or built</td>
<td>For sidewalk repair: Streets Division of Public Services, 341-7879 For new sidewalk: Skipper Thunderberg, 341-5899</td>
<td>Call to report a broken sidewalk, or to ask for a new sidewalk in your neighborhood.</td>
</tr>
<tr>
<td>Start a community watch in your neighborhood, to make it safer for walking or riding a bike.</td>
<td>Linda Rawley, 343-3600 Wilmington Police Department, Sergeant Lockamy, 341-4266 Sheriff's Department</td>
<td>A community watch is all about neighbors looking out for each other. Call to find out how to start a neighborhood community watch.</td>
</tr>
<tr>
<td>Report a stray animal in your neighborhood</td>
<td>Animal Control, 341-4197</td>
<td>Call this number to report a stray animal.</td>
</tr>
<tr>
<td>Get a streetlight bulb replaced</td>
<td>Karen Dixon, 341-7893</td>
<td>Call to request a bulb replacement to help make your neighborhood safer for walking.</td>
</tr>
</tbody>
</table>
# WISEWOMAN Project
## Neighborhood Assessment

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>Choices</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>How easy or hard is it for you to get to a large grocery store? (A store that has more produce and cheaper prices)</td>
<td>O very easy</td>
<td>O somewhat easy</td>
<td>O very hard</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>When you go grocery shopping, how often do you go to a large grocery store?</td>
<td>O very often</td>
<td>O sometimes</td>
<td>O hardly ever</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>How many times during the week do you eat food from a fast food place or snack foods from a convenience store?</td>
<td>O 0-1</td>
<td>O 2-4</td>
<td>O 5+</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td>Are there a lot of these places in your neighborhood?</td>
<td>O no</td>
<td>O yes</td>
<td>O [DK]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>4</strong></td>
<td>How often do you get produce from a fruit/vegetable stand, farmer's market, garden and/or local farm (during the season)?</td>
<td>O very often</td>
<td>O sometimes</td>
<td>O hardly ever</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Are any of these types of places in your neighborhood?</td>
<td>O no</td>
<td>O yes</td>
<td>O [DK]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>5</strong></td>
<td>How healthy is the food you eat while at church, another place of worship, or at a social gathering?</td>
<td>O very healthy</td>
<td>O somewhat healthy</td>
<td>O not very healthy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>6</strong></td>
<td>If you work, how healthy is the food you eat while at work?</td>
<td>O very healthy</td>
<td>O somewhat healthy</td>
<td>O not very healthy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>7</strong></td>
<td>How often do you keep snack foods like candy &amp; chips in your home?</td>
<td>O hardly ever</td>
<td>O sometimes</td>
<td>O very often</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### How easy or hard is it for you to walk in your neighborhood, either for exercise or to do errands?
- **7** How often do you walk for exercise or to run errands (instead of driving) in your neighborhood?
  - [ ] very easy
  - [ ] somewhat easy
  - [ ] very hard

Do you have a car?
- [ ] no
- [ ] yes

### How easy or hard is it for you to exercise at the schools in your area?
- **8** How often do you use a school's facilities (like a track or gym) to exercise?
  - [ ] very easy
  - [ ] somewhat easy
  - [ ] very hard

Is there a school where you could exercise in your neighborhood?
- [ ] no
- [ ] yes
- [ ] [DK]

### How easy or hard is it for you to exercise (such as walk or ride a bike) at a park or on a trail in your area?
- **9** How often do exercise at a park or on a trail?
  - [ ] very easy
  - [ ] somewhat easy
  - [ ] very hard

Is there a park or trail where you could exercise in your neighborhood?
- [ ] no
- [ ] yes
- [ ] [DK]

### How easy or hard is it for you to use the exercise places (like a YMCA or fitness center) in your area?
- **10** How often do you use an exercise place, like a fitness center or YMCA?
  - [ ] very easy
  - [ ] somewhat easy
  - [ ] very hard

Is there an exercise place where you could go to exercise in your neighborhood?
- [ ] no
- [ ] yes
- [ ] [DK]

### If you work, does your workplace provide time when and/or places where you can be active?
- **11** If there are opportunities at work, how often do you use them?
  - [ ] time and place
  - [ ] time or place
  - [ ] neither

- [ ] [NA --> stop here]
  - [ ] 3+ times per week
  - [ ] 1-2 times per week
  - [ ] 3 or less times per month
Healthy choices for good nutrition
in your community

1 Get the healthiest food for your money:
   - Carpool with friends or relatives to a larger grocery store.
   - Use the biweekly trips to the grocery store offered by the Martin Luther King
     Community Center and the New Hanover County Senior Center (for people 60+) (see
     the Community Resource Guide).
   - If a grocery store doesn’t have the types of foods you like, talk to the manager about
     stocking these foods.
   - Larger grocery stores have a wider selection of healthy foods that are cheaper than
     foods at smaller neighborhood grocery stores or convenience stores. For example:

<table>
<thead>
<tr>
<th></th>
<th>Large Grocery Store</th>
<th>Small Grocery Store</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cheerios (15 oz box)</td>
<td>$3.09</td>
<td>$4.59</td>
</tr>
<tr>
<td>Skim milk (1 gallon)</td>
<td>$2.99</td>
<td>$3.79</td>
</tr>
<tr>
<td>Canned corn</td>
<td>$0.75</td>
<td>$1.49</td>
</tr>
</tbody>
</table>

2 Drive on past the fast food:
   - If you eat fast food, look at the nutrition information to choose healthier options.
   - If you get tempted to stop for fast food in the mornings, eat a healthy breakfast
     at home—this is usually faster and cheaper!
   - Take quick snacks, like apples or carrot sticks, when running errands, so that
     you are not hungry when you pass a fast food place. Plan for times like this and
     buy healthy, quick snacks at the grocery store.
   - There are many ways to prepare ‘fast’ food at home! See New Leaf pages

3 Try fruit/vegetable stands and pick-your-own farms for healthy, low-cost food:
   - Homegrown produce is so fresh and tasty!
   - Farmer’s markets and produce stands can give you the small town feel in a
     larger city.
   - Fruits and vegetables that are in season are usually the least expensive.
   - Buy fruits and vegetables in bulk, and freeze (strawberries, corn) or can
     (peaches, beans) what you don’t eat, for an ‘off-season’ treat!
   - Go with a friend to a pick-your-own place and share what you pick with other
     friends and neighbors.
   - See the Community Resource Guide for places to get low-cost, fresh fruits and
     vegetables.
4 Make healthy choices easier at church or a social gathering:
- Take a healthy dish to potluck dinners, and encourage your family and friends to try it!
- Talk to church or social club leadership about including healthy foods at church-wide or club-wide meals. Be sure you can recommend a caterer or restaurant that has healthy food.
- Choose to eat healthy foods at potlucks.

5 Make your workplace a healthier place to be:
- Bring food from home—buy foods you enjoy, like sandwiches, canned fruit, or a salad.
- In your work cafeteria, choose fruits, vegetables, wheat bread, and lean meats.
- If you eat from a snack bar, choose low-fat yogurt, milk, fruit, granola bars, or orange juice.
- If you choose foods from a vending machine, buy water or diet drinks and snacks like baked potato chips, pretzels, or animal crackers.
- If you would like to see healthier foods available at work, ask your boss about what you can do to make this happen!
- Take advantage of kitchen facilities at work!
  - If a refrigerator is available, bring:
    - Fruit salad
    - Low-fat yogurt
  - If a microwave is available, bring:
    - Leftovers
    - Healthy soups that can be reheated
    - Tuna salad and crackers
    - Low-fat frozen entrees (Lean Cuisine)
  - If neither is available:
    - Talk to your boss how to make these things available
    - Pack healthy lunch items that don’t need to be refrigerated, such as peanut butter on whole wheat bread, fruit, or raw vegetables.

6 Make healthy choices easier in your home:
- Keep a big bowl of fruit in the house, instead of a candy dish.
- Treat the children in your household to tasty, convenient, and healthy snacks. Try grapes, trail mix, flavored rice cakes, bananas and apples with peanut butter, and nuts. It’s never too early to start eating healthy!
- Keep healthy foods in easy to reach places, and put unhealthy foods in hard-to-reach places.
Healthy choices for physical activity in your community

7 Walk in your neighborhood for exercise or to do errands:
   • Call the appropriate people if sidewalks, traffic, crime, lack of streetlights, or stray animals keep you from walking. (Community Resource Guide has the numbers to call.)
   • Start a walking group in your neighborhood!
   • Think about other places to walk, like a school track or the mall (See the Community Resource Guide for more information).

8 Use school facilities to exercise:
   • Call schools near you to find out if they allow the public to use their facilities.
   • UNC-Wilmington’s track is a safe, fun place to walk.

9 Enjoy the outdoors at a park near you:
   • Take a family trip to a park for the day.
     o Walk around the playground while your children play on the equipment.
     o Enjoy the paddleboats at Greenfield Lake.
   • Parks can be good places for prayer, meditation, and reflection.
   • Write or call the Wilmington Parks & Recreation Department to suggest improvements to the parks, such as adding benches, widening paths, or adding bathroom facilities (See the Community Resource Guide for information).
   • Contact the Wilmington Police for more patrolling if a park seems unsafe.
   • Start a walking group at a local park.
   • Enjoy a quiet walk on the beach or the riverfront.
   • Remember, parks are a great place for the whole family to enjoy the outdoors while getting exercise!

10 Exercise at low-cost exercise places:
   • Try affordable exercise places, like the Boxing Center, the YMCA, and the Senior Center.
     o Most community centers (like the Derick Davis Center) offer free childcare.
   • Curves and Cory Everson are all women’s gyms that may offer special deals.
   • If the exercise place doesn’t offer programs or equipment you like, talk to the manager about how to change this.
   • Ask about a trial membership, so you can see if you’d really enjoy it. Take a friend with you and try it out!

11 Choose to exercise at work:
   • Look for opportunities to boost your energy at work: Take the stairs, walk to a co-worker’s office instead of calling, or park farther away.
   • Talk to your boss about providing flex-time during work for exercising.
   • Explore the area around your workplace to find a safe place for walking during lunch, break, or after work.
   • Bring exercise clothes and stop at a park, trail, gym, or track on your way to or from work.
APPENDIX C: Qualitative Interview Guides
Interview Guide I for “Exploring the Community”

Hello. My name is Stephanie Jilcott, and I’m a student at UNC in Chapel Hill, interested in learning about what you think about things in this community that can help people like you be more active or eat healthier. Would you be interested in participating in an interview about these things? You will be compensated for your time. [If woman agrees, read consent. Answer questions and get her signature.]

Thank you for agreeing to participate in this interview. The information you provide will be very valuable to us!

We are doing a project in New Hanover County, to help women lower their risk of getting heart disease, through better nutrition and exercise. We all know it’s important to exercise and eat right, but sometimes it’s hard to do. There are many things that make it hard or easy for a person to have a healthy lifestyle, and I’d like to hear from you about some of those things.

[GET INFORMATION FROM PARTICIPANT HERE; PROBE: “WHAT COMES TO MIND?” COUNTER THE BARRIERS AND PROBE: “IF YOU HAD MORE TIME, WHAT WOULD MAKE IT HARD TO GET EXERCISE?” AFTER SHE RUNS OUT OF BARRIERS/ ENABLERS, ASK QUESTION BELOW:]

Now I’d like to hear your ideas about all the things that come to mind when I ask about things in your community that make it either easier or harder to eat healthier or get more exercise. Things that might make it easier include a walking trail or fruit stand, and things that might make it harder are too many fast food restaurants, or no affordable programs for exercising.

- Things that make it easier:
- Things that make it harder:

I’ve heard you say that ____________, ______________, and ______________ are things in this community that can help people eat healthier and be more active.

- Do you use any of these things?
- Tell me more about them.

I’ve heard you say that ______________, ______________, and ______________ are things in this community that make it harder for people to eat healthier and exercise more.

- Tell me more about this.
- What are things that get in the way of using these things?
To make it easier to use things in the community that can help with healthier eating and PA easier, we have put together a list of resources in the community for low cost healthy foods and exercise.

[Give participant the Community Resource Guide. Read each section and ask the questions below. Literacy might be an issue here!]

- Have you heard about any of these places?
- Would you consider using any of these? Why or why not?

[AFTER THE WALK-THROUGH IS COMPLETED, ASK:]

- Could your neighborhood benefit from any of these changes? (Refers to sidewalks, streetlights, traffic resources)
- How do you feel about calling some of these places? How do you think your neighbors would feel about calling these places?

If you could wave a magic wand, and have the perfect circumstances for eating healthy foods and exercising regularly, what would those circumstances look like? What would a typical day look like for you? [PROBE]

Now I’m going to read you a story about a hypothetical woman and ask your opinion about what she should do in her situation:

Lisa is a busy, working mother of two teenagers. She knows she should exercise, but when she gets home at night, it is dark and she feels unsafe going out to walk in her neighborhood. What should Lisa do? [ASK WOMEN TO PROVIDE THEIR OWN ANSWERS FIRST. THEN READ BELOW:]

--Call the YMCA and ask them to start an aerobics class that meets later in the evenings or earlier in the mornings
--Talk to her boss about exercising at lunch
--Ask a friend to walk with her after work
--Go to the local high school to walk after work

Lisa also knows that she should try to include more fruits and vegetables when she is cooking for her family. Her husband was recently diagnosed with high blood pressure, and his doctor told him to increase the amount of fruits and vegetables in his diet. The fruits and vegetables in stores close to her home and work are not high quality and they’re expensive. What should she do? [GET PARTICIPANT’S OPINION/ THOUGHTS FIRST. THEN READ BELOW:]
--Talk to the manager of the store near her home about increasing the quality of the fruits and vegetables.
--Try to find a store that has better quality fruits and vegetables at more reasonable prices.
--Ask her friends and neighbors to call local stores to ask for more high quality fruits and vegetables at reasonable prices.
--Something else?
Hello. My name is Stephanie Jilcott, and I’m a student at UNC in Chapel Hill, interested in learning about what you think about things in your neighborhood that can help people be more active and eat healthier, and things that make it harder to eat healthier and be active. Would you be interested in participating in an interview about these things? You will be compensated for your time. [If woman agrees, read consent. Answer questions and get her signature. Give her a copy of the consent form.]

Thank you for agreeing to participate in this interview. The information you provide will be very valuable to us!

We are doing a project in New Hanover County, to help women lower their risk of getting heart disease, through better nutrition and exercise. We all know it’s important to exercise and eat right, but sometimes it’s hard to do. Several things make these things hard to do, such as lack of time, lack of childcare, and low motivation. Some things in our communities or neighborhoods can also make it harder or easier to eat healthy and exercise. These things might be a lack of affordable exercise places, farmer’s markets, or too many vending machines.

I’d like to get your thoughts on some materials we are developing to help women identify and use healthy things in their communities and identify and avoid the less healthy things in their communities. I’m interested in what you think about this neighborhood assessment. Please try to think aloud, as you answer the questions. I’ll try to give you an example of thinking out loud when we get to that part of the interview.

[Walk through neighborhood assessment with woman.]

1. After the introduction is read, ask:

   ■ If you could put this into your own words, what would you say?

   ■ Do you have any questions, right off hand?

   ■ What did you think of the introduction?

   ■ What should be added and taken out? Is anything confusing?

   ■ Does it sound like it was written for someone like you?

2. Go through the nutrition assessment: [Give example of thinking out loud]
Now I’m going to read through this next page (nutrition assessment); Please choose the answer that best describes you.

- Try to think out loud as you answer. In other words, what do you think each question is asking? How did you choose your answer?
- Make sure to provide positive feedback and occasionally paraphrase what she says.

