

Responses to Health Knowledge and Behavior Questionnaire: Implications for Nutrition Intervention

Dawkins NL^{1*}, Carter VL², Findlay HJ³ and Howard B³

¹Department of Food and Nutritional Sciences, Tuskegee University, USA

²Department of Sociology and Psychology, University in Findlay, USA

³Department of Continuing Education and Department of Biology, Tuskegee University, USA

Article Information

Received date: Nov 17, 2015

Accepted date: Feb 18, 2016

Published date: Feb 23, 2016

*Corresponding author

Norma L Dawkins, Department of Food and Nutritional Sciences, College of Agriculture, Environment and Nutrition Sciences, Tuskegee University, USA, Tel: 334-727-8028; Email: ndawkins@mytu.tuskegee.edu

Distributed under Creative Commons CC-BY 4.0

Keywords Nutrition education; Rural; African-American; Chronic diseases; Community programs

Abstract

Objective: Health disparities for African-Americans are complex and often interrelated with low socioeconomic status, inequalities in income, education, and overall standard of living. The objective of this study was to assess health knowledge and health behaviors among rural residents at risk for chronic diseases and to provide information that may be used in planning community-based nutrition education intervention.

Methods: Two survey instruments (Fact finding and Health knowledge and behavior) were developed to elicit from rural residents their knowledge, and behavior regarding the prevalence of chronic diseases (cancer, diabetes, obesity)1) The fact finding survey was designed to ascertain information about chronic disease awareness and prevention; willingness to participate and level of commitment; and 2) The health knowledge survey assessed participants' knowledge, health behavior, and information about their health and demographic information. The completed instruments were coded and entered into SPSS 17.0 Windows version. Descriptive frequencies, t-Test, and correlations were used to analyze the data.

Results: Approximately 95% of respondents agree that community programs can provide answers to nutrition-related chronic diseases prevention. Of those surveyed 87% expressed willingness to participate in nutrition and health education intervention and only 71% expressed willingness to commit for a year-long program, while 69% are desirous of making healthy lifestyle changes. Respondents felt that annual health examination was important (100%) and 75% had scheduled appointments; 24% of respondents had no form of health insurance. In general 77% and 76% agreed that physical inactivity and high salt intake lead to obesity and hypertension, respectively.

Conclusion: Prevention and awareness nutrition education community-based programs are necessary in rural areas for the reduction of risk factors associated with cancer and other chronic diseases. The results provided information that can be used to influence the planning, development and implementation of nutrition-based community programs for prevention of obesity, cancer and cardiovascular diseases prevention.

Introduction

It is projected that, by 2030, the global cancer burden will reach 21.4 million new cases and cause 13.2 million deaths. Each year, in the US alone, there are two million new cases with 585,720 deaths [1]. African Americans are disproportionately affected having the highest death rate and shortest survival. This trend is also true for life expectancy and other chronic diseases, including heart disease [2].

The yearly cancer incidence rate for Alabama is 446.4 [3] and that of African Americans is 469.5 compared to Whites who have a rate of 461.4 [4]. Bullock and Macon County, rural counties in Alabama's Black Belt, have cancer rates of 488.1 and 442.6, respectively [3]. Additionally, Alabama has one of the highest obesity (32.4%) and diabetes (12.9%) rates in the nation [5,6]. There is a strong correlation between overweight and obesity and increased risk for developing Type 2 diabetes mellitus. Alabama has 17 Black Belt counties; these counties are characterized by rural socioeconomic decline, inadequate education, and high level of poverty, poor health and underemployment [7]. These conditions (poverty, obesity and cancer rates, and unemployment) provide the need for nutrition education community-based programs that will enable individuals in these communities to make dietary and behavior changes to reduce the risk of chronic diseases. Modifiable risk factors can be employed to reduce the risk of chronic illnesses. Globally, recommendations are consistent with advocating high intakes of fruits and vegetables and exercise programs to assist in preventing a wide range of diet-related chronic diseases including cancer and cardiovascular disease [8-15]. Dietary changes are critical in the prevention of diet-related diseases. Intake of fruits and vegetables contributes to cancer risk reduction [16]. Physical activity is also implicated with enhanced health by preventing the onset of certain disease conditions as diabetes, overweight, obesity and certain types of cancer [17]. Community-Based Participatory Research (CBPR) model is a constructive research paradigm used to promote active community participation in shaping research and intervention strategies. It is a process that incorporates research, reflection and dynamic action

Table 1: Demographic characteristics of survey respondents from bullock and Macon county^a.

