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Promoting Heart Health in Rural Women

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Abstract

Purpose—To compare 2 strategies, Stage Matched Nursing and Community Intervention (SMN+CI) and Community Intervention (CI) alone in changing cardiovascular risk factors in up to 3 behavioral areas: diet, physical activity, and/or smoking among rural women.

Methods—A 14-month, multisite randomized controlled trial of 117 rural women was conducted. Transtheoretical model was used in identification of stage of change and development of the SMN+CI nursing interventions. A Social-ecological model was used to address issues of rurality in the development of interventions.

Findings—The SMN+CI group was superior on 4 outcomes. There were significant increases in 2 measures of dietary intake; improvement in dietary stage of change for fruits and vegetables; and reduced diastolic blood pressure (DBP) in the SMN+CI group. After log transformation DBP significance was lost. The CI group had a significant reduction in change in total cholesterol; however, significance was lost after control for the initiation of lipid lowering medications. There was a significant reduction in Framingham risk scores pre- to post-intervention, regardless of group.

Conclusions—There continues to be a need to improve cardiovascular risk factors in rural women. There should be an exploration of whether intensified dose and fidelity of the intervention strategies of diet and physical activity are effective in improving anthropometric and laboratory values. Further investigation is warranted into factors influencing the pre- to post-reduction in Framingham risk scores.

Keywords

cardiovascular disease; nursing; rural women; Social-ecological model; Transtheoretical model

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Cardiovascular disease (CVD) is the number 1 cause of death in the world. Over one-third of Untied States (US) women aged 20 and older had some form of CVD in 2008[1];of these, 47.3% were black and 33.8% white. Prevalence rates of CVD specific for rural dwellers are outdated and difficult to extrapolate from national data.[2] Rural Healthy People 2010 indicated rural populations have higher CVD morbidity, particularly in the South and Appalachian portions of the US.[3] Although some note a higher prevalence of CVD risk factors in rural populations,[4] very few studies have specifically identified the cardiovascular

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risk burden for rural US populations and these are usually small, descriptive, regional studies.[5–8] One study conducted in New Mexico found that "rural patients, regardless of ethnicity received significantly fewer targeted CVD treatments and were less likely to reach blood pressure goals compared with urban patients.[9](p420)

Most agree there are limitations in access to health care, particularly specialty care, in rural areas. Cardiology services are often regionalized and may be less accessible to rural populations, who must deal with distance and transportation issues. One study found echocardiogram utilization among rural veterans was limited by distance.[10] Another study found that transfer of Acute Myocardial Infarction (MI) patients from rural to more tertiary care facilities reduced inhospital mortality; however, women were transferred less frequently,[11] possibly indicating another gap in cardiovascular care for rural women.

Smoking, hypertension, hyperlipidemia and diabetes are known major risk factors associated with increased lifetime risk for CVD and decreased median survival rates.[1] Elevated levels of C-reactive protein (CRP) may increase the risk of CVD in women.[12] Other recognized modifiable risk factors for CVD include physical inactivity, obesity, and abdominal adiposity.[13] Although rural often evokes visions of outdoor work with a physically fit population, this is not always the case. As rural America has become less agriculturally based and more mechanized, rural women have fewer opportunities for physical activity, which in turn increases their cardiovascular risk. Although current literature does not answer the question of whether US rural women have a higher CVD burden than their urban counterparts, it is clear that CVD, as the number 1 killer of women,[1] is negatively affecting the health of all women including those living in rural areas, and thus intervention is warranted.

Modifying diet, physical activity and smoking can reduce CVD risks and improve morbidity and mortality rates.[14] Even modest behavioral changes have benefits, especially if sustained. However, making and sustaining lifestyle modifications is not easily accomplished. A major gap in the literature exists regarding study interventions lasting more than 6 months. Moreover, results are mixed on whether to approach lifestyle modification from sequential or combined interventions.[14]

The purpose of this study was to compare 2 strategies, Stage Matched Nursing and Community Intervention (SMN+CI), and Community Intervention (CI) alone, in reducing cardiovascular risk factors and improving risk markers among rural women. This study sought to reduce modifiable cardiovascular risk factors in up to 3 behavioral areas: diet, physical activity, and/or smoking.