{I. Explain the way the assessment works. Pick two of the things she is doing well: Ask her to give tips on how she would help a friend overcome barriers to healthy eating. Write down her tips. Ask her to review the tips we would give her friend, and see if any are not practical or feasible. Which would someone like her be more likely to use?

II. Then ask her why the things she has a hard time with are a problem for her. (elicit barriers.) Then ask her to review the tips we’ve given for the things she could improve on. Can she add anything, or does she think any of the tips are not helpful? Which tips are the most practical and feasible, and which are least practical/feasible?}

3. Go through PA Neighborhood Assessment:

- Try to think out loud as you answer. In other words, what do you think each question is asking? How did you choose your answer?
- Make sure to provide positive feedback and occasionally paraphrase what she says.

{I. Explain the way the assessment works. Pick two of the things she is doing well: Ask her to give tips on how she would help a friend overcome barriers to using exercise facilities. Write down her tips. Ask her to review the tips we would give her friend, and see if any are not practical or feasible. Which would someone like her be more likely to use?

II. Then ask her why the things she has a hard time using the other PA facilities (elicit barriers.) Then ask her to review the tips we’ve given for the things she could improve on. Can she add anything, or does she think any of the tips are not helpful? Which tips are the most practical and feasible, and which are least practical/feasible?}

ASK about YMCA!
4. Ask her what she thinks overall:

- Does this seem like it was meant for someone like you or somebody else?
- Does it make sense why we are asking these things?
- Do any of the words sound funny or sound like they don’t belong?

5. Now I’d like to hear your ideas about all the things that come to mind when I ask about places or things in your community that make it either easier or harder to eat healthier or get more exercise. Some of these things might be a walking trail, fast food restaurants on every corner, or a fruit stand.

- What are things that might make it harder for a person to eat healthier? [PROBE]
- What are things that might make it harder for a person to exercise? [PROBE]
- What are things that might make it easier for a person to eat healthier? [PROBE]
- What are things that might make it easier for a person to exercise? [PROBE]

6. A final question:
When I say “neighborhood”, what do you think of? Describe the area you would call your neighborhood. Does this include the place where you work? Does the definition I gave describe what you consider to be your neighborhood? Is your neighborhood different from your community?
APPENDIX D: Qualitative Codebook
Individual nutrition barrier (indiv_nutr_barr): something specific to the individual (an individual’s knowledge, attitude, work schedule, taste preferences, etc), which is keeping her from healthy eating.

Individual physical activity barrier (indiv_pa_barr): something specific to the individual, which is keeping her from being physically active.

Individual nutrition asset (indiv_nutr_ast): something specific to the individual that facilitates healthy eating.

Individual physical activity asset (indiv_pa_ast): something specific to the individual that facilitates physical activity.

Nutrition social support (nutr_soc_supp): When friends positively influence an individual’s eating habits. (The support must really exist or have existed in the past, not just be theoretical.)

Physical activity social support (pa_soc_supp): When friends positively influence an individual’s physical activity habits. (The support must really exist or have existed in the past, not just be theoretical.)

Nutrition family environment/influence (nutr_fam_env/infl): When family members influence an individual’s eating habits, either positively or negatively.

Physical activity family environment/influence (pa_fam_env/infl): When family members influence an individual’s physical activity habits, either positively or negatively.

Church nutrition environment (ch_nutr_env): When the participant mentions any aspect of the nutrition environment (foods served at potlucks, health/wellness committee programs, etc) at her church, either positive or negative.

Church physical activity environment (ch_pa_env): When the participant mentions any aspect of the physical activity environment at her church, either positive or negative.

Work nutrition environment (wk_nutr_env): When the participant mentions any aspect of the nutrition environment at work, either positive or negative (e.g., vending machines, restaurant options near work).

Work physical activity environment (wk_pa_env): When the participant mentions any aspect of the physical activity environment at or around her workplace, either positive or negative (e.g., flex time for PA, trail near workplace).

Nutrition resource positive or negative (nutr_res_+ or -): When participant describes an existing community resource for healthy eating (the resource should be a positive resource, that would normally facilitate healthy eating); When she mentions something about the resource facilitating it’s use (e.g., cheaper prices, location close to home), use “+”; when she mentions something about the resource being a barrier to it’s use (e.g., cost of use, social atmosphere), use “-“.

Physical activity resource positive or negative (pa_res_+ or -): When participant describes an existing community resource for physical activity; When she mentions something about the resource facilitating it’s use (e.g., cheaper prices, location close to home), use “+”; when she mentions something about the resource being a barrier to it’s use (e.g., cost of use, social atmosphere), use “-“.
Nutrition asset-urban or rural (nutr_ast_urb/rur): When participant describes an attribute of a rural or urban setting that is a facilitator to obtaining and/or eating healthy foods.

Physical activity asset-urban or rural (pa_ast_urb/rur): When participant describes an attribute of a rural or urban setting that is a facilitator to being physically active.

Nutrition barrier-urban or rural (nutr_barr_urb/rur): When participant describes an attribute of a rural or urban setting that is a barrier, or hindrance, to obtaining and/or eating healthy foods.

Physical activity barrier-urban or rural (pa_barr_urb/rur): When participant describes an attribute of a rural or urban setting that is a barrier, or hindrance, to being physically active.

Nutrition family upbringing (Nutr_fam_upbr): Something about how the participant was raised influences her cooking, purchasing, or eating habits; can be either positive or negative.

Social capital (soc_cap): Participant describes neighborhood trust, cooperation, or any other aspect of the neighborhood or community social capital, either increasing or decreasing.

Food security strategies/resources (food_sec_strat/res): Participant mentions ways or resources she uses to overcome food insecurity.

Urban sprawl (urb_spr): Participant mentions the influence of urban sprawl (e.g., things being spread out, cities designed for car use only) on her physical activity or eating habits.

Transportation issues (transp): Anytime a participant mentions how a car or bus (or lack thereof) helps or hinders her in getting more activity or eating healthier foods; or mentions walking/biking as a form of transportation; or compares two places in terms of availability of public transportation.

Neighborhood change/ advocacy (nh_chg_adv): Participant mentions some sort of change she would like to see in her neighborhood or community to facilitate healthier eating or physical activity.

Media influence (med_infl): Participant mentions some influence the media has on the eating or physical activity habits of herself or those around her.

Young vs. old differences (young_vs_old): Participant mentions the differences between young people versus older people (e.g., in advocacy, in sharing food, in gym use)

Gatekeeper (Gtkpr): Woman describes a positive influence she has had or currently has on her family members in terms of healthier eating or physical activity.

Health issues (hlth_iss_+ / -): A physical condition or disease that either facilitates (+) or hinders (-) participant’s ability and/or desire to be physically active or eat healthy.
Potential community resource (pot_comm_res): Participant describes a community resource that does not exist, but will soon exist.

Time-environment interaction (time × env): Having little or enough time coupled with having environmental barriers or facilitators influences participant’s eating or physical activity habits.

Cost-environment interaction (cost × env): Having environmental barriers or facilitators coupled with a high or low cost influences participant’s eating or physical activity habits.

Tip for less fast food use (tip_ff): Participant gives advice she’d give a friend about how to eat less fast food.

Tip for more use of farmer’s market/fruit stand (tip_fm): Participant gives advice/advantages for shopping at a farmer’s market;

Tip for improving healthfulness of food at work (tip_wkfood): Participant gives advice about how to increase the healthfulness of foods eaten at work.

Tip for improving healthfulness of food at home (tip_homefood): Participant gives advice about how to increase the healthfulness of foods at home.

Tip for improving healthfulness of church food (tip_chfood): Participant gives advice about how to increase the healthfulness of foods at church.

Tip for using a physical activity community resource more frequently (tip_gym or tip_park or tip_trail, etc): Participant gives advice about how to increase the use of PA resources.

Tip for getting more physical activity on the job (tip_wkpa): Participant gives advice about how to increase activity done at/during work.

Tip for getting more physical activity at home (tip_homepa): Participant gives advice about how to increase activity done at home.
APPENDIX E: Environmental Survey (Administered at baseline and 12-months)
Sometimes the neighborhoods where we live make it either easier or harder to eat healthy and get enough exercise. Thinking about the area where you live, what things in your neighborhood keep you from exercising more or eating healthier? Please say "problem" or "not a problem" for each one as I read the list. Remember, the question is not just whether these things exist in your neighborhood, but whether they keep you from exercising more or eating healthier.

<table>
<thead>
<tr>
<th></th>
<th>not a problem</th>
<th>problem</th>
<th>[don't know]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>not enough sidewalks</td>
<td>ENV1 O</td>
<td>O</td>
</tr>
<tr>
<td>2.</td>
<td>not enough bike lanes</td>
<td>ENV2 O</td>
<td>O</td>
</tr>
<tr>
<td>3.</td>
<td>too many fast food places</td>
<td>ENV3 O</td>
<td>O</td>
</tr>
<tr>
<td>4.</td>
<td>not enough parks, gyms or tracks for walking</td>
<td>ENV4 O</td>
<td>O</td>
</tr>
<tr>
<td>5.</td>
<td>not enough affordable exercise places</td>
<td>ENV5 O</td>
<td>O</td>
</tr>
<tr>
<td>6.</td>
<td>not enough physical activity programs that meet your needs (like through the Parks and Recreation Department)</td>
<td>ENV6 O</td>
<td>O</td>
</tr>
<tr>
<td>7.</td>
<td>too much crime</td>
<td>ENV7 O</td>
<td>O</td>
</tr>
<tr>
<td>8.</td>
<td>no street lights</td>
<td>ENV8 O</td>
<td>O</td>
</tr>
<tr>
<td>9.</td>
<td>unattended dogs</td>
<td>ENV9 O</td>
<td>O</td>
</tr>
<tr>
<td>10.</td>
<td>not enough food stores with affordable fruits and vegetables</td>
<td>ENV10 O</td>
<td>O</td>
</tr>
<tr>
<td>11.</td>
<td>not enough restaurants with healthy food choices</td>
<td>ENV11 O</td>
<td>O</td>
</tr>
<tr>
<td>12.</td>
<td>not enough farmer’s markets or fruit stands</td>
<td>ENV12 O</td>
<td>O</td>
</tr>
<tr>
<td>13.</td>
<td>heavy traffic</td>
<td>ENV13 O</td>
<td>O</td>
</tr>
<tr>
<td>14.</td>
<td>bad air from cars or factories</td>
<td>ENV14 O</td>
<td>O</td>
</tr>
<tr>
<td>15.</td>
<td>verbal abuse from people on the street</td>
<td>ENV15 O</td>
<td>O</td>
</tr>
<tr>
<td>16.</td>
<td>speeding drivers</td>
<td>ENV16 O</td>
<td>O</td>
</tr>
<tr>
<td>17.</td>
<td>no place to buy a quick, healthy breakfast to go</td>
<td>ENV17 O</td>
<td>O</td>
</tr>
</tbody>
</table>

This is Version 2 of this form. Data collected on Version 1 was scanned and mapped to the appropriate fields of this form. Data that was omitted when Version 2 was edited has not been entered.
18. Is there anything else I haven't mentioned about your neighborhood that makes it hard for you to eat healthier foods? 

  \[ ENV18a \]
  \[ \text{Pt ID} \]
  \[ ENV \ Page 2 \]

\[ ENV18 \text{ no } \text{ yes } \text{ specify} \]

19. Is there anything else I haven't mentioned about your neighborhood that makes it hard for you to get more exercise? 

  \[ ENV19a \]

\[ ENV19 \text{ no } \text{ yes } \text{ specify} \]

One way that people make changes in the way they eat or how much exercise they get is to join classes or programs in their community or use things like high school tracks, walking trails, or exercise clubs like the YMCA. Each community is different, and some places have more things like this than others.

If you decided you want to make use of some of these things to improve your health, first you have to know what is available. Second, you have to make the commitment to make a change and stick with it. I'm going to ask you some questions about both of these things.

First, how much do you feel you know about what kinds of things are in your community to help you eat healthier or exercise more? Using a scale of 1 to 10, where 1 means you know nothing about it and 10 means you know a lot, please tell me how much you know about the following things in your community.

20. What classes or sessions you could attend to learn how to eat healthier

  \[ ENV20 \]
  \[ \text{know nothing} \]
  \[ \text{1} \quad \text{2} \quad \text{3} \quad \text{4} \quad \text{5} \quad \text{6} \quad \text{7} \quad \text{8} \quad \text{9} \quad \text{10} \text{ know a lot} \]

21. Where to shop to get fruits and vegetables for the least money

  \[ ENV21 \]
  \[ \text{know nothing} \]
  \[ \text{1} \quad \text{2} \quad \text{3} \quad \text{4} \quad \text{5} \quad \text{6} \quad \text{7} \quad \text{8} \quad \text{9} \quad \text{10} \text{ know a lot} \]

22. Affordable exercise places where you could join classes or use equipment

  \[ ENV22 \]
  \[ \text{know nothing} \]
  \[ \text{1} \quad \text{2} \quad \text{3} \quad \text{4} \quad \text{5} \quad \text{6} \quad \text{7} \quad \text{8} \quad \text{9} \quad \text{10} \text{ know a lot} \]

23. Parks, walking trails or tracks where you could go to get more exercise

  \[ ENV23 \]
  \[ \text{know nothing} \]
  \[ \text{1} \quad \text{2} \quad \text{3} \quad \text{4} \quad \text{5} \quad \text{6} \quad \text{7} \quad \text{8} \quad \text{9} \quad \text{10} \text{ know a lot} \]
24. How much would you say you currently make use of what your community has to offer in terms of being more physically active?

**ENV24**

not at all 01 02 03 04 05 06 07 08 09 10 a great deal

25. How much would you say you currently make use of what your community has to offer in terms of healthy food options?

**ENV25**

not at all 01 02 03 04 05 06 07 08 09 10 a great deal

I realize that you may have a lot of other things going on in your life, but I want to ask you some questions about resources in your community. First I'm going to ask you how sure you are that you could get yourself to find out more about what is available in your community. Then I will ask you some questions about how sure you are that you could get yourself to start using these resources. On this scale of 1 to 10, 1 means "not very sure" and 10 means "very sure." If you are already doing one of these things, answer "10."

26. I can get myself to find out what classes about good nutrition are available.

**ENV26**

not very sure 01 02 03 04 05 06 07 08 09 10 very sure

27. I can get myself to attend at least 3 classes or programs a year about good nutrition.

**ENV27**

not very sure 01 02 03 04 05 06 07 08 09 10 very sure

28. I can get myself to find out what exercise places are affordable and offer the kinds of things that are right for me.

**ENV28**

not very sure 01 02 03 04 05 06 07 08 09 10 very sure

29. I can get myself to join an affordable exercise place and attend class or use the equipment at least once a week.

**ENV29**

not very sure 01 02 03 04 05 06 07 08 09 10 very sure
30. I can get myself to learn more about parks, walking trails and tracks.

\[ \text{ENV30} \]
\[
\text{not very sure} \quad 01 \quad 02 \quad 03 \quad 04 \quad 05 \quad 06 \quad 07 \quad 08 \quad 09 \quad 10 \quad \text{very sure}
\]

31. I can get myself to start using parks, trails or tracks on a regular basis.

\[ \text{ENV31} \]
\[
\text{not very sure} \quad 01 \quad 02 \quad 03 \quad 04 \quad 05 \quad 06 \quad 07 \quad 08 \quad 09 \quad 10 \quad \text{very sure}
\]

In some communities where there aren’t many safe places to walk or good places to buy healthy, low-cost foods, people sometimes get together to try and find ways to make things better. It isn’t always easy to know how to get started when trying to make changes like this. For these next questions, we’re still using the scale of 1 to 10 where 1 means “not very sure” and 10 means “very sure.”