Variables	Counties	
	Bullock	Macon
Gender		
Male	6 (21.4)	13 (38.2)
Female	22 (78.6)	21 (61.8)
Age Range		
30 - 40	5 (17.9)	8 (23.5)
41- 50	12 (42.9)	14 (41.1)
51- 60	7 (25.0)	10 (29.4)
>60	4 (14.3)	2 (6)
Education		
High School	6 (21.4)	6 (17.6)
Technical College	10 (35.7)	9 (26.4)
College	8 (28.6)	19 (56.0)
Graduate	4 (14.2)	————
Annual Income		
3,000 -10,000	13 (46.4)	7 (20.6)
11,000 - 35,000	10 (35.7)	16 (47.0)
36,000 - > 46, 000	5 (17.9)	11 (32.4)
Health Insurance		
Medicare	4 (14.3)	3 (8.8)
Medicaid	3 (10.7)	5 (14.7)
Blue Cross/Blue Shield	8 ((28.6)	17 (50.0)
Private Insurance	5 (17.9)	2 (5.9)
No Insurance	8 (28.6)	7 (20.6)

^a: The study was conducted during 2012 in Macon County and 2013 in Bullock County two rural counties in Alabama
 *Numbers in parenthesis indicate (%)

involving the community members as full participants [18]. The objective of this study was to assess health knowledge and health behaviors among rural residents at risk for chronic diseases and to provide information that may be used in planning community-based nutrition intervention.

Materials and Methods

Development of survey instruments

This preliminary study was based on the community-based participatory research model. The model engages the community at multiple levels; members from a local coalition voiced concerns regarding the lack of health prevention activities in the community. From this informal discussion coalition members were asked to identify community members who would be willing to participate in a survey to identify views on the community and health-related issues. The “snowball technique” was utilized; initially identified individuals provided information for additional participants [19,20]. Coalition members recruited participants for focus group sessions from local churches, businesses and civic organizations. The information

provided by the focus group sessions (3) were used to develop the fact finding and health knowledge surveys.

The ‘Fact finding’ survey consisted of 19 items that addressed issues relating to community-based programs, individuals’ willingness to participate, individual’s health and family history, physical activity engagement and types, if engaged, demographics, and potential program logistics. The Health knowledge survey consisted of forty items that addressed health knowledge, health behavior, health status, health problems, and the prevalence of diseases and related issues, and demographic information. Prior to distribution the surveys were reviewed by experts in nutrition, sociology, and psychology. It was pilot-tested with a population of similar demographical characteristics and subsequently modified based on results from the pilot test. Subsequent reliability of the instrument yielded a Cronbach’s coefficient alpha of 0.80. “Knowledge” was measured using Likert-type five-point scales (1=strongly disagree to 4=strongly agree or 5=no opinion) which were used to quantify responses based on present knowledge.

Participants/Respondents

Bullock and Macon County are rural counties in Alabama’s Black Belt; Bullock County has a median income of \$34,500 compared with the state median income of \$43,160 with 22.6% of persons falling below the federal poverty level [21]. Macon County’s median income is \$27,957, compared with the state median income of \$43,160 with 28.1% of persons falling below the federal poverty level. Based on the rurality of the area, potential responders were identified using the ‘snowball technique’ initially identified individuals provided information for additional community residents [19,20]. They were recruited from churches, through cooperative extension and other community-based organizations. Inclusion criteria were: 1) age 30-75; 2) residence in Bullock and Macon County. Participants were assured of anonymity and were asked to sign an informed consent after an explanation of the study was provided and their questions were answered satisfactorily. Study approval was obtained from the Human Participants Review Committee at Tuskegee University and the surveys were distributed by hand delivery in different forums (mayor’s office, churches, cooperative extension offices, and other community-based organizations) within the local communities.