Theoretical underpinnings for this study included the Transtheoretical model (TM)[15] as well as a social-ecological model to account for both environmental and personal systems in health-related behavior and status.[16] Transtheoretical model included assessment of stage of change (SOC) at 5 levels (eg, pre-contemplation, contemplation, preparation, action and maintenance).[15] The Moos model[16] was chosen to help address environmental system limitations (eg, few sidewalks or safe places to exercise in rural communities) and the fact that many rural women drive long distances to work, thus limiting time for physical activity.

Specific aims included determining whether rural women, ages 35 to 65 in the group that received SMN+CI, would have greater changes than those in the CI group on: 1) dietary intake, physical activity, and/or smoking; 2) forward movement through the SOC for behavioral action relative to dietary intake of fruits and vegetables, fats, fiber; intention for weight loss, and physical activity; and 3) improvement on selected modifiable cardiovascular risks as measured on the Framingham Coronary Disease Risk Prediction tool (Framingham), serum levels for CRP, lipids, and cotinine for those reporting smoking within the last 2 years, and anthropometric outcomes including blood pressure (BP), body mass index (BMI), and waist circumference.

METHODS

Design

Promoting Heart Health (PHH) was a randomized controlled trial (RCT). Human subject committee approval was obtained for this study from 2 universities.

Sample

Two hundred and seventy-four (274) rural women were evaluated for eligibility to participate. Barriers to recruitment and participation included 10% of those evaluated with higher than expected CVD burden, including diagnosis of diabetes, Framingham scores of > 20 points, or positive history of a cardiovascular event. Additional recruitment barriers specific to enrolling rural samples (and which have been previously described[17]) included costs, transportation, and the need for multiple recruitment events over a wide geographic area.

Women enrolled in this study had a Framingham score of ≤ 20 points and were between 35 and 65 years of age, with no history of coronary heart disease (CHD) or diabetes. Subjects who reported medications such as lipid lowering drugs or antihypertensives were included if they had been taking those medications for at least 1 year.

Many rural areas are ethnically homogeneous; for this reason, 2 counties were chosen for recruitment of subjects. Rural county 1 was located in upstate New York (NY) and was predominately Caucasian (98%). Rural county 2 was located in Virginia (VA) with a 12% African American population. Both counties had a rural urban continuum code (RUCC) of 6 on a scale of 1–9.[18] The VA site enabled the inclusion of African American women in an attempt to reduce the bias of underrepresentation of this ethnic background in rural CVD research. A power analysis was calculated with $\alpha = .05$ and ES = .50, resulting in a sample size of 64 per group or N = 128.[19] A convenience sample (N = 167) was randomly assigned to SMN+CI or CI groups. Of these, 19 were either medically withdrawn after evaluation of screening electrocardiogram (ECG) or did not complete the first questionnaire. This left 74 women in each of group (N = 148).[17] Figure 1 shows the flow of participants through the study. A total of 117 women completed the study physiologic measures, with 110 of these completing the questionnaires. Table 1 shows the demographics for women completing the study and includes columns for the total sample as well as by group. There were no statistically significant differences for any demographic variable between the SMN+CI and CI groups at study entry. The only variance by state was on the self-report of ethnicity with no African American women enrolled from NY.

Procedure

The Community Intervention (CI) consisted of an invitation, extended to all participants, to attend a community-visioning meeting; 1 meeting was held at each site. Meeting participants discussed ways to increase awareness of both female CVD and the local community resources available to women to improve their heart health. A directed round robin exercise elicited and prioritized ideas for new community-based interventions. The NY subjects requested a web-based listing of countywide accessible physical activity sites. The list of sites and photos was posted on the county health department webpage. The VA subjects chose to use an annual health fair organized and held at a primarily African American church as a means to improve heart health in that region. A community organization in each county was given $2,000 to implement each respective idea.

In addition to assessment of SOC for all subjects, TM was used to develop interventions for the SMN+CI group, across multiple behaviors. Interventions were team developed, designed according to the 10 processes of change,[15] and approved by a TM consultant (personal communication Sue Rossi, University of Rhode Island). Interventions were also designed to take into consideration the rural living environment using the Moos social-ecological perspective.[16] This model helped in designing interventions that accounted for differences in physical environment; for example including ideas for winter outdoor activities in upstate NY and planning physical activity in early morning or later evening in the heat of VA summers. Positive rural environmental factors built into interventions included identifying advantages of space and the cultural aspect of growing vegetables and fruits as well as using seasonal, locally grown foods in a heart healthy diet. Nurses providing the interventions received training on the staged matched interventions in a 2-day workshop.