How sure are you that you would know where to get started if you wanted to . . .

32. get the sidewalks fixed in your neighborhood so it would be safer for walking?

\[ \text{ENV32} \]
\[
\text{not very sure} \quad 01 \quad 02 \quad 03 \quad 04 \quad 05 \quad 06 \quad 07 \quad 08 \quad 09 \quad 10 \quad \text{very sure}
\]

33. start a Farmer’s Market started in your neighborhood?

\[ \text{ENV33} \]
\[
\text{not very sure} \quad 01 \quad 02 \quad 03 \quad 04 \quad 05 \quad 06 \quad 07 \quad 08 \quad 09 \quad 10 \quad \text{very sure}
\]

34. get the local high school to open their gym for community classes on the weekend?

\[ \text{ENV34} \]
\[
\text{not very sure} \quad 01 \quad 02 \quad 03 \quad 04 \quad 05 \quad 06 \quad 07 \quad 08 \quad 09 \quad 10 \quad \text{very sure}
\]

35. get the city to build a walking trail?

\[ \text{ENV35} \]
\[
\text{not very sure} \quad 01 \quad 02 \quad 03 \quad 04 \quad 05 \quad 06 \quad 07 \quad 08 \quad 09 \quad 10 \quad \text{very sure}
\]
When people are working together to change something in their neighborhood, sometimes they might write a letter, talk to city officials, or sign a petition. Thinking about something you feel would be important to change in your neighborhood, how likely are you to do the following? (1 means "not at all likely" and 10 means "very likely.")

How likely are you to . . .

36. sign a petition to city officials in support of your neighborhood change?

**ENV36**

not at all likely: 01 02 03 04 05 06 07 08 09 10 very likely

37. ask your friends and neighbors to sign a petition?

**ENV37**

not at all likely: 01 02 03 04 05 06 07 08 09 10 very likely

38. write a letter to city officials in support of your change?

**ENV38**

not at all likely: 01 02 03 04 05 06 07 08 09 10 very likely

39. ask your friends and neighbors to write letters to city officials?

**ENV39**

not at all likely: 01 02 03 04 05 06 07 08 09 10 very likely

40. go by yourself to visit a city official to discuss your ideas?

**ENV40**

not at all likely: 01 02 03 04 05 06 07 08 09 10 very likely

41. go with others to visit a city official to discuss your ideas?

**ENV41**

not at all likely: 01 02 03 04 05 06 07 08 09 10 very likely

42. organize a group of friends and neighbors to visit a city official?

**ENV42**

not at all likely: 01 02 03 04 05 06 07 08 09 10 very likely
43. **attend** a city council meeting in support of your neighborhood change?

   **ENV43**
   
   not at all likely 1  2  3  4  5  6  7  8  9  10 very likely

44. **speak** at a city council meeting in support of your neighborhood change?

   **ENV44**
   
   not at all likely 1  2  3  4  5  6  7  8  9  10 very likely

We often think our lives would be different if we just had more money. For the next two statements, please answer using a scale of 1 to 10 with 1 meaning "very unsure" and 10 meaning "very sure."

45. If I had more money, I could get myself to eat healthier.

   **ENV45**
   
   very unsure 1  2  3  4  5  6  7  8  9  10 very sure

46. If I had more money, I could get myself to be more physically active.

   **ENV46**
   
   very unsure 1  2  3  4  5  6  7  8  9  10 very sure

Now, a last question about what you eat:

47. On a typical day, how many servings of fruits and vegetables do you usually eat?

   **ENV47** 0  1  2  3  4  5 or more

Rate the overall quality of this interview: **ENVratng** excellent 0 good 0 fair 0 poor 0 not sure

Interviewer:   **ENVintrv**
APPENDIX F: Validation of a Brief Dietary Assessment to Guide Counseling For Cardiovascular Disease Risk Reduction in the Underserved (DRAFT)
Validation of a brief dietary assessment to guide counseling for cardiovascular disease risk reduction in the underserved

Authors: Stephanie B. Jilcott, Thomas C. Keyserling, Carmen D. Samuel-Hodge, Larry F. Johnston, Myron D. Gross, Alice S. Ammerman

Affiliations: Department of Nutrition, Schools of Medicine and Public Health (SBJ, CDSH, ASA), Department of Medicine, School of Medicine (TCK), and the UNC Center for Health Promotion and Disease Prevention (SBJ, TCK CDSH, LFJ, ASA) at the University of North Carolina, Chapel Hill, NC; and Department of Laboratory Medicine and Pathology, University of Minnesota, Minneapolis, MN (MDG)

Corresponding author: Stephanie B. Jilcott, Center for Health Promotion and Disease Prevention
1700 Martin Luther King, Jr Blvd, CB# 7426
Chapel Hill, NC 27599-7426
Email: jilcott@email.unc.edu; Phone: (919) 843-0595; Fax: (919) 966-3374

Send reprint requests to: Alice S. Ammerman, Center for Health Promotion and Disease Prevention
1700 Martin Luther King, Jr Blvd, CB# 7426
Chapel Hill, NC 27599-7426
Email: alice_ammerman@unc.edu; Phone: (919) 966-6082; Fax: (919) 966-3374

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Running head: Validation of a brief dietary assessment
Abstract

Background: Brief dietary assessment tools are needed to guide dietary counseling in underserved populations to reduce chronic disease risk. The Dietary Risk Assessment (DRA) is one such tool that has been modified over time.

Objective: We examined the capacity of the modified DRA to measure various aspects of diet quality in a group of underserved, midlife (40-64 years) women, by comparing responses to the DRA with responses to a longer food frequency questionnaire and with plasma carotenoids.

Design: This study used baseline data from women enrolled in a heart disease risk reduction intervention trial. The DRA was administered to 236 women. Results were compared to those from a longer food frequency questionnaire (FFQ) administered to 104 women, and to plasma carotenoids from all participants.

Results: Correlations between DRA indices and corresponding measures from the FFQ were statistically significant: fruit and vegetable, r = -0.53 (p < 0.0001); total fat, r = 0.62 (p < 0.0001). In linear regression models stratified by smoking status and adjusted for BMI, LDL-C, HDL-C, VLDL-C, and age, the DRA fruit and vegetable index was significantly associated with plasma carotenoid levels (parameter estimate for non-smokers = -0.22, p = 0.01; for smokers = -0.45, p = 0.003). Correlation coefficients between DRA total score and diet quality index scores generated from FFQ variables were statistically significant, ranging from 0.57 to 0.60.

Conclusions: When compared to a longer FFQ and biochemical markers of fruit and vegetable consumption, the DRA provides a relatively good measure of aspects of the diet associated with chronic disease risk.
Keywords: validation, dietary assessment, underserved women, chronic disease, diet quality
Introduction

A Western dietary pattern, usually characterized by low fruit and vegetable consumption and high intake of red and processed meats, butter, refined grains, and high-fat dairy products,(1) is thought to be associated with higher risk of chronic diseases,(2) including cardiovascular disease(1) and colon cancer.(3) Compared to their higher-income white counterparts, low-income and racial and ethnic minorities suffer a disproportionate burden of chronic disease associated with sub-optimal diet quality.(4-6) Thus, valid dietary assessment tools are needed to facilitate dietary counseling in high risk populations. Nutrition counseling among high-risk populations often occurs in clinical settings with time and resource limitations. Therefore, dietary assessment tools for this setting should be brief.

The Dietary Risk Assessment (DRA) is one such tool, developed for non-dietetics trained health professionals (e.g., nurses and physicians) who provide dietary counseling to underserved patients.(7) The original DRA was previously validated.(8-10) However, over time, the DRA has been modified to incorporate more recent scientific evidence regarding the components of a heart-healthy diet. Because the DRA was developed to guide dietary counseling, it is important that it accurately measures aspects of the diet that are associated with chronic disease prevention. In this paper, we examined the capacity of the DRA to adequately measure various aspects of diet quality in a group of low-income, Southern, midlife (40-64 years) women, by comparing responses to the DRA with responses to a longer food frequency questionnaire and with plasma carotenoids.

Subjects and methods

Setting and participants:
The WISEWOMAN (Well Integrated Screening and Evaluation for Women Across the Nation) Project is a federally-funded cardiovascular disease risk reduction program for underinsured, midlife (40-64 years) women. In addition to serving as a screening program, the WISEWOMAN Project also includes a lifestyle intervention program to help women improve dietary habits, increase physical activity, and stop smoking. As part of the WISEWOMAN Project and described in detail elsewhere, a randomized, controlled trial was conducted at one community health center in southeastern North Carolina to evaluate a more intensive lifestyle intervention program. The dietary validation analyses, the focus of this paper, used baseline data collected for the randomized trial and data from an extensive food frequency questionnaire (FFQ) administered to a subset of participants for the purpose of conducting this study. WISEWOMAN participants were, on average, 53 years old, had an average body mass index of 31 kg/m², approximately 25% were smokers, and 95% had no health insurance. Those who completed the longer FFQ reported an average of 1670 kilocalories and 3.5 servings of fruits and vegetables per day. All participants in this study signed informed consent upon enrollment and the study was approved by the School of Public Health Institutional Review Board on Research Involving Human Subjects at the University of North Carolina, Chapel Hill.

**Dietary Assessment:**

The DRA was administered to all WISEWOMAN participants (n = 236). It measures diet using responses to 54 questions on four pages with the following subject headings: (1) meats; (2) side dishes, desserts, snacks; (3) spreads, salad dressings, oils; and (4) dairy, eggs, cereal, and salt. The DRA was designed for a Southern patient population and includes foods commonly eaten in the South. DRA response options are in three columns. The left column
indicates the healthiest dietary practices, while responses in the far right or middle columns indicate less healthy practices. For instance, one question is “In an average week, how many servings of bacon or sausage do you eat?” Response options are 0–1 per month in the left column, 1-2 in the middle column, and 3+ in the far right column. Questions with responses in the right column (least healthy practices) get a score of 2, those with responses in the middle get a score of 1, and responses in the left column receive a score of 0. Scores from all questions are summed for a total DRA score ranging from 0 to 108, with a higher score signifying a less healthy dietary pattern. The DRA provides a framework for dietary counseling. Responses in the left column represent practices that should be continued and encouraged, while responses in the right column represent problematic practices that need improvement.

We created DRA indices for fruits, vegetables, fruit and vegetables, fiber, total fat, and saturated fat as outlined in Table 1. The DRA fruit and vegetable index consisted of specific questions that asked about fruit and vegetable consumption. To create the fiber, total fat, and saturated fat indices, we estimated typical portions of various foods consumed using the Continuing Survey of Food Intake for Individuals (CSFII) 1994-96 data(13) for females, ages 40-59 years. For lower fat options, the full fat option typical serving size was used (e.g., the typical serving size for frankfurters was 59 grams, so this was the typical serving size used for low fat and fat-free hot dogs). When the CSFII did not include serving size for a particular food, we estimated typical serving sizes using a combination of standard nutrition guidelines and by reviewing food nutrient labels. For example, for nuts, we estimated a typical serving size as ¼ cup (36 grams). We used the U.S. Department of Agriculture (USDA) national nutrient database(14) to determine the nutrient content of foods. For DRA
questions with multiple relevant items in the USDA data set, we selected specific questions felt to best represent a Southern diet. For example, the foods chosen to represent the DRA food item “beef and pork” were pork chops (pan-fried), ham (honey, smoked, cooked), chuck roast beef (1/8” fat, braised), top round beef (½” fat, prime, broiled), and sirloin beef (¼” fat, cooked, pan-fried). Saturated, total fat, and fiber content were obtained from the database for the typical portion size of representative foods, and values were averaged for each DRA question. The fiber index included the 9 DRA questions about food items that contributed ≥ 2.5 g of fiber per typical portion. The total fat index (29 questions) and saturated fat index (30 questions) included DRA questions that either: (1) contributed ≥ 6.5 grams of total fat per typical portion size or ≥ 2 grams of saturated fat per typical portion; or (2) described a food preparation method that added fat.

A subset of participants in the WISEWOMAN randomized trial agreed to participate in this dietary validation study, which included administration of the Fred Hutchinson Cancer Research Center-Food Frequency Questionnaire (FHCRC-FFQ). The FHCRC-FFQ includes 136 questions on 11 pages, and also assesses portion size. A portion size booklet is used to help participants understand what is meant by small, medium, and large portions. The FHCRC-FFQ was previously validated in a group of minority and underserved women.(15) Of the 236 women enrolled in the randomized trial, 123 were offered the chance to participate in the validation study, and 104 (84.6%) completed the FHCRC-FFQ.

The average time between completion of the DRA and FHCRC-FFQ was 23.9 days. Phone interviewers were trained to administer the FHCRC-FFQ, referring to the portion size booklet given to participants at enrollment. FHCRC used two methods to create FHCRC-FFQ fruit and vegetable variables: (1) the summation method, wherein frequencies of
reported fruits and vegetables consumed from a list of relevant items on the FFQ are summed; and (2) The 5 A Day method, which uses 2 summary questions to capture consumption of most fruits and vegetables. The questions are: “How often did you eat a serving of fruit (not including juice)/vegetables (not including salad and potatoes)?” Juice, salad, and potato consumption are then added to values obtained using those questions.(16) We excluded participants from analyses if their total self-reported caloric intake was ≤ 600 or ≥ 3500 kilocalories per day.

The Alternate Healthy Eating Index (AHEI),(2) the Diet Quality Index (DQI),(17) and the Diet Quality Index-Revised (DQI-R)(18) have all been used to quantify overall diet quality. The AHEI and DQI have also been used to predict risk of cardiovascular disease.(2;19;20) Using components of each diet quality index for which we had FHCRC-FFQ data, we calculated the three dietary quality index scores. Higher AHEI and DQI-R scores signify healthier dietary patterns while a higher DQI score signifies a less healthy dietary pattern.

**Plasma Carotenoids:**

As an objective measure of dietary intake, we also measured plasma carotenoids. Blood samples were drawn after an overnight fast (minimum of 10 hours) by venipuncture into an evacuated serum separator tube. After clotting and centrifugation, the serum was placed into an airtight storage vial and stored at –60 degree C. until shipped on dry ice to the Molecular Epidemiology and Biomarker Research Laboratory at the University of Minnesota. Carotenoids were measured by high performance liquid chromatography (HPLC)-based assay as described by Bieri et al.(21) with several modifications as described previously(22) and with calibration by the methods of Craft et al.(23) A description of the
method and the modifications, as used in several large epidemiological studies, has been reported previously by Gross et al.(22) The analytes that were quantitated by this method for this study included lycopene, \(\alpha\)-carotene, \(\beta\)-carotene, \(\beta\)-cryptoxanthin, zeaxanthin plus lutein, \(\alpha\)–tocopherol, and \(\gamma\)-tocopherol.

**Additional measures:**

The primary outcome for the WISEWOMAN intervention trial was physical activity, which was objectively measured using the Actigraph (Shalimar, FL, formerly known as CSA WAM 7164 Activity Monitor) monitor, a small, uniaxial accelerometer worn on the waist. Participants wore the accelerometer during waking hours for 1 week and returned it by mail at the conclusion of this period. Total cholesterol, high-density lipoprotein cholesterol (HDL-C), and triglycerides were determined by automated enzymatic methods on a Roche/Hitachi 717 analyzer (Indianapolis, IN). Blood pressure was measured using the Omron HEM-907 automated blood pressure monitor (Omron Healthcare, Inc., Vernon Hills, IL).(24)(25) Weight, measured with a Detecto balance beam scale (Detecto, Webb City, MO), and height, measured with a Schorr portable height board (Schorr Productions, Olney, MD) were used to calculate body mass index (BMI), as weight in kilograms divided by height in meters squared.