Data analysis

The completed questionnaires were coded and entered in SPSS 13.0 Windows version. Frequencies, independent t-test, and correlation were used to analyze the data.

Results

The majority of the respondents from both counties were female between the ages of 41-50 years of age; 69% were females and 29% were males (Table 1). Respondents (42%) earned an annual income of \$11,000- \$35,000 while 25% earned greater than \$36,000 annually. The majority of respondents reported having a college degree (44%). It is important to note that many of the respondents were covered with BlueCross/Blue shield health insurance; however, 24% of them were without any form of health coverage (Table 1). Of the participants from Bullock County and Macon County, 95% and 78%, respectively, indicated their willingness to participate in a cancer risk reduction and prevention study (Table 2).

Table 2: Responses from fact finding survey among individuals in two rural counties of Alabama*.

Statements	Response (%)	
	Counties	
	Bullock(n=28)	Macon(n=34)
Would you be willing to participate in a program related to cancer awareness and prevention among African Americans?	95.2	78
Do you feel that community program provide answers to cancer awareness and prevention?	100.0	85
Would you participate in a healthy lifestyle program?	95.0	93.0
Are you aware of any previous cancer awareness and prevention programs in your community?	52.4	36
If you decide to participate in a healthy lifestyle program, would you stay committed for the full two year period?	61.9	79
Do you think you could be a team leader to help others make a healthy Life style change?	52.4	64.0
Do you exercise regularly?	67	36
Are you desirous of making dietary and life style changes?	81	57
Are you worried about developing cancer or other chronic diseases?	21	29

*The study was conducted during 2012 in Macon County and 2013 in Bullock County two rural counties in Alabama.

^a: Number of respondents 62

Table 3: Responses to health knowledge items by study participants residing in two rural counties, Alabama (N=62).

Selected Statements *	Agree/Strongly Agree		Disagree/ Strongly Disagree		No Opinion	
	Bullock	Macon	Bullock	Macon	Bullock	Macon ^a
Adding moderate amounts of exercise five or more times a week can lead to large weight losses and reduce the risk of heart disease.	20 (71)	29(85%)	8 (29)	5 (15%)	0 (0)	0 (0)
Reducing dietary/food intake alone will allow one to lose weight.	15 (53.6)	19 (56)	8 (28.8)	15 (44)	5 (17.9)	0 (0)
Overeating and lack of physical activity are the main causes of obesity.	19 (72)	28 (82)	6 (21)	6 (18)	2 (7)	0 (0)
Lifestyle behavior is generally affected by cultural orientation.	16 (57)	25 (73)	6 (21)	7 (21)	6 (21)	2 (6)
Excess dietary salt can contribute to high blood pressure.	18 (64)	30 (88)	7 (25)	2 (6)	3 (10)	2 (6)
Understanding what and why you eat is a major factor for controlling your weight	19 (68)	30 (88)	7(25)	4 (12)	0(0)	2 (7)
Processed foods contain more salt than non-processed foods.	18 (64)	30 (88)	6 (22)	3 (9)	4 (14)	1 (3)
Eating a minimum of five servings of fruits and vegetables daily can lower risk of certain chronic diseases.	19 (68)	28 (82)	5 (18)	5 (15)	4 (14)	1 (3)
Overeating and lack of physical activity are the main causes of obesity	20 (71)	28 (82)	6 (21)	6 (18)	2 (7)	0 (0)
Overweight and obesity result when one eats more calories than one uses.	20 (71)	29 (85)	6 (21)	5 (15)	2 (7)	0 (0)
Healthy lifestyle involves a balanced diet, physical activity and adequate rest.	21 (75)	28 (82)	7 (25)	6 (18)	0(0)	0 (0)
Lifestyle behavior is generally affected by cultural orientation.	16 (57)	25 (74)	6 (21)	7(21)	6 (21)	2 (6)

*Numbers in parenthesis indicate (%) ; ^a: The study was conducted during 2012 in Macon County and 2013 in Bullock County two rural counties in Alabama.