Each enrolled subject received a pedometer and a monthly diary. The diary included sections for daily recordings of numbers of: 1) servings of various types of food, 2) pedometer steps, and 3) cigarettes smoked. All subjects were paid $5 for each returned diary whether or not completed. Diary and pedometer use were voluntary and are not reported here.

In addition to the community interventions, subjects in the SMN+CI group were also visited 4 times by 1 of 12 Registered Nurses (RNs), using a book of possible interventions for up to 3 areas: diet, physical activity, and/or smoking. Subject and RN negotiated time and place of visit as well as which area(s) to address for each visit.

MEASURES

A booklet containing previously tested instruments measuring dietary intake, [20] physical activity[21] and smoking behaviors,[22] as well as demographic and SOC measures,[22] was given to each participant at the beginning and end of the study. Preintervention anthropometric measures were obtained the day of enrollment and fasting laboratory serums were drawn the following morning. Data reported here include answers to the questionnaires and physiologic measures collected at the time of enrollment and again 14 months later. Post physiologic measures were usually gathered at the same site where subjects had enrolled such as church or workplace. If a subject had scheduling conflicts with the planned final data collection, physiologic measures were obtained by an RN in the home.

Dietary Intake

The National Institute of Health fruit and vegetable food frequency questionnaire (NIH F&V) included 3 subscales: 1) fruit intake by meal, 2) vegetable intake by meal, and 3) total fruit and vegetable daily intake.[20] This instrument measures frequency of intake as well as portion size. Validity for this tool was noted as significantly better than previous tools at measuring fruit and vegetable intake, particularly for women.[20] Cronbach's alpha based on standardized items was calculated as .64 for vegetable, .74 for fruit and .82 for fruit and vegetable intake by meal in this study. The NIH Fat and Fiber screener (NIH F&F) provided an estimate of daily percent of energy from fat.[23] The Department of Agriculture recommends between 25% and 35% of daily caloric intake be derived from fats.[24] The 10 items regarding high fat intake had a Cronbach alpha = .69.

Physical Activity

The Yale Physical Assessment Scale (YPAS) was used to measure Total Time Summary Index (TTSI), Energy Expenditure Summary Index (EESI), and Activity Dimension Summary Index (ADSI) scores.[21] Time spent in work, yard work, caretaking, exercise, and recreational activities was calculated to provide a TTSI reported as hours per week. The

EESI provided an estimation of energy use, reported as kilocalories (Kcal) per week. The ADSI included the 5 dimensions of vigorous and leisurely walking, moving about, standing, and sitting. The YPAS was designed to capture the lower ranges of physical activity seen in older adults by including activities they might participate in such as light housekeeping and gardening.[21] Early work on the YPAS used a 2-week test—data were retested to establish reliability, with correlation coefficients ranging from .42 to .65.[21] Significant correlations have been reported between the YPAS and the Stanford 7-day physical activity recall (PAR), establishing YPAS validity.[25] The areas of lighter activity measured within the ADSI subscale, such as sitting, standing and moving did not correlate as well as walking and vigorous activity or the total summary of the ADSI with the PAR measure.[25] Although initially used with adults 60 and older, the instrument has been used with a variety of groups including postpartum women.[26] The YPAS was chosen for this study since little was known about the physical activity levels of this population. The instrument included activities thought to be pertinent to rural women such as gardening and the fact that it had been previously used in a sample that included African American women.[25] The average energy expenditure for subjects in this study, at 6,445 Kcal/week, compares well to those in the original work where female subjects expended an average of 6,935 Kcal/week.[21]

Smoking

Smoking habits were measured with the University of Rhode Island (URI) Model Stage of Change instrument.[22] Serum cotinine samples were only drawn for women who reported having smoked in the past 2 years upon entry to the study. Cotinine costs were prohibitive for measurement of all subjects.

Stages of Change (SOC)

Transtheoretical model instruments were used to measure SOC in the areas of diet, physical activity, and smoking.[22] Instruments included SOC for dietary intake of fruits and vegetables, fat, fiber, physical activity, smoking, and weight loss intentions. Stage of change was calculated from self-reports about current behavior, whether the individual was considering changing her behavior, and the timeframe in which she expected to make that change.