**Statistical analysis:**

Spearman correlations were used to evaluate associations between DRA indices and FHCRC-FFQ variables. Pearson’s correlation coefficients were used to examine the association between DRA indices and plasma carotenoids and FHCRC-FFQ variables and plasma carotenoids. The association between a plasma carotenoid index and fruit and vegetable intake scores from the DRA was assessed using multiple linear regression,
adjusting for potential covariates. The plasma carotenoid index was the dependent variable, calculated as the natural log transformed sum of α- and β-carotene, β-cryptoxanthin, and zeaxanthin plus lutein. Participants with α-tocopherol values ≥ 2 mg/dl and/or β-carotene values ≥ 50 ug/dl were excluded from all plasma carotenoid analyses because these values are consistent with supplement use. Because smoking status modifies the relation between dietary and plasma carotenoid levels,(26) models stratified by smoking status are presented. Additional covariates were kilocalories consumed per day, BMI, age, LDL, HDL, and VLDL cholesterol.(27) LDL-C was estimated from the Friedewald equation(28) and VLDL-C was estimated using measured triglycerides divided by 5. To evaluate the association between DRA scores and diet quality index scores, Spearman’s rank order correlation coefficients were calculated between each diet quality index score and the DRA total score. All statistical analyses were conducted using SAS Version 8.2 (Cary, NC).

Results

Table 2 shows differences between WISEWOMAN participants who completed the FHCRC-FFQ (n= 104) and those who did not (n = 132). The groups were not statistically significantly different for any comparisons.

Table 3 shows correlations between DRA indices and FHCRC-FFQ variables. All correlations were statistically significant at the p < 0.0001 level, with the exception of the correlation between DRA total score and fiber (r = -0.22, p = 0.03). With regard to negative correlations, the range was from -0.44 to -0.56, and in terms of positive correlations, the range was 0.54 to 0.62. Many of the correlation coefficients are negative because the DRA is scored by assigning higher values to less healthy practices.
The top of Table 4 shows correlations between DRA fruit and vegetable indices and plasma carotenoids. The correlation between β-cryptoxanthin and fruit was examined as β-cryptoxanthin occurs primarily in fruit. Except for the correlation between zeaxanthin plus lutein and the DRA vegetable index, all correlations were statistically significant. The largest correlations were between the following (p-values for associations were < 0.0001): the DRA fruit and vegetable index and the plasma carotenoid index ($r = -0.30$); the DRA fruit and vegetable index and beta-carotene ($r = -0.31$); the DRA fruit index and β-cryptoxanthin ($r = -0.27$); and the DRA vegetable index and alpha- ($r = -0.33$) and beta-carotene ($r = -0.35$). The bottom half of Table 4 shows correlations between FHCRC-FFQ variables and plasma carotenoids. Overall, these correlations were smaller in magnitude than those between the DRA indices and plasma carotenoids.

In Table 5 we present the associations between the log transformed carotenoid index (dependent variable) and the DRA fruit and vegetable index (independent variable). When the sub-sample of women who completed both the DRA and the FHCRC-FFQ were used to model this relationship, we were able to adjust for total caloric intake as estimated by the FHCRC-FFQ. In this model (top of Table 5), stratified by smoking status and adjusted for BMI, HDL-C, LDL-C, VLDL-C, and total kilocalories per day, the DRA fruit and vegetable index was significantly associated with the carotenoid index among non-smokers only (standardized parameter estimate = -0.28, $p = 0.02$). The parameter estimate did not change appreciably when age and alcohol were included in the model. When we used the entire study sample, we were not able to adjust for total kilocalories, but when the model was stratified for smoking status and adjusted for BMI, HDL-C, LDL-C, VLDL-C, and age, the relationship was statistically significant among both non-smokers and smokers.
Table 6 shows correlation between the DRA total score and the three diet quality index scores (calculated from FHCRC-FFQ variables). All correlation coefficients between the DRA and diet quality index scores were statistically significant and magnitudes ranged from 0.57 to 0.60 (all p-values < 0.0001).

Discussion

In this study we (1) compared dietary intake as assessed by the DRA to that measured using the FHCRC-FFQ; (2) determined the associations between fruit and vegetable intake measured using the DRA and the FHCRC-FFQ and levels of blood carotenoids (biomarkers of fruit and vegetable consumption); and (3) compared the DRA total score to diet quality index scores calculated from responses to the FHCRC-FFQ. Results indicate that DRA indices and the DRA total score were significantly correlated with FHCRC-FFQ variables. The highest correlations were between the DRA saturated and total fat indices and FHCRC-FFQ saturated and total fat variables, as might be expected, given that these DRA indices included a large percentage of the DRA questions. However, though only contributing four questions, the DRA fruit and vegetable index was also significantly correlated with FHCRC-FFQ variables.

Results of the current study suggest that the revised DRA accurately measures aspects of the diet associated with chronic disease (e.g., fruit and vegetable consumption, fat quality and quantity, and fiber) as compared to the previously validated FHCRC-FFQ. In addition, the DRA fruit and vegetable indices were significantly correlated with biomarkers of fruit and vegetable consumption. The highest correlations were between total plasma carotenoids and the DRA fruit and vegetable index, beta- and alpha-carotene and the DRA vegetable and fruit and vegetable indices, and β-cryptoxanthin and the fruit index. These correlations were
similar in magnitude to those found in other studies,(16;29-31) and, of note, were greater
than the correlations between the FHCRC-FFQ and plasma carotenoids. Finally, the DRA
total score was significantly correlated with various diet quality scores. Current evidence
indicates significant associations between low diet quality scores and chronic disease risk.(2)
(32)These findings suggest that the DRA, when administered in an underserved population,
measures diet quality and fruit and vegetable intake relatively well, and compares favorably
with other brief dietary assessment tools.(33;34)

This study has several limitations. There is likely to be correlated error in analyses
between DRA variables and FHCRC-FFQ variables. As the study sample included
underserved, midlife, Southern women, our findings may not be generalizable to other
populations. Finally, there may be unmeasured confounding factors in the carotenoid
analyses. Despite these limitations, there are several strengths of this study. We compared
DRA responses with objective measures of diet (carotenoids), which are less likely to have
correlated error with self-reported dietary intake.(35) Additionally, this research was
conducted in an understudied, high risk population for which effective assessment and
intervention materials are greatly needed. Finally, we compared DRA total scores with diet
quality scores, as mounting evidence points to the relevance of overall diet quality in
determining chronic disease risk. In conclusion, the brief, modified DRA is a useful
alternative to longer dietary assessment instruments, and is appropriate for use to guide
dietary counseling in chronic disease prevention programs focusing on underserved, midlife,
Southern women.
Acknowledgements

The authors would like to acknowledge the valuable work of Sara Lindsley, Kathryn Bramble, Avia Mainor, and Agna Boas. We are also grateful for the helpful comments of Ziya Gizlice and Shrikant Bangdiwala, and for the help of the UNC Nutrition Epidemiology Core (Grant #DK56350).

Author contributions: SBJ, TCK, and ASA conceptualized the study. TCK and LFJ were responsible for DRA and carotenoid data collection. MDG analyzed carotenoids. SBJ, TCK, CSH, and MDK developed analysis strategy. SBJ and TCK drafted the manuscript. ASA, TCK, CSH, SBJ interpreted results. All authors provided conceptual critique of the manuscript and approved the final draft.

Conflict of interest statement: The authors wish to disclose no conflicts of interest.
REFERENCES


Table 1. Dietary Risk Assessment Indices.

<table>
<thead>
<tr>
<th>Index</th>
<th>Questions included</th>
<th>Score range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit</td>
<td>“How many servings a day do you have of fruit?”</td>
<td>0 – 4</td>
</tr>
<tr>
<td></td>
<td>“How many servings a day do you have of juice?”</td>
<td></td>
</tr>
<tr>
<td>Vegetable</td>
<td>“In an average week, how many servings of tossed salad do you eat?”</td>
<td>0 – 4</td>
</tr>
<tr>
<td></td>
<td>“How many servings a day do you have of vegetables of any kind?”</td>
<td></td>
</tr>
<tr>
<td>Fruit and</td>
<td>“How many servings a day do you have of fruit?”</td>
<td>0 – 8</td>
</tr>
<tr>
<td>vegetable</td>
<td>“How many servings a day do you have of juice?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“In an average week, how many servings of tossed salad do you eat?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“How many servings a day do you have of vegetables of any kind?”</td>
<td></td>
</tr>
<tr>
<td>Fiber</td>
<td>“In an average week, how many servings of dried peas or beans, like pinto, navy beans or black-eyed peas, including canned beans do you eat?”</td>
<td>0 – 18</td>
</tr>
<tr>
<td></td>
<td>“In an average week, how often do you eat dried peas, beans, or tofu instead of meat in a meal?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“In an average week, how many servings of regular peanut butter, peanuts, or other nuts like almonds, walnuts, pecans, or cashews do you eat?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“How many servings a day do you have of fruit?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“In an average week, how many servings of French fries, fried potatoes, or hash browns do you eat?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“In an average week, how many servings of tossed salad do you eat?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“How many servings a day do you have of vegetables of any kind?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Do you eat whole grain bread like whole wheat, rye, pumpernickel, or mixed grain bread?”</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“In an average week, how many servings of high fiber cereals like bran flakes or shredded wheat do you eat?”</td>
<td></td>
</tr>
<tr>
<td>Total fat</td>
<td>“In an average week, how many servings of bacon or sausage (regular) do you eat?”</td>
<td>0 – 58</td>
</tr>
<tr>
<td>Question</td>
<td>Answer</td>
<td></td>
</tr>
<tr>
<td>------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>“In an average week, how many servings of hot dogs or lunchmeats like bologna or salami (regular) do you eat?”</td>
<td>“In an average week, how many servings of hamburger, including hamburger meat in dishes like meatloaf or spaghetti, do you eat?”</td>
<td></td>
</tr>
<tr>
<td>“In an average week, how many servings of cuts of beef or pork – like roast, stew meat, ribs, steak, chops, roasts, BBQ, or ham, do you eat?”</td>
<td>(“Is the fat usually trimmed?” “Is your serving larger or smaller than a deck of cards?”)</td>
<td></td>
</tr>
</tbody>
</table>
| “In an average week, how many servings of organ meats like liver or chitlins do you eat?” | |}

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
</table>
| “Is the chicken you eat usually fried?” | |}

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
</table>
| “Do you usually eat the skin (chicken)?” | |}

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
</table>
| “Is the fish you eat usually fried?” | |}

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
</table>
| “In an average week, how many servings of regular peanut butter, peanuts, or other nuts like almonds, walnuts, pecans, or cashews do you eat?” | |}

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
</table>
| “In an average week, how many servings of sweets, including pies, cakes, cookies, donuts, sweet rolls, or chocolate candy, do you eat?” | |}

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
</table>
| “In an average week, how many servings of snack chips, or crackers like “Nabs” do you eat?” | |}

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
</table>
| “In an average week, how many servings of French fries, fried potatoes, or hash browns do you eat?” | |}

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
</table>
| “In an average week, how many servings of biscuits or cornbread made with butter, lard, or shortening do you eat?” | |}

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
</table>
| “In an average week, how many servings of whole milk or regular sweet milk do you eat?” | |}

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
</table>
| “In an average week, how many servings of whipping cream, half and half, or powdered creamers in coffee do you eat?” | |}

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer</th>
</tr>
</thead>
</table>
| “In an average week, how many servings of regular cheese plain or in mixed dishes do you eat?” | |}

245
“In an average week, how many servings of regular ice cream do you eat?”

“In an average week, how many servings light or low fat ice cream, sherbet, or frozen yogurt do you eat?”

“In an average week, how many whole eggs (not counting egg substitutes or eggs used in baking) do you eat?”

“If you use margarine, is it tub, liquid, light or stick?”

“How many teaspoons (pats) of margarine or butter do you add to food at the table each day?”

“How are your vegetables usually seasoned, especially greens or potatoes?”

“How much, if any, margarine, butter, or meat fat is added?”

“How many times a week do you eat gravy or meat drippings?”

“How many times a week do you eat regular mayonnaise or creamy salad dressing like Miracle Whip?” (“How much do you use?”)

“How many times a week do you eat foods that are deep fried, like hushpuppies or seafood?”

<table>
<thead>
<tr>
<th>Saturated fat</th>
<th>The saturated fat index included all questions in the total fat index except the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• “In an average week, how many servings of snack chips, or crackers like “Nabs” do you eat?”</td>
</tr>
<tr>
<td></td>
<td>• “How many times a week do you eat regular mayonnaise or creamy salad dressing like Miracle Whip?” (“How much do you use?”)</td>
</tr>
</tbody>
</table>

In addition to the following:

• “In an average week, how many servings of low fat cheese plain like part skim mozzarella do you eat?”

• “In an average week, how many servings of regular sour cream or whipped toppings do you eat?”

• “What is fried food at home usually fried in?”

• “What kind of fat is usually used for baking in your home?”

0 – 60
Table 2. Characteristics of study participants who completed the Fred Hutchinson Cancer Research Center-Food Frequency Questionnaire (FHCRC-FFQ) and those who did not.

<table>
<thead>
<tr>
<th>Participant characteristic</th>
<th>Participants who completed FHCRC-FFQ (n = 104)</th>
<th>Participants who did not complete FHCRC-FFQ (n = 132)</th>
<th>P-value for difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average age (years)</td>
<td>53.7</td>
<td>52.3</td>
<td>0.15</td>
</tr>
<tr>
<td>Non-Hispanic white (%)</td>
<td>62.5</td>
<td>55.3</td>
<td>0.27</td>
</tr>
<tr>
<td>Annual household income less than $10,000 (%)</td>
<td>33.7</td>
<td>38.6</td>
<td>0.74</td>
</tr>
<tr>
<td>High school diploma or less (%)</td>
<td>57.7</td>
<td>65.9</td>
<td>0.20</td>
</tr>
<tr>
<td>Currently living with a spouse or partner (%)</td>
<td>43.3</td>
<td>43.2</td>
<td>0.99</td>
</tr>
<tr>
<td>Employed (%)</td>
<td>55.8</td>
<td>61.4</td>
<td>0.39</td>
</tr>
<tr>
<td>Retired (%)</td>
<td>51.4</td>
<td>42.9</td>
<td>0.50</td>
</tr>
<tr>
<td>No health insurance (%)</td>
<td>95.2</td>
<td>95.5</td>
<td>0.92</td>
</tr>
<tr>
<td>Distance from home to health center (miles)</td>
<td>12.3</td>
<td>10.7</td>
<td>0.09</td>
</tr>
<tr>
<td>Smokers (%)</td>
<td>28.8</td>
<td>22.0</td>
<td>0.23</td>
</tr>
<tr>
<td>Known history of CVD(^1) (%)</td>
<td>6.7</td>
<td>9.1</td>
<td>0.51</td>
</tr>
<tr>
<td>Known family history of CVD(^1) (%)</td>
<td>22.1</td>
<td>26.5</td>
<td>0.44</td>
</tr>
<tr>
<td>Average systolic blood pressure (mmHg)</td>
<td>128.0</td>
<td>126.7</td>
<td>0.47</td>
</tr>
<tr>
<td>Average diastolic blood pressure (mmHg)</td>
<td>77.4</td>
<td>79.0</td>
<td>0.11</td>
</tr>
<tr>
<td>Total cholesterol (mg/dl)</td>
<td>209.8</td>
<td>211.7</td>
<td>0.92</td>
</tr>
<tr>
<td>Triacylglycerol</td>
<td>141.5</td>
<td>161.5</td>
<td>0.51</td>
</tr>
</tbody>
</table>