Table 4: Effect of gender on the selected responses to health knowledge queries¹.

Statements	Male	Female	t	P*
Adding moderate amounts of exercise five or more times a week can lead to large weight losses and reduce the risk of heart disease.	3.2±0.99	3.06±1.09	0.66	0.51
Reducing dietary/food intake alone will allow one to lose weight.	3.11±1.04	2.74±1.23	1.10	0.27
Understanding what and why you eat is a major factor for controlling your weight.	3.42±0.90	3.23±1.15	0.63	0.72
Overeating and lack of physical activity are contributing factors to diet related illnesses	3.57±0.83	3.16±	0.36	0.18
Overeating and lack of physical activity are the main causes of obesity.	3.36±1.01	3.25±1.17	1.35	0.72
Overweight and obesity result when one eats more calories than one uses.	3.32±0.82	3.14±1.16	0.60	0.55
Healthy lifestyle involves a balanced diet, physical activity and adequate rest.	3.42±0.84	3.18±1.20	0.77	0.44
Lifestyle behavior is generally affected by cultural orientation.	3.15±0.89	3.18±1.24	0.89	0.93

Table 5: Participants Response to health behavior inquires form Bullock and Macon Counties.

Statements*	Often		Usually		Sometimes		Rarely/Never	
	Bullock/Macon	Bullock/Macon	Bullock/Macon	Bullock/Macon	Bullock/Macon	Bullock/Macon	Bullock/Macon	
In a typical week, about how many times do you talk on the phone with friends or relatives?	16(57)	21(61)	6 (21)	9 (26)	3 (11)	1 (3)	3 (11)	1(3)
How often do you attend meetings or programs of groups, organizations or clubs to which you belong?	3(11)	2 (6)	3 (11)	21(61)	14 (50)	8 (24)	8 (29)	2 (6)
I feel extremely guilty after I overeat.	4 (14)	2 (6)	4 (14)	5 (15)	6 (21)	12(35)	14(50)**	8(24)
I have used diet pills to lose weight	2 (7)	1 (3)	2 (7)	1(3)	2 (7)	4 (12)	22 (79)	27(79)**
I have used laxatives, diuretics, or diet pills or other dieting products recommended by health professionals to lose weight.	2 (7)	2 (6)	(4)	(3)	4 (14)	3 (9)	21 (75)	25 (74)**
I eat and drink in privacy.	2 (7)	1 (3)	1 (4)	1(3)	6 (21)	7(21)	19 (68)	24 (71)**
I skip meals in order to keep from gaining weight	1 (4)	1 (3)	0 (0)	3(9)	6(21)	(29)	21(75)	19 (56)**
I tried to lose weight by fasting	2 (7)	1 (3)	1 (4)	1(3)	(14)	8(24)	21 (75)	23 (68)**
I only eat fruits, vegetables and other low calorie foods.	5 (18)	2 (6)	2 (7)	4(12)	8 (29)	10 (29)	13 (46)	15 (44)
I drink at least 8 glasses of water per day	11 (39)	6 (18)	2 (7)	9(26)	11 (39)	0(29)	4 (14)	7 (21)
I think I should lose weight	9 (32)	6 (18)	1 (4)	13(38)	7 (25)	6 (18)	11 (39)	7 (21)

*: The study was conducted during 2012 in Macon County and 2013 in Bullock County two rural counties in Alabama.

*Numbers in parenthesis indicate (%); ** Areas of concern

Table 6: Comparison of responses to health behavior statements as affect by county of residence.