Framingham Coronary Heart Disease Risk Score (Framingham)

Risk assessment for CHD was derived using the Framingham prediction score sheet for women.[27] The Framingham calculates risk of CHD within a 10-year period for those without known heart disease, but it does not predict other CVD risks. The algorithm included age grouped in increments of 5 years, total cholesterol, high-density lipid (HDL), BP, and status as a diabetic and smoker.[27] The Framingham risk score sheet for women was found to be valid and reliable in the original work on development of the simple algorithm approach to measuring CHD risk for women.[27]

Physiologic Measures

Physiologic measurements included systolic and diastolic BP, height, weight, BMI, waist measurements, total cholesterol, LDL, HDL, triglycerides, CRP, and serum cotinine, as indicated above. Blood pressure was measured using the Joint National Commission on Hypertension (JNC VII) criteria[28] with 3 measurements, averaging the last 2. Laboratory samples were processed on site or at the closest collaborating hospital lab. Samples were transported to 1 site for analysis using laboratory protocol.

Pre and post Framingham and anthropometric measures for the 117 people completing the study are shown in Table 2. There were no statistically significant differences between the 2 groups (SMN+CI vs CI) before interventions for any of the variables measured.

RESULTS

Alpha was preset at .05. Data analysis included N =117 for physiologic measures. Sample size for analyses of self-report instruments was 110. The physical activity instrument (YPAS) responses of "no answer" or "do not know" were coded as missing data. The number of subjects for computations on the YPAS subscales ranged from 98 to 110.

At the end of the study the SMN+CI group had higher fruit intake by meal ($P = .005$) and showed greater pre-post change in total fruit and vegetable intake ($P = .03$). Although the SMN+CI group also ate more vegetables by the end of the study, the difference between the 2 groups was not significant (see Table 3).

There were no statistically or clinically significant differences in percent of energy from fat by group. A reduction of more than 4% of energy from fat is considered clinically significant.[24] The mean reduction for the CI group was 1.7% and it was 2.5% for the SMN +CI group. Both groups had an acceptable mean intake of percentage of energy from fat.

The only physical activity subscale to show a significant correlation with self-reported regular physical activity was the ADSI (r =.55, $P = .00$). There were no significant differences between groups for either physical activity postintervention or in the change scores calculated by subtracting post from preintervention values and conducting an independent t-test on the change.

Stage of Change was collapsed into 2 groups: 1) preparation or lower and 2) action or higher for analysis since some cells had too few subjects using all 5 SOC. In calculating the proportion of women making changes in SOC, a best-case scenario was used. This scenario occurred with 1 of 2 conditions: 1) when a woman moved from preparation or below to action or higher; or 2) if in action or higher preintervention, stayed in that stage or moved from action to maintenance postintervention. Table 4 shows the number and percentage of those making the best-case scenario change by group for SOC variables. The best-case scenario for dietary fruit and vegetable intake was the only significant SOC measure between groups (χ^2 (1)= 6.35, $P = .012$).

Framingham scores ranged from −2 to 13 points, M = 4.50, SD = 3.56. There was no significant difference on Framingham by group after the intervention (t (115) = 1.07, $P = .28$), yet, Framingham scores decreased significantly for the entire sample (t (116) = 6.01, $P = .000$), despite the fact that 18 (15%) subjects had moved into an older age category adding points to the Framingham calculations.

Anthropometric measures, by group, for both pre and postintervention on the 117 subjects completing the study can be seen in Figure 1. The only statistically significant difference by group in BP was in the pre-post diastolic change. The SMN+CI group had a larger change in DBP (− 4 mmHg) compared to a decrease of − .4 for the CI group. Although the difference in change was statistically significant, a reduction of 4 mmHg would be considered a small and clinically non-significant change in diastolic BP[28]; this difference disappeared with log transformation of BP data. The mean BP for all participants was 120/77 mmHg postintervention.

Over half (59, 53%) of the subjects lost weight over the 14-month intervention; of those 31 (53%) were in the SMN+CI group. Although the range for weight loss in the SMN+CI group was from 0.5 to 45.5 pounds, the median weight change for this group was only − 0.5 pounds. Zero (0) was the median weight loss for the CI group. Mean BMI was reduced by 1 point over the 14 months for the SMN+CI and unchanged for the CI group. The CI group had a slightly lower waist measurement postintervention. No differences in measures of weight, BMI, or waist circumference were statistically significant.