\(^1\) CVD, cardiovascular disease
<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>HDL-C</td>
<td>54.4</td>
<td>57.5</td>
<td>0.08</td>
</tr>
<tr>
<td>LDL-C</td>
<td>126.7</td>
<td>126.1</td>
<td>0.77</td>
</tr>
<tr>
<td>Body mass index (kg/m²)</td>
<td>31.6</td>
<td>30.7</td>
<td>0.31</td>
</tr>
<tr>
<td>Wore accelerometer 7 days (%)</td>
<td>51.5</td>
<td>41.0</td>
<td>0.12</td>
</tr>
<tr>
<td>Average moderate and vigorous physical activity (minutes per week)</td>
<td>716.2</td>
<td>679.2</td>
<td>0.28</td>
</tr>
</tbody>
</table>
Table 3. Correlations between Dietary Risk Assessment (DRA) variables (indices and total score) with selected Fred Hutchinson Cancer Research Center-Food Frequency Questionnaire (FHCRC-FFQ) variables, N = 94.\(^1\)

<table>
<thead>
<tr>
<th>Dietary Risk Assessment variables</th>
<th>Fred Hutchinson Cancer Research Center-Food Frequency Questionnaire variables</th>
<th>Spearman’s correlation coefficient(^2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable index</td>
<td>Vegetable – summation method(^3)</td>
<td>-0.49</td>
</tr>
<tr>
<td>Vegetable index</td>
<td>Vegetable – 5 A Day method(^3)</td>
<td>-0.53</td>
</tr>
<tr>
<td>Fruit index</td>
<td>Fruit – summation method</td>
<td>-0.55</td>
</tr>
<tr>
<td>Fruit index</td>
<td>Fruit – 5 A Day method</td>
<td>-0.45</td>
</tr>
<tr>
<td>Fruit and vegetable index</td>
<td>Fruit and vegetable – summation method</td>
<td>-0.53</td>
</tr>
<tr>
<td>Fruit and vegetable index</td>
<td>Fruit and vegetable – 5 A Day method</td>
<td>-0.53</td>
</tr>
<tr>
<td>Fiber index</td>
<td>Fiber</td>
<td>-0.56</td>
</tr>
<tr>
<td>Total fat index</td>
<td>Total fat</td>
<td>0.62</td>
</tr>
<tr>
<td>Saturated fat index</td>
<td>Total saturated fat</td>
<td>0.60</td>
</tr>
<tr>
<td>DRA total score(^4)</td>
<td>Fruit and vegetable – summation method</td>
<td>-0.49</td>
</tr>
<tr>
<td>DRA total score</td>
<td>Fruit and vegetable – 5 A Day method</td>
<td>-0.44</td>
</tr>
<tr>
<td>DRA total score</td>
<td>Fiber</td>
<td>-0.22</td>
</tr>
<tr>
<td>DRA total score</td>
<td>Total fat</td>
<td>0.54</td>
</tr>
<tr>
<td>DRA total score</td>
<td>Total saturated fat</td>
<td>0.54</td>
</tr>
</tbody>
</table>

\(^1\)10 participants reported < 600 or > 3500 kilocalories/day on the FHCRC-FFQ and thus were excluded.  
\(^2\)All correlation coefficients have a p-value < 0.0001 except for correlation between Dietary Risk Assessment total score and fiber (r = -0.22, p = 0.03).  
\(^3\)Two methods were used to create FHCRC-FFQ fruit and vegetable variables: (1) the summation method adds frequencies of reported fruits and vegetables consumed from a list of relevant items on the FHCRC-FFQ; and (2) The 5 A Day method, which uses 2 summary questions to capture consumption of most fruits and vegetables: “How often did you eat a serving of fruit (not including juice)/vegetables (not including salad and potatoes)?” Juice, salad, and potato consumption are then added to values obtained using those questions.(16)  
\(^4\)n = 93 because 1 participant who had FHCRC-FFQ data was missing a Dietary Risk Assessment total score.
Table 4. Correlation between Dietary Risk Assessment (DRA) indices or Fred Hutchinson Cancer Research Center Food Frequency Questionnaire (FHCRC-FFQ) variables and measured plasma carotenoids.

<table>
<thead>
<tr>
<th>DRA index</th>
<th>Carotenoid</th>
<th>Pearson’s correlation</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit and vegetable</td>
<td>Carotenoid index</td>
<td>-0.30</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Fruit and vegetable</td>
<td>Zeaxanthin plus lutein</td>
<td>-0.15</td>
<td>0.03</td>
</tr>
<tr>
<td>Fruit and vegetable</td>
<td>α-carotene</td>
<td>-0.23</td>
<td>0.0009</td>
</tr>
<tr>
<td>Fruit and vegetable</td>
<td>β-carotene</td>
<td>-0.31</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Fruit</td>
<td>B-cryptoxanthin</td>
<td>-0.27</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Vegetable</td>
<td>Zeaxanthin plus lutein</td>
<td>-0.10</td>
<td>0.16</td>
</tr>
<tr>
<td>Vegetable</td>
<td>α-carotene</td>
<td>-0.33</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Vegetable</td>
<td>β-carotene</td>
<td>-0.35</td>
<td>&lt; 0.0001</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FHCRC-FFQ variable</th>
<th>Carotenoid</th>
<th>Pearson’s correlation</th>
<th>5 A Day method</th>
<th>Summation method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit and vegetable</td>
<td>Carotenoid index</td>
<td>0.19, p = 0.08</td>
<td>0.22, p = 0.05</td>
<td></td>
</tr>
<tr>
<td>Fruit and vegetable</td>
<td>Zeaxanthin plus lutein</td>
<td>0.05, p = 0.67</td>
<td>0.11, p = 0.31</td>
<td></td>
</tr>
<tr>
<td>Fruit and vegetable</td>
<td>α-carotene</td>
<td>0.13, p = 0.24</td>
<td>0.09, p = 0.40</td>
<td></td>
</tr>
<tr>
<td>Fruit and vegetable</td>
<td>β-carotene</td>
<td>0.26, p = 0.02</td>
<td>0.28, p = 0.01</td>
<td></td>
</tr>
<tr>
<td>Fruit</td>
<td>B-cryptoxanthin</td>
<td>0.25, p = 0.02</td>
<td>0.19, p = 0.08</td>
<td></td>
</tr>
<tr>
<td>Vegetable</td>
<td>Zeaxanthin plus lutein</td>
<td>-0.05, p = 0.65</td>
<td>0.02, p = 0.88</td>
<td></td>
</tr>
<tr>
<td>Vegetable</td>
<td>α-carotene</td>
<td>0.21, p = 0.06</td>
<td>0.12, p = 0.29</td>
<td></td>
</tr>
</tbody>
</table>

1N = 200; Participants with α-tocopherol values ≥ 2 mg/dl and/or β-carotene values ≥ 50 ug/dl, values consistent with supplement use, were excluded.

2Sum of α-carotene, β-carotene, β-cryptoxanthin, and zeaxanthin plus lutein.

3N = 83; Participants with α-tocopherol values ≥ 2 mg/dl and/or β-carotene values ≥ 50 ug/dl, values consistent with supplement use, and those who reported consuming ≤ 600 or ≥ 3500 kilocalories per day on the food frequency questionnaire were excluded.

4The 5 A Day method uses 2 summary questions to capture consumption of most fruits and vegetables. The questions are: “How often did you eat a serving of fruit (not including juice)/vegetables (not including salad and potatoes)”? Juice, salad, and potato consumption are added to values obtained using those questions. The summation method sums frequencies of reported fruits and vegetables consumed from a list of relevant items on the FFQ. (16)
<table>
<thead>
<tr>
<th>Vegetable</th>
<th>β-carotene</th>
<th>0.24, p = 0.03</th>
<th>0.19, p = 0.08</th>
</tr>
</thead>
</table>

Table 5. Association between natural log of carotenoid index (sum of α-carotene, β-carotene, β-cryptoxanthin, and zeaxanthin plus lutein) and the Dietary Risk Assessment (DRA) fruit and vegetable index.

<table>
<thead>
<tr>
<th>Participants who completed the Fred Hutchinson Cancer Research Center Food Frequency Questionnaire (n = 83)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
</tr>
<tr>
<td>1. n = 83</td>
</tr>
<tr>
<td>2. non-smokers, n = 60</td>
</tr>
<tr>
<td>smokers, n = 23</td>
</tr>
<tr>
<td>3. non-smokers, n = 60</td>
</tr>
<tr>
<td>smokers, n = 23</td>
</tr>
<tr>
<td>4. non-smokers, n = 59</td>
</tr>
<tr>
<td>smokers, n = 23</td>
</tr>
<tr>
<td>5. non-smokers, n = 59</td>
</tr>
<tr>
<td>smokers, n = 23</td>
</tr>
<tr>
<td>6. non-smokers, n = 59</td>
</tr>
<tr>
<td>smokers, n = 23</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>All participants (n = 200)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
</tr>
<tr>
<td>1Participants with α-tocopherol values ≥ 2 mg/dl and/or β-carotene values ≥ 50 ug/dl, values consistent with supplement use, and those who reported consuming ≤ 600 or ≥ 3500 kilocalories per day on the food frequency questionnaire were excluded.</td>
</tr>
</tbody>
</table>
1.  n = 200  --  -0.25  0.0004  0.06
2.  non-smokers, n = 145  --  -0.20  0.01  0.03
   smokers, n = 55  --  -0.36  0.006  0.12
3.  non-smokers, n = 145  BMI  -0.19  0.02  0.03
   smokers, n = 54  BMI  -0.40  0.003  0.13
4.  non-smokers, n = 140  BMI, HDL-C, LDL-C, VLDL-C  -0.18  0.04  0.02
   smokers, n = 53  BMI, HDL-C, LDL-C, VLDL-C  -0.41  0.005  0.15
5.  non-smokers, n = 140  BMI, HDL-C, LDL-C, VLDL-C, age  -0.22  0.01  0.07
   smokers, n = 53  BMI, HDL-C, LDL-C, VLDL-C, age  -0.45  0.003  0.15

^Participants with α-tocopherol values ≥ 2 mg/dl and/or β-carotene values ≥ 50 ug/dl, values consistent with supplement use, were excluded.
Table 6. Components of three diet quality indices and Spearman correlation coefficients between Dietary Risk Assessment total score and diet quality index scores, N = 931

<table>
<thead>
<tr>
<th>Diet quality index</th>
<th>Components of the index</th>
<th>Correlation with Dietary Risk Assessment total score¹²³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alternate Healthy Eating Index</td>
<td>Servings of fruits per day</td>
<td>r = -0.57</td>
</tr>
<tr>
<td></td>
<td>Servings of vegetables per day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cereal fiber</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Trans fat (% of energy)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Poly: Saturated fat ratio</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Alcohol servings per day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Multi-vitamin use³</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nuts and soy protein³</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ratio of white to red meat³</td>
<td></td>
</tr>
<tr>
<td>Diet Quality Index</td>
<td>Total fat (% of energy)</td>
<td>r = 0.60</td>
</tr>
<tr>
<td></td>
<td>Saturated fat (% of energy)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Cholesterol (mg/d)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Vegetable and fruit servings per day</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Protein</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sodium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Calcium</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Servings of grains³</td>
<td></td>
</tr>
<tr>
<td>Diet Quality Index-Revised</td>
<td>Cholesterol (mg/d)</td>
<td>r = -0.57</td>
</tr>
<tr>
<td></td>
<td>Total fat (% of energy)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Saturated fat (% of energy)</td>
<td></td>
</tr>
</tbody>
</table>

¹10 participants who reported consuming < 600 or > 3500 kilocalories/day on the Food Frequency Questionnaire were excluded. One additional participant was missing a DRA total score.

²All p-values for correlations were < 0.0001.

³Indicates components for which necessary data were not available and thus not used to calculate the diet quality index score for this study.
Servings of fruits per day
Servings of vegetables per day
Calcium (% Adequate intake for age)
Iron (% Recommended Daily Allowance for age)
Diet diversity\(^3\)
Diet moderation\(^3\)
Servings of grains\(^3\)
Linking Clinical Care to Community Resources for Cardiovascular Health

A Guide for WISEWOMAN Projects and Other Community-Based Health Promotion Projects
Acknowledgments

Content
Stephanie Jilcott, Nutrition Doctoral Student
University of North Carolina School of Public Health

Editor
Claire Viadro, PhD, MPH

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People Designs
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Overview of this Guide

Why are community resources important?

Community and neighborhood resources can make it easier to turn new, healthy behaviors into lifelong habits. Using community resources can also help people overcome the barriers to a healthy lifestyle. Resources such as farmer’s markets and produce stands can make it easier to eat more fruits and vegetables; and parks and trails can make it easier to walk regularly.

To be able to use local resources, however, community members first need to know that the resources exist. They also need to be motivated to use the resources. By developing and using community resource materials, WISEWOMAN projects and other community-based health promotion programs can help program participants become more aware of resources in their community and encourage them to regularly use such resources. Use of resources can support and reinforce behavior changes that participants make as a result of other program activities.
How can this Guide help?

This Guide will help you create tailored community resource tools. The Guide is based on our experience designing and testing tools in a WISEWOMAN research project in New Hanover County, North Carolina (2002-2004). The tools highlight local resources to help participants eat healthier foods, be more physically active, stop smoking, and learn how to advocate for changes in their communities. To increase participants' awareness of and motivation to use local resources, we developed three intervention tools:

1. The **Community Assessment** helps participants think about community and personal barriers that influence their behaviors and encourages them in setting goals to improve their lifestyle choices. The Assessment is standard for all programs and does not need to be tailored to your specific community.

2. The **Tip Sheets** offer encouragement and help participants identify resources to achieve and support their behavior change goals. The Tip Sheets are also standard, but can be tailored to your community.

3. The **Community Resource Guide** is tailored to your community and pulls together key information about how to tap into local resources.

---

Our experience: Using the community resource tools in WISEWOMAN

In the New Hanover County WISEWOMAN project, participants who received community resource tools reported increasing their use of local physical activity resources more than participants who did not receive the tools. Participants living in urban areas who received the tools also reported increasing their use of local nutrition resources more than participants living in urban areas who did not receive the tools. We believe that the community resource tools helped women become more engaged with local resources for the following reasons:

- The **tools were put to immediate and effective use**: WISEWOMAN Health Counselors incorporated the community resource tools into their structured counseling intervention.¹
- The **tools helped participants set achievable goals**: The Community Assessment and Tip Sheets made it easy for Health Counselors to guide goal setting.
- The **tools increased participants' awareness of local opportunities**: The Community Resource Guide provided specific and relevant information on a wide range of local resources.
- The **tools were culturally appropriate**: Qualitative research was used to test and revise all tools.

¹ The North Carolina WISEWOMAN project used the New Leaf...Choices for Healthy Living intervention as their structured counseling intervention. The New Leaf manual is a theory-based diet and physical activity assessment and tailored counseling program designed for use in public health clinic settings.
Who can use this Guide?

This Guide is designed primarily for WISEWOMAN Project Coordinators working in local health departments and community health centers. However, it can also be used by coordinators of other health promotion programs.

Why are resources for community advocacy included in this Guide?

WISEWOMAN participants and participants in other community-based programs have tremendous potential to advocate for neighborhood and community changes that can make it easier to obtain healthy foods and be physically active. In some localities, citizens have been able to mobilize and use federal, state, or private funds to build walking trails or supermarkets. The Health Counselor or Program Coordinator can facilitate community advocacy and action by linking program participants to resources that can help them improve their communities.
Steps for creating community resource tools

There are four basic steps that you can follow to create tailored community resource tools for program participants. You may find it helpful to begin working on more than one step at a time. Below we provide an overview of the steps, which are described in more detail on the following pages.