Statements	County			
	Bullock	Macon	t	P*
I feel extremely guilty after I overeat.	3.43±1.79	3.59±1.78	0.377	0.70
I have used diet pills to lose weight.	4.50±1.10	1.97±1.57	-7.19	0.000
I eat or drink in privacy.	1.04±1.26	1.66±1.21	-7.45	0.000
I skip meals in order to keep from gaining weight.	4.24±1.04	2.21±1.55	-5.90	0.000
I have tried to lose weight by fasting	4.2±1.25	1.88±1.19	-7.43	0.000
I have used diet pills to lose weight	4.43±1.26	1.76±1.45	-7.61	0.000
I drink at least 8 glasses of water a day	2.32±1.21	3.64±1.69	3.43	0.001
I only eat fruits, vegetables and other low calorie foods.	3.29±1.41	2.82±1.49	-1.25	0.22

*: The study was conducted during 2012 in Macon County and 2013 in Bullock County two rural counties in Alabama. Responses were based on: 1= Never; 2=rarely; 3= Sometimes; 4=Often.

All the respondents in Bullock County felt that a community program can provide answers to chronic diseases awareness and prevention; there was a lower rate in Macon County (85%). In contrast, less than half of the respondents in Macon County (36%) and a little more than half of those in Bullock County (52.4%) indicated knowledge of cancer and prevention programs in their communities. Of those surveyed, 62% in Bullock County and 79% of those in Macon County expressed a willingness to participate and commit to a year-long program. Macon County respondents were more likely to volunteer to be leaders than their Bullock County counterparts. Majority of respondents (81%) from Bullock County were desirous of making dietary and lifestyle changes compared to Macon (57%). Both groups were not concerned about developing chronic diseases 21 and 29% respectively (Table 2).

The Health Knowledge Survey (Table 3) revealed that respondents strongly supported the statement that overeating and

physical inactivity are the main causes of obesity (Bullock, 71% and Macon, 85%). Of the respondents, 64% of those in Bullock County and 88% of those in Macon County “strongly agreed” or “agreed” to the statement that excess salt contributes to hypertension. A similar trend was observed for the salt content of processed and unprocessed foods (Table 3). Respondents ‘strongly agreed’ that consuming a minimum of five servings of fruits and vegetables daily can reduce the risk of chronic disease(s). For most of the health knowledge items respondents from Macon County were more likely to ‘agree or ‘strongly agreed’ than those from Bullock County.

Gender had no significant ($p > 0.05$) impact on responses to selective health knowledge questions; furthermore, county of residence played no significant ($P > 0.05$) role on responses on health knowledge queries (Table 4). This may be due to the homogeneity of the population groups; both are contiguously located in Alabama’ Black Belt with similar socio-economic status and cultural experiences. Notwithstanding the small population the response is clear, thus emphasizing the need for nutrition education in this population group. Additionally, there was a significant ($p < 0.02$) correlation between education and income; nonetheless there was a negative correlation for education between counties.

The health behavior section (Table 5) of the survey revealed areas of concern. One-half of the respondents from Bullock County (50%) rarely or never had a feeling of guilt after overeating relative to those in Macon County (24%). Another behavioral concern was eating and drinking in privacy. According to survey responses, 32% of Bullock County and 29% of Macon County respondents reported that they ‘eat and drink’ in privacy. Skipping meals was identified as a method for losing weight, especially among Macon County respondents (41%). In addition to skipping meals, respondents also cited fasting as a means of losing weight (Table 5). Use of laxatives, diuretics and other dieting products is not a method of choice among these responders for weight lost. Responses on the perception of losing weight varied among the responders. There were significant ($p < 0.05$) differences between Bullock and Macon county in regards to health behavior statements (Table 6). Respondents from Bullock county were more likely to respond to “often” with all health behavior statements except

for “I eat or drink in privacy “ and “I drink 8 glasses of water a day compared to Macon County. The responses seen from Macon county respondents may reflect the higher number of respondents with a college education. In an effort to prevent diet related illnesses in these rural counties, the need exists for nutrition and physical activity education.