Lipid levels for the 117 women showed acceptable mean HDL pre and postintervention. Both groups showed a trend level reduction in total cholesterol ($P = .09$) and LDL ($P = .06$). Pre-post changes in total cholesterol were calculated. SMN+CI had a mean reduction of .05 mg/dl compared to 11 mg/dl for the CI group ($t = 2.36$, $df = 115$, $P = .02$). This difference turned out to be pharmacologically determined. In the CI group, 7 women compared to 1 woman in SMN+CI reported beginning a lipid lowering drug during the study. After controlling for those on lipid lowering medications, the statistically significant difference in pre to post cholesterol levels by group disappeared.

DISCUSSION

Adding targeted nursing interventions to community interventions significantly improved outcomes for 3 dietary measures: 1) intake of fruit by meal, 2) change in total fruit and vegetable intake (see Table 4), as well as 3) SOC for readiness to intake 5 or more servings of fruits and vegetables. SMN+CI subjects also showed a statistically significant but clinically small decrease in diastolic BP, which disappeared after log transformation. Although both groups reduced total cholesterol, initial analysis indicated a significant pre to post reduction for those in the CI group. Further analysis indicated that 7 women in this group had added a lipid lowering agent after entering the study. After correction for those on lipid lowering medications during the study, there was no longer a significant difference for the CI group. The SMN+CI group had a slight reduction in cholesterol despite only 1 additional subject reporting the initiation of lipid lowering drugs after the beginning of the study.

Lipid lowering medications have been shown to be effective in reducing cholesterol yet these medications are not suitable for everyone and are not without risks. A relationship between statins, a type of lipid lowering medication, and the development of diabetes was suggested from a meta-analysis in 2010[29] and most recently this link has been reported among post-menopausal women in the Women's Health Initiative.[30] Thus, nursing interventions that trend toward lowering cholesterol through behavior modification should receive consideration. The National Heart Blood and Lung Institute recommends a trial of 3 months on behavioral modification prior to trying lipid lowering medications for women with Framingham risk scores of < 20 as was true of women in this study.[31]

Both interventions significantly reduced the Framingham risk scores for study participants. There were also trends for increased physical activity in both groups. From these trends it would appear that more study is warranted on the effect of raising individual and community awareness of risks to women's heart health.

Designing interventions for up to 3 behavioral areas at once was undertaken to help build synergy in addressing heart health holistically. One criticism of research using the Transtheoretical model is that if someone enters a study for a particular behavior they are most likely already willing to work on that behavior, and would thus be beyond precontemplation. The study design allowed us to enroll subjects who were ready to work on 1 behavior and begin additional interventions in areas where women were not yet contemplating change at the time of study enrollment.

Comparison of results to other literature specific to cardiovascular risk factors and rural women is difficult due to differences in age ranges across studies.[7,8,32–34] One age-comparable study was found that was successful in reducing BMI and waist circumference using a 12-week classroom intervention that included actual physical activity sessions.[32] There were differences between the 2 studies on physiologic variables preintervention (eg, current study participants had an average beginning BMI of 30.5 K/m^2 and waist circumference of 37.5 in. compared to 32.75 K/m^2 and waist of 40.2 in. in the study of rural overweight and obese midlife women).[32] What is unknown is whether the changes seen using the classroom format would have held for a longer timeframe, such as in the PHH study.

Two comparisons can be made between this study and a descriptive report where 87% of the sample consisted of rural women.[34] First, initially the women in this sample were more likely to be obese (44.4% vs 38.1%).[34] However, by the end of our study only 38.5% of subjects regardless of intervention were obese, which compared favorable to the Pullen et al report.[34] Secondly, the SMN+CI group had a higher percentage of subjects in the action and maintenance SOC for dietary fruit and vegetable intake compared to the Pullen study.[34] A cluster randomized study lasting 6 months had similar outcomes to this PHH study; however, the sample differed as they used men and women living in 20 housing projects.[35] These researchers were also able to increase fruit and vegetable dietary intake in the group receiving individual counseling.[35] It is difficult to find studies with interventions in multiple behaviors conducted in a sample of rural women.