Step 1: Identify resources in the community: Use the Internet and print resources. Most communities have resources to promote and/or support healthy eating, physical activity, smoking cessation, and community change efforts. Many of these resources can be found on the Internet or in phone books. Use the Internet and phone book to identify resources, like produce stands, parks, and affordable fitness centers, that will be most appealing to and appropriate for program participants.

Conducting a literature review:

Before or during your community explorations, you may wish to do a literature review to identify community-level barriers and facilitators. The health promotion literature lists many environmental factors that make it harder or easier for socioeconomically disadvantaged groups to eat a healthy diet and be physically active. For example, studies show that underserved communities may have a lack of supermarkets, less access to healthy foods in restaurants and grocery stores, and a higher proportion of fast food restaurants, which can make it difficult for residents to eat well. Research also suggests that a lack of accessible and affordable physical activity options (e.g., parks, fitness centers), crime, and heavy traffic can discourage physical activity.

For more information about nutrition barriers and facilitators:

For more information about physical activity barriers and facilitators:
Step 2: Get to know your community: Talk to community leaders. You can learn a lot about what your community has to offer program participants by asking community leaders to brainstorm with you about community barriers and resources. Talk to an existing community group, or if an existing group does not exist, form a Community Advisory Board (CAB).

Step 3. Draft and pilot test the community resource tools. Use the information from Steps 1 and 2 to draft the community resource tools. The templates and appendix A included in this book and on the CD-ROM will help you get started. Visit or call each resource to confirm its business status and to obtain specific information about location, hours, costs, special rates, populations served, and other relevant details.

After the tools are drafted, pilot test them with community members similar to program participants to make sure that the tools are understandable, appropriate, and complete. Finalize the tools by incorporating the feedback you receive.

Step 4. Use the tools to address barriers, and encourage and support behavior change. The community resource tools are highly compatible with the New Leaf… Choices for Healthy Living counseling intervention used in the NC WISEWOMAN Project. However, even if your project does not use New Leaf, you can help program participants consider their health behaviors within the context of their local communities. Use the Community Assessment to help participants set concrete goals that move them closer to a healthier lifestyle. Review the Tip Sheets to encourage participants to overcome community barriers and use community resources. The Tip Sheets provide a natural link to the Community Resource Guide, which can help participants translate specific goals into action.

After program participants have begun thinking about barriers in their communities regarding healthy eating and physical activity, invite a group of participants to work together to advocate for an improvement in their community that they feel strongly about. Although this process can be time-intensive, the investment will be worth it if participants succeed in achieving the desired improvement.
Step 1

Identify resources in the community: Use the Internet and print resources

1. Search the Internet and phone book to find relevant resources in the communities where participants live and work.

Look for the following types of resources in the community:

a. Nutrition resources:
   - Farmer’s markets, produce stands, pick-your-own farms
   - Food buying clubs
   - Restaurants with healthy food options (Winner’s Circle Program)
   - Local nutrition classes (through the Cooperative Extension Agency)
   - Food banks
   - Gleaning networks
   - Congregate meal sites
   - Van rides to grocery stores

b. Physical activity resources:
   - Parks and trails
   - Mall walking
   - School tracks, fields, and tennis courts
   - YWCAs and YMCA
   - Community gyms and recreation centers
   - Senior centers
   - Communities or downtown areas with sidewalks and/or bike lanes
   - Public pools
c. Smoking cessation resources:
   - NC and National Quitlines
   - American Cancer Society (ACS) guide to quitting smoking
   - Medicaid-reimbursed over-the-counter nicotine replacement therapy
   - Centers for Disease Control and Prevention—Office of Smoking and Health (CDC-OSH)
   - Women’s Health: Interventions for Smoking Cessation (WHISC)
   - American Lung Association
   - NC Prevention Partners: Quit Now NC!
   - QuitNet: online support group
   - Quit Smoking Now!: telephone support and instant messaging cessation services

d. Community change resources¹:
   - Community Watch programs
   - Park Watch programs
   - Public Services and/or Public Works Departments
   - Traffic Services branch (Department of Transportation)
   - Local utility companies
   - County departments and offices
   - Animal Control Services
   - Healthy Carolinians (http://www.healthy Carolinians.org/)
   - NC Main Street Program

¹Community change resources are defined as organizations or groups you can contact to begin making beneficial community changes, such as getting neighborhood sidewalks repaired or starting a community watch to make neighbors feel safer as they walk.
2. Begin listing phone numbers and other useful information about each resource in each of the Community Resource Guide templates as you collect the information. (See next page for version to photocopy or go to the CD for an editable Microsoft Word version.)

Call or visit each resource on your evolving Community Resource Guide to check its business status and find out additional information needed to use the resource. You should collect three broad categories of information:

- **Who to talk to**, which goes into the “Talk to” column on the templates. (See next page for version to photocopy or go to the CD for an editable Microsoft Word version.)
  - Name and phone number of contact person
  - Name and location of organization, agency, or resource

### Nutrition Resources

<table>
<thead>
<tr>
<th>If you want to...</th>
<th>Talk to...</th>
<th>Information you should know</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learn about...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learn about...</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Learn about...</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Physically Explore Your Community: Conduct A “Windshield” Tour**

Try to visit as many local resources as possible so that you can knowledgeably discuss the resources with program participants. One way to enhance community familiarity is to drive around your community, paying special attention to community characteristics that make it harder or easier for residents to eat healthy and be active. For example, do you notice fresh produce stands, or only fast food restaurants? Where are grocery stores located? Does the community have sidewalks? Are there plenty of parks and green spaces?

You can learn even more about the community by getting out of the car to explore different resources. For instance, compare the cost and availability of healthy foods in locations such as supermarkets, neighborhood grocery stores, convenience stores, farmer’s markets, and restaurants. To assess physical activity resources, visit and even exercise at local parks, senior centers, community gyms, and recreation centers.
Our experience: the Community Resource Guide

The New Hanover County Community Resource Guide included information about a variety of local resources.

Nutrition:
- Classes offered by the Cooperative Extension Service, Diabetes Coalition, and Health Department
- Local produce stands and pick-your-own farms
- Gleaning opportunities
- Van rides to discount superstores for individuals lacking transportation

Physical activity:
- Places to walk (e.g., malls, school tracks, trails, parks)
- Programs offered by the Recreation Department, YMCA, and Senior Center

Community change:
- Phone numbers of municipal agencies (e.g., where to request sidewalk repairs and other neighborhood improvements)

In the New Hanover County project, the resources used the most by WISEWOMAN participants were farmer's markets, produce stands, parks and trails, walking programs (e.g., at the mall), and affordable fitness centers. If appropriate for your community, include these types of resources in your Community Resource Guide.

b. Specific information about the resource, which goes into the "Information you should know" column on the templates. (See next page for version to photocopy or go to the CD for an editable Microsoft Word version.)
- Name of specific resource (if applicable)
- Hours/days of operation
- Cost/fees
- Activities and programs offered

c. Encouraging words or specific explanations about the resource in the "Benefits" column

The Community Resource Guide templates will help you prioritize the most important resources for nutrition, physical activity, smoking cessation, and community change. If you think of other types of resources that could be helpful to individuals in your community, go ahead and include them!
<table>
<thead>
<tr>
<th>Exercise Resources</th>
<th>Physical Activity Resources</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Recreation and fitness center</td>
<td>- Community center and gym locations</td>
</tr>
<tr>
<td>- Fitness and exercise classes</td>
<td>- Exercise classes and programs at local gyms</td>
</tr>
<tr>
<td>- Local fitness centers</td>
<td>- Local fitness centers and programs</td>
</tr>
<tr>
<td>- Local parks and trails</td>
<td>- Local parks and trails for walking</td>
</tr>
<tr>
<td>- Local swimming pools and parks</td>
<td>- Local swimming pools and parks for swimming</td>
</tr>
<tr>
<td>- Local tennis courts and parks</td>
<td>- Local tennis courts and parks for tennis</td>
</tr>
<tr>
<td>- Local basketball courts and parks</td>
<td>- Local basketball courts and parks for basketball</td>
</tr>
</tbody>
</table>

**Talk to...**

**Park of choice**

**Exercise Resources**

- Local swimming pools and parks
- Local tennis courts and parks
- Local basketball courts and parks
- Local parks and trails for walking
- Local parks and trails for running

**Physical Activity Resources**

- Community center and gym locations
- Exercise classes and programs at local gyms
- Local fitness centers
- Local parks and trails
- Local swimming pools and parks for swimming
- Local tennis courts and parks for tennis
- Local basketball courts and parks for basketball

**Benefits**

- Improved physical health
- Increased energy levels
- Better mood
- Reduced stress
- Improved sleep

**Information you should know**

- Local fitness centers and programs
- Local parks and trails
- Local swimming pools and parks
- Local tennis courts and parks
- Local basketball courts and parks
### Smoking Cessation Resources

**Call a Quitline**

- 1-800-QUIT NOW (1-800-784-7669)

**Call the American Cancer Society’s Quitline**

- 1-800-227-2345

Choose 5 from the menu and ask for the quitline.

**Day's Smoke-Free Days & Week**

Talk with a friend.

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Information You Should Know...</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Signs**

- Stop smoking. Find out about the ones offered in your area. Ask local health care professionals to help people who want to quit.

**Your Goals**

- Set a quit date.
- Make a quit plan.
- Identify triggers and find ways to avoid them.

**Call to Action**

- If you want to quit today, talk to a friend.

---

**Quit Smoking**

1. Call a quitline.
2. Call the American Cancer Society's quitline.
3. Choose the number that works best for you.
4. Ask for assistance.
5. Set a quit date.
6. Make a quit plan.
7. Identify triggers and find ways to avoid them.
8. Ask for help from friends, family, and community resources.
<table>
<thead>
<tr>
<th><strong>Trouble Shooter</strong></th>
<th><strong>Community Change Resources Sample (photocopy or use editable CD version)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Report a sky anomaly</td>
<td>Get a streetlight bulb repaired.</td>
</tr>
<tr>
<td></td>
<td>Get a pool repaired or built.</td>
</tr>
<tr>
<td></td>
<td>Face a sewer maintenance superintend.</td>
</tr>
<tr>
<td>Name and number of contact person or local</td>
<td>Street</td>
</tr>
<tr>
<td></td>
<td>neighborhood watch in your street.</td>
</tr>
<tr>
<td></td>
<td>Talk to...</td>
</tr>
</tbody>
</table>
Step 2

Get to know your community: talk to community leaders.

1. Find out if there is an existing health promotion group in your community.
   a. Look for groups such as Healthy Carolinians\(^1\), a Local Physical Activity and Nutrition (LPAN) Coalition\(^2\), or a Student Health Action Committee.
   b. If one of these groups exists in your community, learn about their activities and goals for community change, and consider becoming a member of the group if your agency is not represented.
   c. Contact the group and ask if you can present your program at a future meeting.
   d. At the meeting, explain the importance of linking participants with community resources to help them make and maintain healthy behavior changes.
   e. Ask the group to suggest local resources appropriate for program participants.
   f. Brainstorm with group members about potential community change ideas.

\(^{1,2}\) Find out about Healthy Carolinians at [http://www.healthy Carolinians.org/index.htm](http://www.healthy Carolinians.org/index.htm) and LPANs at the "Eat Smart, Move More" website. [http://www.eatsmartmovemorenc. com/programs/lpas/lpas.htm](http://www.eatsmartmovemorenc.com/programs/lpas/lpas.htm)

2. If your community does not have an existing health promotion group, consider forming a Community Advisory Board (CAB).
   a. Generate a list of potential members (see box). Make sure your list includes people with varied racial/ethnic and socioeconomic backgrounds. Members might include:
      - Leaders of community organizations (e.g., Parks & Recreation, Senior Centers).
      - Active members of the local diabetes coalition.
      - Cooperative Extension agents.
      - Representatives from the Health Department, Community Health Center, or hospital.

What is the purpose of a Community Advisory Board?

The Community Advisory Board has 5 tasks:

1. To give advice on how to work with community members.
2. To share ideas on how to promote good health in the community.
3. To identify community resources that can help participants improve their eating habits, increase their physical activity, and stop smoking (e.g., walking trails, healthy restaurants, smoking quitlines).
4. To give input on strategies to improve community resources.
5. To give input on strategies to make the community more supportive of healthy behaviors.
What are key characteristics of a Community Advisory Board member?

A CAB member:

1. knows the community well.
2. is a team player.
3. has time, interest, and energy to commit (i.e., isn’t over-committed to several other projects or advisory boards).
4. is interested in and committed to improving his/her own health, that of his/her friends and neighbors, and the health of community members.
5. has a “go get ‘em” personality.
6. is willing to attend meetings.

- Program participants who are active in the community.
- The spiritual leaders of a local place of worship.
- Long-time community residents at local places of worship with an interest in community health (ask pastors or other spiritual leaders for suggestions).

b. Post recruitment flyers [CD icon] in community meeting places. (See page 20 for version of a CAB recruitment flyer to photocopy or go to the CD for an editable Microsoft Word version.)

c. Recruit 5-10 members.

- Find out which people on your list of potential members have an established relationship with your organization. Call these individuals first.
- Describe the program (WISEWOMAN or another program), their potential role as CAB members, benefits to them personally, and benefits to the community.
- Ask potential members to join the CAB; allow them time to consider the request.
- After 1-2 weeks, touch base with potential members to see if they are willing to participate. If they are willing, get contact information from each new CAB member.

d. Schedule the first meeting.

- Suggest 3-5 possible meeting dates and times and ask CAB members for the dates on which they are available.
- Choose the date that most members can attend.
- Send out a CAB welcome letter that includes the first meeting date. (See page 21 for version to photocopy or go to the CD for an editable Microsoft Word version.)
Hold the first Community Advisory Board meeting

a. Start the meeting with an ice-breaker (For example, ask everyone to name their favorite form of physical activity or to talk about something they’ve done recently to benefit their health).

b. Explain the goal of the program (i.e., for WISEWOMAN, the goal is to help underserved, midlife women reduce their risk of heart disease and obesity through healthier eating, more physical activity, and smoking cessation).

c. Explain the purpose of the community resource tools (i.e., to link participants with community resources that encourage them to initiate and maintain healthy behavior changes).

d. Explain the purpose of the CAB and clearly state your expectations.

e. Ask members what they hope to get out of their CAB participation.

f. Brainstorm with the group about community resources and barriers. Take detailed notes!

g. Ask the group to describe changes they would like to see in their communities. Continue taking good notes!

h. Provide healthy refreshments.

i. Follow up after the meeting to assess their interest and what they have to offer (e.g., skills, time, personal contacts).
Sample CAB Recruitment Flyer (photocopy or use editable CD version)

WISEWOMAN Project
Community Advisory Board

What is WISEWOMAN?
WISEWOMAN is a program to help women reduce their risk of heart disease and obesity, through healthier eating, increased physical activity, and smoking cessation. Women between the ages of 40 and 64 years who are enrolled in the North Carolina Breast and Cervical Cancer Control Program are eligible to participate in WISEWOMAN.

What is the WISEWOMAN Community Advisory Board?
The WISEWOMAN Community Advisory Board (CAB) is made up of 5-10 people who live in our community and are familiar with community resources, are interested in promoting good health, and are willing to share ideas and information about the community with the WISEWOMAN project staff. CAB members do not have to be health professionals.

What will I be asked to do as a CAB member?
As a member of the WISEWOMAN CAB, you will be asked to participate in 1-2 advisory board meetings over the course of a year. You will also be asked to let WISEWOMAN project staff contact you occasionally to get advice on approaches to working with the community. We may ask you to:

- identify community resources (such as walking trails, healthy restaurants, smoking quitlines) that can help women improve their eating habits, increase their physical activity, and stop smoking.
- share ideas on how to promote good health in the community.
- give input on efforts to improve community resources (such as asking the Parks & Recreation Department to offer programs for middle-aged and older women).