Discussion

Participants overwhelmingly agreed that community programs can provide answers to chronic diseases risk reduction and prevention. Macon County respondents seemed less aware of community driven projects than Bullock County respondents. Although a significant number of respondents expressed that community programs can provide answers to cancer prevention, only about two-thirds indicated they would commit to a year-long program with even a smaller percentage indicating their willingness to serve as a leaders. Also while respondents overwhelming believe that exercise, eating fruits and vegetables, and reduction of salt can have positive health effects, a significant portion of the population did not express that view. In addition, respondents were also prone to unhealthy behaviors to lose weight such as skipping meals and fasting. These approaches have been shown to be ineffective in sustaining weight loss and further complicating the adoption of a healthy lifestyle change. Participants indicated that the cost of eating healthy was a major contributing factor to their dietary choices. Furthermore, the cost associated with engagement in physical activity is also affected by the lack of resources to sustain cost effective physical activity programs in the community. Many of the respondents perceived that exercise is associated with reducing heart disease risks factors; while overeating, high salt intake, and physical inactivity are associated with poor health. In rural communities, lack of exercise facilities and the cost associated with healthy eating are barriers to a healthy lifestyle [22]. The strong agreement with health knowledge questions indicated that respondents are fairly knowledgeable about obesity, heart disease and other factors that are important in health promotion and chronic disease prevention. Dietary changes are critical in the prevention of diet-related diseases. Intake of fruits and vegetables, contributes to cancer risk reduction [16]. Noting the agreement among respondents and the evidence that dietary and lifestyle modification can positively impact health, [8-15] the data strongly suggest the need for community-based programs to bring about changes that will result in decreasing the rates of chronic diseases (cancer, obesity, diabetes, CVD) among African-American living in rural communities.

Also of significance, are the unhealthy approaches to weight lost and the lack of guilt after overeating and eating and drinking in privacy. This is of concern given that obesity has become a public health crisis in the United States. Alabama has the third highest rate of obesity and the incidence in the rural Black Belt counties is much higher to that of the state; Bullock has a rate of 48.5% and Macon County, 40.2% [23]. Furthermore obesity is associated with hypertension, heart disease, diabetes, and certain types of cancers [24-27].

Conclusion

The study reported the degree of health knowledge and health behaviors among rural respondents at risk for chronic diseases. Therefore prevention nutrition and physical education programs are necessary in attempting to reduce risk factors associated with chronic diseases, (cancer, obesity, diabetes, and cardiovascular

disease). The results of this survey provided information that can be used to influence the planning, development and implementation of community-based nutrition intervention and should address issues identified. The small sample size in this study is a limitation; in the future efforts should be made to target a larger number of rural counties.