Limitations

Consistent with another intervention study,[36] the calculated attrition over this 14-month study was 21% based on the completion of 117 subjects. The duration of this study does correct previously recognized design flaws of inadequate time to measure long-term behavioral changes using the Transtheoretical model. Five percent (5%) of those completing the study were African American. The most often cited reason for withdrawal, regardless of race, was “too busy.” High attrition rates in long-term studies are not unexpected. Another limitation is that no true control group, without intervention, was used in this design.

Although all instrumentation was valid and reliable, there is no evidence these tools were previously used in a rural-specific population. The food frequency questionnaire was developed and tested with national samples, which should include representation of rural subjects.[20]

Glucose and Hemoglobin A1C levels were not drawn since diabetics were excluded from this sample. Inclusion of these measures would strengthen future work, particularly in light of the recent identification of ideal cardiovascular health defined by inclusion of 7 health components, including fasting glucose.[37,38]

The power calculated for fruit and vegetable intake for this study was .76 given a medium effect size and alpha of .05. Specific variable effect size was unknown prior to this study and thus estimated at .50. Some measures required larger sample sizes to achieve adequate power, (eg, waist measurement by group resulted in $d = .34$, a small effect size requiring 139 subjects per group in order to project a power of .80).[19] Replication of this study with a larger sample size would correct for possible Type II errors on physiologic outcomes.

Multiple RNs provided interventions based on protocols. This approach mirrors the reality of nursing practice. It is possible that some of the lack of significant findings are the result of a Type II error and can be attributed to the lack of fidelity among interventionists.

Intervention programs in rural communities may be affected by informal communication of subjects across intervention groups, thus reducing the impact between groups.[39] Familiarity among subjects in rural areas makes designs that feature randomization and adherence to differing protocols between experiential and control groups difficult. Nurses in this study reported anecdotes of those in the SMN+CI group saying they were going to call a friend, who was not assigned a nurse, to let them know about information they were receiving from their nurse. The sharing of information between members of the 2 differing interventions is very likely, given the size of the rural communities and the close-knit nature of the people who live there. Other researchers have speculated cross-contamination of intervention may have adversely affected the ability to clearly show differences between treatment and control outcomes in rural RCT studies.[39] While this sharing could be considered an advantage in a community-based intervention, it is a deterrent in a RCT. Crossover effects in rural studies do mirror the reality of practice and research in rural communities.

Implications

The change on Framingham scores from pre to postintervention suggests that both interventions led to reduction in risk for CHD. All women received a cardiovascular screening and were told of their Framingham score, which estimates risk of a CHD event in the next 10 years compared to women in the same age group. They also had a copy of all their screening measurements including weight, waist circumference, BMI, BP, total cholesterol, LDL, and HDL prior to entering the study. Knowing their “numbers” may have been enough information for some women to work on risk reduction whether they worked with the RN in the SMN+CI group or were involved only with the CI. Further work needs to be completed on the premise of whether knowing lab values for cardiac risk markers will motivate women to action. Additional analysis of what factors were present for women who did reduce CVD risks, regardless of group, is warranted.

A design that focuses on intervention fidelity, a larger sample size, and ways of preventing contamination across interventions in small rural areas is needed as a next step. Further work needs to be done among rural women on the most effective means of reducing CVD risks, including anthropometric measures. The nurse intervention was successful in improving subjects’ consumption of fruits and vegetables. Unfortunately, these changes did not translate into a statistical reduction in anthropometric or laboratory values for the SMN+CI group. However, a reduction in the Framingham scores, regardless of group, by an average of 2 points across a study period of 14 months may have clinical as well as statistical significance.

Behavioral changes are needed to reduce modifiable risk of CVD in most populations. Although many are aware of heart healthy behaviors, these lifestyle changes remain either elusive or short-lived for too many people. Rural women and particularly African American rural women are often underrepresented in CVD research, yet their risks are of concern. Clearly more work needs to be done to reduce CVD risks to promote heart health among rural women.