Who sponsors the WISEWOMAN Project?
WISEWOMAN is sponsored by the North Carolina Department of Health and Human Services and the Centers for Disease Control and Prevention.

Where can I get more information?
If you are interested in serving as a CAB member, contact:
Step 3

Draft and pilot test the community resource tools.

After adding the community-specific information about each resource into the Community Resource Guide templates, print the Community Assessment, Tip Sheets, and the newly developed Community Resource Guide from this book or the CD. (See page (7) for version of the Community Assessment Tip Sheets to photocopy or go to the CD for an editable Microsoft Word version.)

People who have lived in the community for a while and have an interest in health promotion may be able to provide you with valuable information about community resources. Interview 5-10 potential or current program participants, members of the WISEWOMAN CAB, and other key informants to get feedback about your community resource tools. You can revise the tools so that they are more relevant and culturally appropriate for program participants.

You can use the interview guide in Appendix B to ask key informants about:

a. The most appropriate resources for program participants.

b. Additional local resources (e.g., produce stands, walking clubs) that you may not have been able to find in the phone book, on the Internet, or from community leaders.

c. Important barriers and facilitators that affect participants' ability to use different resources. For example:
   • Does fear of crime keep participants from walking in the local park?
   • Do they know about the local produce market?

d. Advice they would give a friend to encourage her to use resources.

Revise the community resource tools by adding or removing resources from your evolving Community Resource Guide, or adding new tips that participants have provided to the Tip Sheets. Give interview participants a copy of the Community Resource Guide to thank them for their help.

Our experience: Pilot testing the community resource tools

In New Hanover and Columbus Counties, we pilot tested the Community Assessment and Tip Sheets with 16 women and shared the Community Resource Guide with 12 women. Their feedback was insightful and helped us decide what to include in the final versions of the tools. For example, one woman noted the benefits of shopping at a local produce market: “...So, I’d just tell people about the good prices they have there and how fresh the produce is and it’s a really nice place and it’s local, too. You can support the farmers locally.”

Thus we included similar advice on the tip sheets: “Eat homegrown and local produce—it is fresher and tastes better!”

Another community member said: “Assess where the parks and the trails are near your place of work. Just look around you and see what’s available within say a mile range near your work place...even if you work full-time you can still use your lunch hour or right after work.” So we included the following tip: “Explore the area around your workplace to find a safe place for walking during lunch, breaks, or after work.”
Community Assessment

General instructions: Read the following introduction to the participant. Then go through the assessment with the participant, asking her to answer based on her usual practices. Although the Community Assessment does not need to be tailored, you may need to exclude some items. For instance, if your community does not have a mall, you do not need to ask the participant item #10. After all questions are answered, praise the participant for healthy practices, indicated by responses that fall in the far left-hand column. Encourage her to keep up the good work. Work with the participant to choose one diet and one PA practice that fell in either the far right or the middle column that she wants to work on improving. Refer to the tip sheets for that item and the Community Resource Guide for resources to facilitate a healthier lifestyle. If the participant is already exercising regularly for the recommended amount of time (about 60 minutes per day, indicated by questions 6-11), setting a PA goal may not be necessary.

Introduction:

The following questions will help identify things in your community that make it easy or hard for you to eat healthy foods and be active. Identifying these things can help you to take advantage of the positive resources in your community and be more aware of what is less healthy. For these questions, a healthy diet is one that includes plenty of vegetables and fruits, some whole grain breads, pastas, and cereals, and small amounts of fat from meats, dairy products, spreads, and sauces. For each question, choose the word or phrase that best answers the question for you.
<table>
<thead>
<tr>
<th>Question</th>
<th>Response Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. During the growing season, how often do you get produce from a fruit/vegetable stand, farmer’s market, personal garden, and/or local farm?</td>
<td>Very often</td>
</tr>
<tr>
<td>2. How many times during the week do you eat food from a fast-food place or snack foods from a convenience store?</td>
<td>0</td>
</tr>
<tr>
<td>2a. If 1-2 or 3+, are these foods...</td>
<td>Very healthy</td>
</tr>
<tr>
<td>3. How often do you keep snack foods such as candy and chips in your home?</td>
<td>Hardly ever</td>
</tr>
<tr>
<td>4. How healthy is the food you eat while at your place of worship or at a social gathering?</td>
<td>Very healthy</td>
</tr>
<tr>
<td>5. How healthy is the food you eat while at work?</td>
<td>Very healthy</td>
</tr>
<tr>
<td>6. How often do you walk for exercise?</td>
<td>3+/week</td>
</tr>
<tr>
<td>7. How often do you exercise at a park or on a trail?</td>
<td>3+/week</td>
</tr>
<tr>
<td>8. How often do you exercise at a fitness center, such as a YWCA?</td>
<td>3+/week</td>
</tr>
<tr>
<td>9. How often do you exercise at a school’s facilities (like a track or gym)?</td>
<td>3+/week</td>
</tr>
<tr>
<td>10. How often do you walk for exercise at the local mall?</td>
<td>3+/week</td>
</tr>
<tr>
<td>11. How often do you exercise at work?</td>
<td>3+/week</td>
</tr>
<tr>
<td>12. Does crime in your community make it harder to be active?</td>
<td>No</td>
</tr>
<tr>
<td>13. Does traffic in your community make it harder to be active?</td>
<td>No</td>
</tr>
<tr>
<td>14. Does your community have sidewalks?</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Tip Sheets

1. Try fruit and vegetable stands and pick-your-own farms:
   ♦ Eat homegrown and local produce—it is fresher and tastes better!
   ♦ If you live in a larger city, visit farmer's markets and produce stands to build "small-town" connections with the people who grow your food.
   ♦ Buy in-season fruits and vegetables—they are usually the least expensive.
   ♦ Buy fruits and vegetables in bulk and freeze (strawberries, corn) or can (peaches, beans) what you don't eat, for an "off-season" treat!
   ♦ Go with a friend to a pick-your-own place and share what you pick with other friends and neighbors.
   ♦ See the Community Resource Guide for places to get low-cost, fresh fruits and vegetables.

2. Drive on past the fast food:
   ♦ If you are often tempted to stop for fast food in the mornings, eat a healthy breakfast at home instead—this is usually faster and cheaper!
   ♦ Take quick snacks, like apples or carrot sticks, when running errands, so that you are not hungry when you pass a fast-food place. Plan for times like this and buy healthy, quick snacks at the grocery store.
   ♦ Use recipes in the New Leaf manual to prepare "fast" food at home!
   ♦ If you eat at fast-food restaurants, be sure to look at the nutrition information to choose the healthiest options.

3. Make healthy choices easier in your home:
   ♦ Keep a big bowl of fruit in the house, instead of a candy dish.
   ♦ Treat the children in your household to tasty, convenient, and healthy snacks. Try grapes, trail mix, flavored rice cakes, bananas and apples with peanut butter, and nuts. It's never too early to start eating healthy!
   ♦ Don't bring unhealthy foods into your home. But if you do, keep healthy foods in easy-to-reach places, and put unhealthy foods in hard-to-reach places.
4 Make healthy choices easier at church or social gatherings:
   ✦ Take a healthy dish to potluck dinners, and encourage your family and friends to try it!
   ✦ Choose healthy foods at potlucks and other gatherings. Try healthfully prepared vegetables and fruits; avoid dishes with heavy sauces and creams; choose baked or grilled meats rather than fried.
   ✦ Talk to church or social club leadership about including healthy foods at church-wide or club-wide meals. Recommend a caterer or restaurant that has healthy food.

5 Make your workplace a healthier place to be:
   ✦ Bring food from home—when you grocery shop, stock up on foods that you enjoy, such as sandwiches, canned fruit, or salad fixings, which can be very easy to bring to work.
   ✦ In your work cafeteria, choose fruits, vegetables, whole grain breads, and lean meats.
   ✦ If you eat from a snack bar, choose low-fat yogurt, milk, fruit, granola bars, or orange juice.
   ✦ If you buy foods from a vending machine, choose water or diet drinks, and snacks like granola bars, baked potato chips, pretzels, or animal crackers.
   ✦ If you would like to see healthier foods made more available at work, ask management what you can do to make this happen!
   ✦ Take advantage of kitchen facilities at work.
     If a refrigerator is available, bring:
     • Fruit salad
     • Low-fat yogurt
     • Tuna salad and crackers

     If a microwave is available, bring:
     • Leftovers
     • Healthy soups that can be reheated
     • Low-fat frozen entrees

     If neither is available:
     • Talk with your boss how to make a refrigerator and/or microwave available.
     • Pack healthy lunch items that don’t need to be refrigerated, such as peanut butter on whole wheat bread, fruit, or raw vegetables.
Walk in your community:
♦ Start a walking group in your community!
♦ Walk for errands instead of driving.
♦ Think about other places to walk, such as school tracks or malls. See the Community Resource Guide for more information about places to walk.
♦ Call the appropriate city or county agencies if sidewalks, traffic, crime, lack of streetlights, or stray animals keep you from walking in your area. (The Community Resource Guide lists the people and phone numbers to call.)

Enjoy nearby parks:
♦ Take a family trip to a park—walk around the playground while your children play on the equipment. Use parks as a place for the whole family to enjoy the outdoors while getting exercise!
♦ Start a walking group at a local park.
♦ While you walk at the park, you can also use your time for prayer, meditation, or reflection.
♦ Write or call the Parks & Recreation Department to suggest park improvements, such as adding benches, widening paths, or adding restroom facilities (see the Community Resource Guide for information).
♦ If a park seems unsafe, contact the Police Department for more patrolling. Look for information about park watches in the Community Resource Guide.

Exercise at low-cost exercise places:
♦ Try all-women’s gyms, and ask about special deals.
♦ Ask local gyms about trial memberships. Take a friend with you and try it out!
♦ If an exercise place doesn’t offer programs or equipment you like, talk to the manager and make some suggestions.
♦ See the Community Resource Guide for low-cost fitness centers and gyms.

Use school facilities to exercise:
♦ Call local schools, community colleges, and universities to find out if they allow the public to use their facilities.
♦ The Community Resource Guide includes some schools that allow the public to use their facilities.
10 Walk in the mall:
+ Join the mall walking group, and reap extra benefits like making new friends.
+ See the Community Resource Guide for the hours the mall opens for mall walkers.

11 Exercise before, during, or after work:
+ Look for opportunities to be active and boost your energy at work. Take the stairs, walk to a coworker’s office (instead of calling or emailing), and park your car farther away from the entrance.
+ Explore the area around your workplace to find a safe place for walking during lunch, breaks, or after work.
+ Talk to your boss about providing flex-time during work for exercising.
+ Bring exercise clothes and stop at a park, trail, gym, or track on your way to or from work.

12 Make your community safer from crime:
+ Organize a Community Watch or Park Watch in your area to foster deeper community relationships and to deter would-be criminals.
+ See the Community Resource Guide for more information on who to call.

13 Ask your city or town for safer traffic patterns:
+ Improve the walking and biking infrastructure in your community by asking for traffic-calming measures in your area.
+ See the Community Resource Guide for more information on who to call.

14 Advocate for more or better quality sidewalks:
+ Sidewalks are an important resource for walking in the neighborhood and community. If your community does not have sidewalks, call to ask for new sidewalks to be built.
+ If your community has sidewalks, but they are of poor quality (many cracks, potholes), call to ask for sidewalk repairs.
+ See the Community Resource Guide for more information on who to call.
Step 4

Use the community resource tools to address barriers and encourage and support behavior change.

When you have finalized your community resource tools (see Step 3), prepare to use the Community Assessment, Tip Sheets, and Community Resource Guide found in this book or go to the CD for an editable Microsoft Word version. The tools can be used in at least four ways with program participants:

1. In one-on-one counseling sessions
2. In group sessions
3. In telephone counseling
4. In mailings

1. One-on-one counseling sessions
   a. Give participants the Community Resource Guide.
      • Explain what the Community Resource Guide is and how to use it.
      • Encourage participants to explore one or more resources.
   b. Administer the Community Assessment.
      • The Community Assessment works just like other assessments that are part of the New Leaf...Choices for Healthy Living manual. Optimal behaviors are in the left column, and behaviors that could be improved are in the middle and far right columns.

<table>
<thead>
<tr>
<th>Community Assessment:</th>
<th>Please circle the appropriate response option for each question.</th>
</tr>
</thead>
<tbody>
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<td>4. How healthy is the food you eat while at your place of worship or at a social gathering?</td>
<td>Very healthy</td>
</tr>
</tbody>
</table>
• Examine responses in the left ("optimal") column. Praise the participant and encourage her to keep up these healthy behaviors.

• Ask the participant how she has overcome community and personal barriers that make it hard to engage in healthy behaviors—this is a good way to gather ideas to share with other participants.

• Examine the behaviors that need improvement (far right and middle columns). Collaborate with the participant to set goals to improve one diet and one physical activity behavior.

• Smoking is not included on the Community Assessment. Refer smokers to the New Leaf smoking cessation tools and resources listed on the Community Resource Guide.

c. Ask the participant about the barriers she faces.

• Use the corresponding Tip Sheets, Community Resource Guide, your own experience, or ideas shared by other participants to give the participant suggestions about how to overcome the identified barriers.

• The Tip Sheets refer to the Community Resource Guide frequently, so be sure to have it handy!

**Tip Sheets**

1. Try fruit and vegetable stands and pick-your-own farms:
   - Eat homegrown and local produce—it is fresher and tastes better!
   - If you live in a larger city, visit farmer’s markets and produce stands to build "smalldown" connections with the people who grow your food.
   - Buy in-season fruits and vegetables—they are usually the least expensive.
   - Buy fruits and vegetables in bulk and freeze strawberries, corn, or any produce, because what you don’t eat, for an ‘offseason’ treat!
   - Go with a friend to a pick-your-own place and share what you pick with other friends and neighbors.
   - See the Community Resource Guide for places to get low-cost, fresh fruits and vegetables.

2. Drive on past the fast food:
   - If you are often tempted to stop for fast food in the mornings, eat a healthy breakfast at home instead—this is usually faster and cheaper!
   - Take quick snacks. Use apples or carrots sticks, when running errands, so that you are not hungry when you pass a fast food place. Plan for times like this and buy healthy, quick snacks at the grocery store.
   - Use recipes in the New Leaf manual to prepare "fast" food at home! See pages 3-23 & 3-24.
   - If you eat at fast food restaurants, be sure to look at the nutrition information to choose the healthiest options.

3. Make healthy choices easier at home:
   - Keep a fruit bowl at the house, instead of a candy dish.
   - Treat the children to your household to sleep, exercise, and healthy snacks. Try grapes, melon, and no-fat milk. Bananas and apples with peanut butter, and nuts. It’s never too early to start eating healthy!
   - Parents’ habits can be a child’s favorite. Never if ever eat, argues unhealthy foods.
Facilitate beneficial community changes

When your program is well established and participants have begun thinking about barriers in their communities regarding healthy eating and physical activity, consider whether it is time to encourage community advocacy and community change efforts. These might include:

- establishing a community garden
- getting a sidewalk repaired
- adding streetlights
- advocating for improved traffic patterns
- setting up a community watch group

Invite a group of participants to work together on a community advocacy or change effort. It may take some time to investigate the appropriate people and departments to call, but the investment of time will be worth it if participants succeed in achieving the desired improvement!