References

1. American Cancer Society. Learn about Cancer. 2012.
2. American Cancer Society. Cancer facts and figures. 2011.
3. National Cancer institute/Centers for Disease control. State cancer profile. 2014.
4. Alabama Cancer incidence rate.
5. CDC Centers for Disease Control and Prevention. Prevalence of self-reported obesity among US adults by state territory? 2013.
6. Robert Wood Foundation. The state of obesity. 2014.
7. Wimberley RC and Morris LV. The Southern Black Belt: A national perspective. Lexington, KY: TVA Rural Studies (The University of Kentucky). 1997.
8. Slavin JL, Lloyd B. Health benefits of fruits and vegetables. *Adv Nutr.* 2012; 3: 506-516.
9. Bostwick DG, Brawer MK. Prostatic intra-epithelial neoplasia and early invasion in prostate cancer. *Cancer.* 1987; 59: 788-794.
10. Liu RH. Health benefits of fruit and vegetables are from additive and synergistic combinations of phytochemicals. *Am J Clin Nutr.* 2003; 78: 517S-520S.
11. Schuurman AG, Goldbohm RA, Dorant E, van den Brandt PA. Vegetable and fruit consumption and prostate cancer risk: a cohort study in The Netherlands. *Cancer Epidemiol Biomarkers Prev.* 1998; 7: 673-680.
12. Watson AJ1. An overview of apoptosis and the prevention of colorectal cancer. *Crit Rev Oncol Hematol.* 2006; 57: 107-121.
13. Jackson CL, Dreaden TM, Theobald LK, Tran NM, Beal TL, et al. Pectin induces apoptosis in human prostate cancer cells: correlation of apoptotic function with pectin structure. *Glycobiology.* 2007; 17: 805-819.
14. Lentini A, Tabolacci C, Provenzano B, Rossi S, Beninati S. Phytochemicals and protein-polyamine conjugates by transglutaminase as chemopreventive and chemotherapeutic tools in cancer. *Plant Physiol Biochem.* 2010; 48: 627-633.
15. Baranowski T, Henske J, Simmons-Morton B, Palmer J, Kathy Tiernan et al. Dietary change for cardiovascular prevention among Black-American Families. *Health education Research.* 1990; 5: 433-443.
16. PBRC. Pennington Biomedical Research Center. Healthier lives through education in nutrition and preventive medicine Pennington Nutrition Series, V. 21, Baton Rouge Louisiana. 2009.
17. Ignarro LJ, Balestrieri ML, Napoli C. Nutrition, physical activity, and cardiovascular disease: an update. *Cardiovasc Res.* 2007; 73: 326-340.
18. Wallerstein N, Duran D. The conceptual historical and practical roots of community-based participatory research and related participatory traditions: In: Minkler M, Wallerstein N, editors. *Community-based participatory research for health.* San Francisco CA: Jossey Brass. 2003.
19. Dawkins NL, McMickens T, Findlay HJ, Pace RD. Community leaders' knowledge and perceptions about obesity: Implications for outreach educators in designing interventions. *J. of Extension.* 2010; 48: 1-12.
20. Allen JD, Kennedy M, Wilson-Glover A, Gilligan TD. African-American men's perceptions about prostate cancer: implications for designing educational interventions. *Soc Sci Med.* 2007; 64: 2189-2200.
21. U.S. Census Bureau: (2008-2012) State and County Quick Facts. Data derived from Population Estimates, American Community Survey, Census of

- Population and Housing, State and County Housing Unit Estimates, County Business Patterns, Non-employer Statistics, Economic Census, Survey of Business Owners. Last Revised. 2014; 53: 14.
22. Sequin R, Conner L, Lelson M, Croix L, Gallen E. Understanding barriers and facilitators to healthy eating and active living in rural communities. *J. Nutr. and Metabol.* 2014.
23. Centers for Disease Control Counties with Over 40% Obese Adults based on Behavioral Risk Factor Surveillance Systems. 2012.
24. Abbasi F, Brown BW Jr, Lamendola C, McLaughlin T, Reaven GM. Relationship between obesity, insulin resistance, and coronary heart disease risk. *J Am Coll Cardiol.* 2002; 40: 937-943.
25. Lavie CJ, Milani RV, Ventura HO. Obesity and cardiovascular disease: risk factor, paradox, and impact of weight loss. *J Am Coll Cardiol.* 2009; 53: 1925-1932.
26. Stevens J, Truesdale KP. Epidemiology and consequences of obesity. *J Gastrointest Surg.* 2003; 7: 438-442.
27. Steinberger J, Daniels SR; American Heart Association Atherosclerosis, Hypertension, and Obesity in the Young Committee (Council on Cardiovascular Disease in the Young); American Heart Association Diabetes Committee (Council on Nutrition, Physical Activity, and Metabolism). Obesity, insulin resistance, diabetes, and cardiovascular risk in children: an American Heart Association scientific statement from the Atherosclerosis, Hypertension, and Obesity in the Young Committee (Council on Cardiovascular Disease in the Young) and the Diabetes Committee (Council on Nutrition, Physical Activity, and Metabolism). *Circulation.* 2003; 107: 1448-1453.