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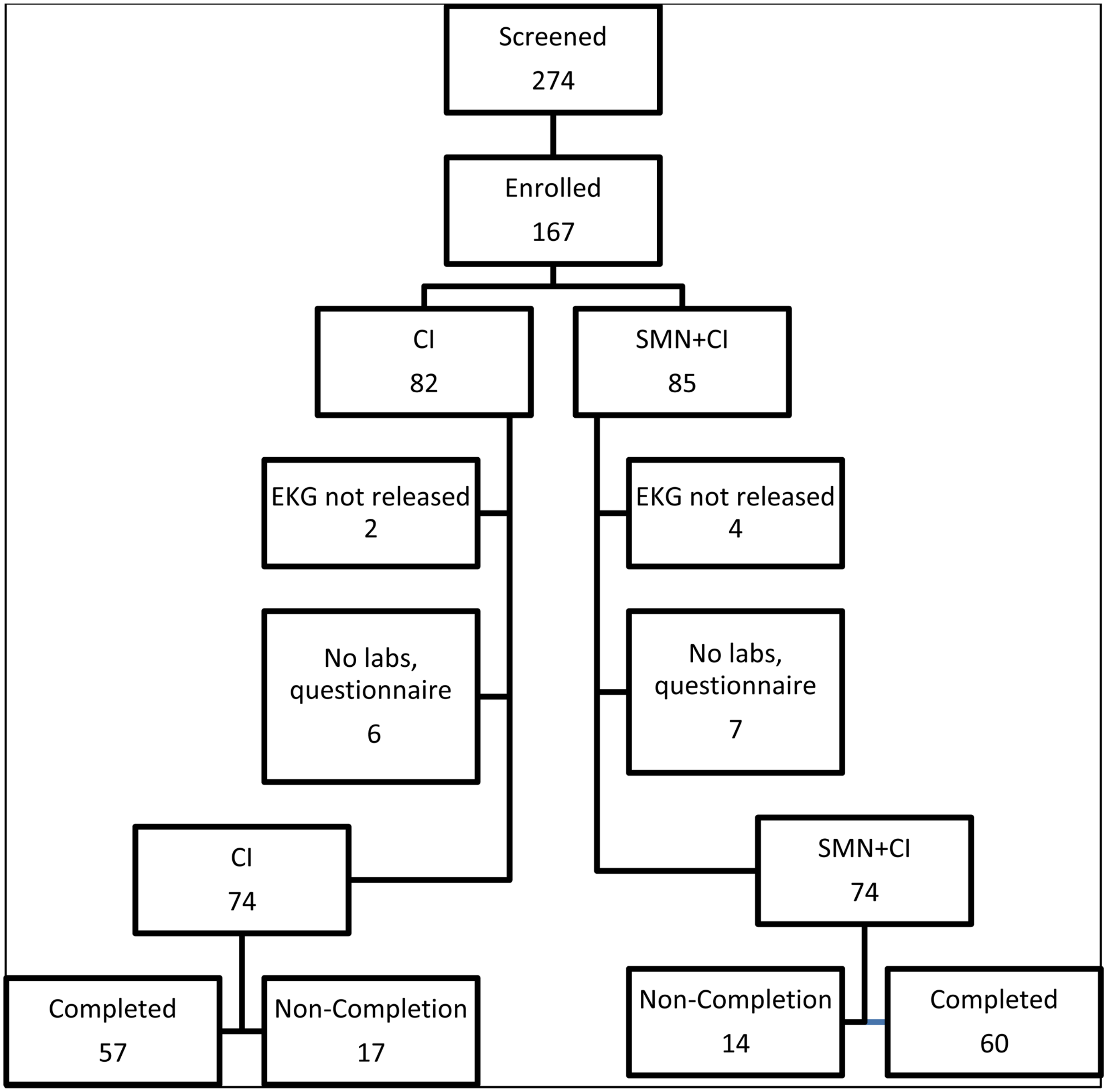

Figure 1.
Flow of Participants Through Study

Table 1

Demographics Total Sample and By Group

	Total N (N = 117)	SMN + CI (n = 60)	CI (n = 57)
Age in years M(SD)	51 (7.59)	52 (7.25)	50 (7.88)
Ethnicity N (%)			
Caucasian	102 (87.2%)	51 (43.6%)	51 (43.6%)
African American	10 (8.5%)	4 (3.4%)	6 (5.1%)
Hispanic	3 (2.6%)	3(2.6%)	0 (0%)
Do Not Wish to Answer	2 (1.7%)	2 (1.7%)	0 (0%)
Education N (%)			
High School, GED or Less	30 (25.6%)	12 (10.3%)	18 (15.4%)
2-Year College or Less	48 (41%)	29 (24.8%)	19 (16.2%)
4-Year College or Post Graduate	39 (33.3%)	19 (16.2%)	20 (17.1%)