We hope that this guide will be helpful for creating and using tailored community resource intervention tools. Use the newly developed tools to support participants as they try to eat healthier foods, be more physically active, stop smoking, and advocate for beneficial community changes. They will feel better and be healthier as a result!

d. Follow up on the participant’s progress.
   - Use follow-up visits or phone calls to ask the participant about progress toward meeting her goals.
   - If goals have been met, encourage the participant to set another goal.
   - If goals have not been met, use the Tip Sheets to encourage the participant to keep trying, and help identify useful resources in the Community Resource Guide.

2. Group sessions

a. Ask group participants about barriers to a healthy diet or physical activity in their neighborhoods and/or communities.
   - Ask them to share ideas about how they overcome barriers.
   - Pass out Tip Sheets and let participants know that the Tip Sheets contain suggestions others have made for overcoming common neighborhood/community barriers or using resources.
   - Discuss some of the salient tips in the session.

b. Give participants copies of the Community Resource Guide.
   - Encourage them to use one or more resources listed in the Community Resource Guide and report back to the group at the next session.
   - Ask if anyone is already using resources listed in the Community Resource Guide.
   - If some of the resources are being used, ask participants to share their experiences using these resources.

3. Telephone counseling

Administer the Community Assessment over the phone and proceed as in #1 above (one-on-one counseling sessions).

4. Mailings

Mail the Community Resource Guide to participants with an encouraging, personalized message about how to use the resources in the Guide.
Appendix A. Finding out more about community resources

This appendix was designed to help you identify specific community resources to include in the Community Resource Guide. Use the information here to tailor the Guide to your community.

There are a variety of websites and local and state offices that can help you identify nutrition, physical activity, smoking cessation, and community change resources in your community. In addition to the specific resources listed by category on the following pages, these websites may be helpful:

- **North Carolina Prevention Partners:** Enter your county’s name and the type of resources you want to learn about, and click “search” to find resources to include on your tailored Community Resource Guide. [http://www.ncpreventionpartners.org/index.htm?focus=165](http://www.ncpreventionpartners.org/index.htm?focus=165).

- Explore the **Eat Smart, Move More North Carolina** website for online resources for a healthier diet and increased PA. [http://www.eatsmartmovemorenc.com/](http://www.eatsmartmovemorenc.com/).

- Find out more about your community by contacting the **Healthy Carolinians Partnership Coordinator** for your area. [http://www.healthycarinians.org/countyprof.htm](http://www.healthycarinians.org/countyprof.htm).

- **NC Health and Wellness Trust Fund:** Find out how to improve your workplace and community to make eating healthier and being physically active easier. This organization is also creating a nutrition and physical activity resource database that will be searchable by county or zip code, available to the public in fall 2005. [http://www.fittogethernc.com](http://www.fittogethernc.com).

- **American Diabetes Association:** Navigate to the section of this website called “Community Programs and Local Events” for activities that are happening in your area related to diabetes prevention. [http://www.diabetes.org](http://www.diabetes.org).

- Many **church or other faith-based organizations** in your community may offer helpful resources or programs for better nutrition, more physical activity, or smoking cessation. You may want to ask program participants or other community members if they know of any of these.

- Many of the resources suggested below can be located using the “find it” feature at [http://www.mapquest.com](http://www.mapquest.com).
Nutrition Resources

Farmer’s markets, produce stands, pick-your-own farms

Search online or call the North Carolina Department of Agriculture for information about local markets, produce stands, and pick-your-own farms.

- NC Farm Fresh: http://www.ncfarmfresh.com/
  http://www.ncfarmfresh.com/farmmarkets.asp
- NC Department of Agriculture and Consumer Services: http://www.nccagr.com/markets/facilities/farmark/
- North Carolina Department of Agriculture: 919-733-7125

Food buying clubs

The SHARE (Self-Help and Resource Exchange) program allows people to purchase a monthly package of food with a retail value of about $35 for $16 plus 2 hours of community service. The package contains meat, fresh fruits, vegetables, and staples. In addition, the Food Trust offers SHARE participants the option of purchasing locally grown fresh fruits and vegetables for six months out of the year (June-November). You may have to search a little to find the SHARE program nearest you.

- SHARE program: http://www.sharefoodprogram.org
  910-485-6925
- Food Trust:

Restaurants with healthy options

The North Carolina Winner’s Circle is a program designed to increase the availability of healthy food options in North Carolina restaurants (as well as schools and other venues).

- NC Winner’s Circle:
  http://www.ncwinnerscircle.com (statewide)
  http://www.ncwinnerscircle.com/documents/nc_venues_listing.pdf (list of local approved venues)
- Contact: State Winner’s Circle Coordinator, NC Division of Public Health
  Physical Activity and Nutrition Branch
  1915 Mail Service Center
  Raleigh, NC 27699-1915
  919-707-5215 (office)
  919-715-0433 (fax)
  wc.communities@ncmail.net

Nutrition classes

Nutrition classes are frequently offered by local organizations. For example, most Health Departments and Cooperative Extension agencies sponsor classes on how to shop and cook for healthier eating. Your own agency may offer nutrition classes, or classes may be available through the local Diabetes Coalition or other chronic disease prevention programs.

- Use your county's name and "nutrition classes" to find local opportunities online: www.google.com.
- Go to your county health department’s website and contact the nutrition education division to ask about community classes on topics such as portion sizes or healthier cooking strategies.
- Contact your county's cooperative extension agency. See one example at: http://www.ces.ncsu.edu/copubs/nutrition/012/

Food banks

Use these resources to find a food bank in or near your community.

- Food Bank of North Carolina (administrative offices): 3808 Tarheel Drive
  Raleigh, NC 27609
  919-675-0707 (phone)
  http://www.foodbanknc.org/distribution.html
- Manna Food Bank:
  627 Swannanoa River Road
  Asheville, NC 28805-2445
  828-299-3663 (phone)
  manna@secondharvest.org
- Second Harvest Food Bank of Metrolina:
  500-B Spratt Street
  Charlotte, NC 28208
  704-376-1785 (phone)
  http://www.secondharvestcharlotte.org

Gleaning networks

Encourage WISEWOMAN participants to volunteer to glean at local farms! Gleaning is a great way to be physically active while helping to gather food for the hungry that would otherwise be left in the fields. The Gleaning Network, a project of the Society of St. Andrew, coordinates volunteers, growers, and distribution agencies.

- If you are from central or eastern North Carolina, contact:
  The Society of St. Andrew
  P.O. Box 25081
  Durham, NC 27702-5081
  919-683-3011 (phone)
  866-453-2662 or 866-GLEANNC (toll-free)
- If you are from western North Carolina, contact:
  The Society of St. Andrew
  P.O. Box 220006
  Charlotte, NC 28222
  704-553-1700 (phone)

To learn more, go to:
http://www.endhunger.org/north_carolina.htm
Congregate meal sites
Search the web using your county’s name and “congregate meal sites” to find websites listing the places where seniors can go for healthy, low-cost meals. You can also call your county’s senior center to ask about congregate meal sites. A list of senior centers by county can be obtained from:

- 2101 Mall Service Center
  Raleigh, NC 27699-2101
  919-733-3983
  http://www.dhhs.state.nc.us/aging/scenters/sccty.htm

Van rides to grocery stores
Many senior centers or other community agencies coordinate van rides to local grocery stores. If you think this is a potentially useful service for your WISEWOMAN population, call the local senior center to find out about these services.

Physical Activity Resources

Parks and trails
Call your city or county Parks & Recreation Department and City/Regional Planning Department to learn about local parks and trails. Ask about walking groups that may be of interest to program participants.

- State parks:
  919-733-PARK (general information or to request a brochure)
  919-733-4181 (State parks main office)
  http://lis.unc.edu/parkproject/main/visit.html

- NC Rails to Trails:
  Carolyn Townsend, RN, BSN, MPH (State WISEWOMAN Coordinator and Rails to Trails Chair)
  919-542-5422
  http://www.ncrailistrails.org/DEPOT.HTM

- NCDOT Division of Bicycle and Pedestrian Transportation:
  1552 Mall Service Center
  Raleigh, NC 27699-1552
  919-733-2804
  http://www.ncdot.org/transit/bicycle/

- North Carolina hiking trails:
  http://www.americantrails.org/resources/statetrails/NCstate.html
  http://www.traillink.com/

- North Carolina bicycle trails:
  http://www.great-trails.com/nc.shtml

- Call the Chamber of Commerce in your town to ask about historic downtown walking programs or related activities.

Mail walking
Call your local mall and ask if they have a formal mail-walking program or if they open their doors early for walkers. Ask about the benefits of joining the program. For example, one mail walking program offers a monthly bagel breakfast for all registered mail walkers.

School tracks, fields, and tennis courts
Call local schools, community colleges, and universities in your area and ask if the public is allowed to use facilities such as tennis courts or tracks. Ask about the specific facilities that are available and their hours and days of availability. Most school gymnasiums can be used by groups with permission and for a fee.

YWCA and YMCA
Visit or call your local YWCA or YMCA to find out about equipment and programs appropriate for WISEWOMAN participants. Ask about reduced fees for income-eligible community members. You can find information on your local YMCA by entering your zip code at http://www.ymca.net/

Community gyms and recreation centers
Find out about community gyms and recreation centers funded by the county or city Parks & Recreation Department. These may offer classes and equipment at low or no cost. Contact local gyms to ask if they are willing to lower or waive introductory membership fees for WISEWOMAN participants. Find out if there are any gyms for women only, as these may be more appealing to participants.

Senior centers
Senior centers often have fun exercise programs, equipment, or walking trails, for little or no cost.

- List of senior centers by county:
  2101 Mall Service Center
  Raleigh, NC 27699-2101
  919-733-3983
  http://www.dhhs.state.nc.us/aging/scenters/sccty.htm

Communities or downtown areas with sidewalks and/or bike lanes
Find out about the most walkable and bikeable areas in your county and refer program participants to these places.

Public pools
Contact the Parks & Recreation Department for a listing of local public pools and ask about any programs that would be appealing to your population.
Smoking Cessation Resources

NC and national Quitlines

- NC Tobacco Quitline: 1-800-QUIT NOW is a free telephone tobacco cessation resource where callers get advice from trained cessation specialists.
- American Cancer Society Quitline: 1-800-ACS-2345

American Cancer Society (ACS)
The website (www.cancer.org) includes a variety of resources for quitting smoking:
- Guide to quitting smoking
  http://www.cancer.org/docroot/PED/content/PED_10_13X_Quitting_Smoking.asp
- Planning a quit day
  http://www.cancer.org/docroot/PED/content/PED_10_7_Committing_To_Quit.asp
- Tips after quitting smoking
  http://www.cancer.org/docroot/PED/content/PED_10_13X_Tips_After_Quitting.asp

Over-the-counter nicotine replacement therapy now covered by NC Medicaid
- A health care professional must write a prescription for the therapy in order for Medicaid recipients to be reimbursed.

Centers for Disease Control and Prevention
- The website offers tips for quitting smoking and benefits you gain from smoking cessation. Materials on smoking cessation:
  http://www.cdc.gov/tobacco/how2quit.htm

Women's Health: Interventions for Smoking Cessation (WHISC)
- Smoking cessation website: http://northwestahc.wfubmc.edu/professional/whsic.html

American Lung Association
www.lungusa.org or 1-800-LUNG-USA provides several resources, such as an action plan for stopping smoking, "freedom from smoking" online smoking cessation program, and information on nicotine replacement treatments.

North Carolina Prevention Partners
Go to www.quitternc.org or call 919-969-7022 to find resources for people who want to quit, for family and friends who want to help, and for health professionals with patients who use tobacco.
- Contact information about national, state, and county smoking cessation resources and programs from "Quit Now NC!": http://www.ncpreventionpartners.org/tobaccoprev/CT_directory_03.pdf
- Prevention Partners' Smoking Cessation referral directory: http://www.ncpreventionpartners.org/tobaccoprev/nc_cessation_resources.htm

QuitNet
- Join an online support group for individuals trying to quit, get advice from counselors, find links to local quit programs, and a program to create a personalized quitting plan at www.quitnet.com.

Quit smoking now!
- Find telephone support, tailor a personalized step-by-step plan for quitting, and use an instant messaging cessation service at www.smokefree.gov

Community Change Resources

Community Watch programs
WISEWOMAN participants may wish to form a community watch group. Contact your local Police or Sheriff's Department to get contact information for the officer (usually the Crime Prevention Specialist) in charge of providing materials and technical assistance to neighborhood groups.
- Free community watch brochures can be downloaded from: http://www.gcp.state.nc.us/Police/CommunityWatch/docs/CommunityWatchBrochures.pdf

Park Watch programs
WISEWOMAN participants can work with neighbors to decrease crime in local parks by watching for suspicious activities in the park. Park Watch programs are usually sponsored by the local Parks & Recreation Department and Police Department.
- For an example, visit: http://www.ci.asheboro.nc.us/Departments/parks_rec/park_watch.html

Public Services and Public Works Departments
For community improvements such as sidewalk repairs, call the Streets Division of the Public Services Department, the Streets Maintenance supervisor, or the Public Works Department in your county.

Traffic Services branch
You can contact the Traffic Services branch in the Department of Transportation for help with traffic pattern improvements, such as adding speed bumps and other traffic-calming measures.

Local utilities
To get a streetlight bulb replaced, contact the energy provider in your area (for example, CP&L or Duke Power).
County departments and offices

The contact information for various county departments and offices can usually be found in the phone book or on the county’s website.

- County websites have the following format:
  - http://www.co.(county name).nc.us
  - For example:
    - http://www.co.durham.nc.us (Durham County)
    - http://www.co.pitt.nc.us (Pitt County)

Animal control services

Contact the animal control office in your area to take care of stray animals. For example: http://www.co.bertie.nc.us/Directory/departments/animal/animal.html

Local Physical Activity and Nutrition Coalitions

For a listing of contacts for each county, go to www.eatsmarimovemorenc.com/contacts/index.php

Healthy Carolinians

Get ideas for positive community changes by reading about success stories from many communities in North Carolina at http://www.healthycarolinians.org/

The NC Main Street Program
Appendix B.

Interview Guide: Developing community resource materials
(Introduce yourself, agency, program, and purpose of the program.)

We are interested in learning what you think about things in this community that support healthy lifestyle practices. This information will be put into a community resource guide for individuals in this community. May I ask your opinion about some community programs and resources, and learn what you’ve found to be helpful? (If participant agrees, continue)

We all know it’s important to be active and eat healthy, but there are many things that can make it hard or easy for a person to have a healthy lifestyle. I’d like to hear from you about some of those things. I want to know what comes to mind when I ask about places or things in your community that make it either easier or harder to eat healthier and be active. For example, having a walking trail near your home might make it easier to be active, but having few low-cost gyms nearby might make it harder.

- What are things in the community that might make it harder for a person to eat healthier? (Probe: give examples if necessary, e.g., excessive fast food, vending machines at work)
- What are things in the community that might make it harder for a person to be active? (Probe: give examples if necessary, e.g., traffic, few affordable gyms)
- What are things in the community that might make it easier for a person to eat healthier? (Probe: give examples if necessary, e.g., produce stands)
- What are things in the community that might make it easier for a person to be active? (Probe: give examples if necessary, e.g., walking trails)

I’ve heard you say that ___________ and ___________ are things in this community that make it easier for people to eat healthier and be more active.

- Do you use any of these things? What motivated you to use them?
- Tell me more about them.
- Can you think of anything you could say to a friend to encourage her to use these resources?
- What makes it harder for you or others you know to use these things?

I’ve heard you say that ___________ and ___________ are things in this community that make it harder for people to eat healthier and be active.

- Tell me more about this—are these things a problem for you?
- Have you found ways to overcome these barriers?

Thank you for your time and helpful feedback. We look forward to giving you a copy of the Community Resource Guide when it is finished.
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