Table 2

Pre and Post Intervention Measures by Group and Total Sample

Preintervention Postintervention	SMN + CI	CI	N = 117
SBP	123 mmhg	122 mmhg	122.5 mmhg
	120 mmhg	120 mmhg	120 mmhg
DBP	80 mmhg	78 mmhg	79 mmhg
	76 mmhg	77 mmhg	76.5 mmhg
BMI	31 K/m^2	30 K/m^2	30.5 K/m^2
	30 K/m^2	30 K/m^2	30 K/m^2
Waist	38 inches	37 inches	37.5 inches
	38 inches	36 inches	37 inches
Framingham	7 points	6 points	6.5 points
	4.85 points	4 points	4.43 points
Total Cholesterol	212 mgDL	212 mgDL	212 mgDL
	212 mgDL	201 mgDL	206.5 mgDL
LDL	145 mgDL	135 mgDL	140 mgDL
	139 mgDL	123 mgDL	131 mgDL
HDL	56 mgDL	55 mgDL	55.5 mgDL
	56 mgDL	55 mgDL	55.5 mgDL
TG	131 mgDL	112 mgDL	121.5 mgDL
	125 mgDL	116 mgDL	120.5 mgDL
CRP	4 mgL	4 mgL	4 mgL
	3 mgL	4 mgL	3.5 mgL
Cotinine[a]	189 ngML	188 ngML	188.5 ngML
	158 ngML	209 ngML	183.5 ngML

Systolic blood pressure (SBP), diastolic blood pressure (DBP), body mass index (BMI), total cholesterol (TC), low density lipid (LDL), high density lipid (HDL), triglycerides (TG), and c-reactive protein (CRP).

[a]Cotinine levels available on 15 subjects pre and postintervention.

Table 3

Independent t-test and Confidence Intervals on Fruit and Vegetable and Fat Screeners

SMN+CI(58); CI (52)		Mean (SD)	t	95%CI
Fruit by meal	SMN + CI	1.62 (1.26)	2.89*	(0.189, 1.01)
	CI	1.02 (.91)		
Vegetables by Meal	SMN + CI	2.48 (1.73)	1.09	(−2.81, .965)
	CI	2.14 (1.54)		
All Fruit & Vegtables	SMN + CI	5.36 (3.18)	1.71	(1.01, .592)
	CI	4.62 (3.02)		
Total Fruit & Vegetable	SMN + CI	1.26 (3.08)	2.16*	(.085, 1.99)
Pre-Post Difference	CI	.22 (1.86)		
% of Energy from Fat	SMN + CI	30.42 (4.08)	−1.72	(−3.40, 0.24)
	CI	32.00 (5.50)		
% Energy	SMN + CI	−2.52 (4.78)	−.810	(−2.82, 1.19)
Pre-Post Difference in	CI	−1.7 (5.82)		

Statistically significant difference = *. Pre-post difference calculated by subtracting preintervention from postintervention values.

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Table 4

Best-Case Scenario Changes in Stage of Change by Group for Diet: Fruit & Vegetables, Fat, and Fiber; Physical Activity; and Weight Loss Intention

SOC Measure	Group	Pre (n = 117) (% total) Action or Higher	Post (n = 110) (% total) Action or Higher	Best Scenario (% Group)
Diet: Fruit & Vegetable	SMN + CI	8 (6.8%)	28 (25.5%)	28 (68.3%)
	CI	12 (10.3%)	13 (11.8%)	13 (31.7%)
Diet: Fat	SMN + CI	23 (19.7%)	41 (37.3%)	37 (53.6%)
	CI	29 (24.8%)	35 (31.8%)	32 (46.4%)
Diet: Fiber	SMN + CI	31 (26.5%)	47 (42.7%)	42 (53.8%)
	CI	33 (28.2%)	40 (36.4%)	36 (46.2%)
Physical Activity	SMN + CI	33 21.2%)	32 (29.1%)	30 (52.6%)
	CI	35 (22.4%)	31 (28.2%)	27 (47.4%)
Weight Loss	SMN + CI	60 (38.5%)	52 (47.3%)	23 (56.1%)
	CI	57 (36.5%)	41 (37.3%)	18 (43.9%)

Stage of Change (SOC), Stage Matched Nursing and Community Intervention (SMN+CI), Community Intervention (CI). (N = 110)