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General Nutrition Knowledge and Perceived Stress in a Rural Female Faith Community

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Cover Page Footnote
I would like to acknowledge my family and friends for their continued support throughout the duration of this project.

Health care in the United States is challenged by increasing medical costs associated with obesity and costs associated with disability and unemployment benefits (Rich, Sheer, Lopez, & Rosenbaum, 2010). Businesses face additional costs associated with obesity-related job absenteeism and lost productivity (Glickman, Parker, Sim, Cook, & Miller, 2012). The costs of obesity related absenteeism range between $3.38 billion- $6.38 billion ($79 – $132 per obese individual) annually nationwide (Centers for Disease Control [CDC], 2015). In 2010, the cost associated with treating associated obesity co-morbid conditions in the United States was estimated at $117 billion with $61 billion and $56 billion in direct and indirect costs, respectively (Trogdon, Finkelstein, Hylands, Dellea, & Kamal-Bahl, 2008). Nationally, more than one third of the U.S. adult population is obese with an estimated $147 billion annual medical cost (CDC, 2012). Preventing obesity in the young and targeting the adult population with prevention strategies may potentially have a profound impact in healthcare costs by decreasing obesity related illnesses, thus improving health in the long-term.

Obesity is defined as having a body mass index (BMI) greater than 30 and a BMI greater than 25 is considered overweight (National Institute of Health [NIH], 2013). Educational programs that teach rural families nutritional recommendations and dietary guidelines have shown to be effective in increasing consumption of nutritious foods (Jenkins-Howard, Stephenson, & Mains, 2013).

The role of education and health literacy is critical for rural communities where educational attainment is behind the nation as a whole (United States Department of Agriculture [USDA], 2016). There is a large and growing gap in college and graduate level educational attainment between rural and urban areas, even among young adults (USDA, 2016). In rural America, high rates of obesity are associated with a decrease in educational attainment (USDA, 2016). Other factors contributing to obesity in rural communities are limited available resources such as: long distances and time required to reach common destinations in rural communities (schools, grocery stores, the closest town), long distances required to get to work-out facilities, lack of physical activity programs, and family commitments that limit time for proper meal planning and physical activity (Kruger et. al, 2012).

Daily psychological stress can influence food choices, which can potentially lead to an increase in BMI (Tom & Berenson, 2013). Psychological stress is defined as what the individual feels when they are under mental, physical, or emotional pressure (Moore & Cunningham, 2012). It is a bio-behavioral mechanism, which may be associated with potential influences of pressure such as environmental demands, perceived stress, or behavioral responses to stress (Barrington, Beresford, McGregor, & White, 2014). Chronic activation of the stress response may lead to disruption in regulation and has been linked to an increase in appetite, preference for high fat/high sugar foods, and

obesity (Barrington et al., 2014). Roberts, Campbell, & Troop noted that high emotional eaters will eat significantly more after a stressor than low emotional eaters with a typical elevated cortisol response (2013). Unrestrained eating may occur as a means of coping when experiencing a higher level of perceived stress. Establishing healthy coping mechanisms may be more difficult in a rural community due to limited resources (Roberts et al., 2013). Limited primary care providers may also affect healthy coping mechanisms in a rural community.

The United States Preventive Services Task Force (USPSTF) advocates screening for obesity in adults (Grade B) as part of routine primary care services (Moyer, 2012). The recommendation further includes suggested multicomponent behavioral interventions to reduce the effect of negative behaviors on health. Primary care is the first avenue for access to screening. Limited primary care access may lead to a reduction in screening for obesity and initiation of early behavioral interventions. In the National Obesity Observatory, Gatineau & Dent (2011) notes obesity as a key risk factor, with a bi-directional association, in mental illness. Women are more at risk for depression, low self-esteem, and eating disorders related to obesity and perceived obesity than men (Gatineau & Dent, 2011). The benefit of professional counseling services is well documented, but not always available due to the shortage of mental health care in rural communities for at risk individuals (USDA, 2009).

The role of stress and perceived stress in obesity has been documented (Barrington et al., 2014). Screening at the primary care level is essential in identifying obese female patients at risk for health related and mental illness. Stress alone is not a mental health issue, but individuals experiencing stress may lead to negative coping and hinder recommended nutrition and diet observance (Roberts et al., 2013).

In 2004, both the Agency for Healthcare Research and Quality (AHRQ) and the Institute of Medicine (IOM) published comprehensive reviews of the literature on health literacy and health outcomes (IOM, 2010). Both reports concluded that limited knowledge, or limited health literacy, is negatively associated with the use of preventive services and management of chronic conditions such as: obesity, stress management, diabetes, high blood pressure, and self-reported health (IOM, 2010). Educating rural populations to increase the knowledge of recommended nutrition, recommended BMI, and the effects of increased stress related to weight is one step to potentially improve overall health and well-being (Roberts et al., 2013). The link between knowledge deficit, stress, and obesity is well documented. The purpose of this research study was to identify how an educational intervention affects retention of knowledge over time in females in a rural faith community.

The research questions were the following:

1. What is the general nutrition knowledge of females in a rural faith community?
2. What is the perceived stress level in females in a rural faith community?
3. Is there a correlation between BMI and perceived stress in females in a rural faith community?
4. Is there a correlation between perceived stress and nutrition knowledge in females in a rural faith community?
5. Is there an increase in knowledge of recommended nutrition and BMI in females in a rural faith community?

Theoretical Framework

The Health Belief Model (HBM) (Richards & Digger, 2011) was utilized as a guide for this study. The HBM was developed in the 1950's in an effort to assess health behavior and why so few people participated in programs that could prevent and detect disease (Abood, Black, & Feral, 2003) and has been the predominant model of preventive health behaviors since the 1970's (Richards & Digger, 2011). The strength of the Health Belief Model is the "eventual success of disease prevention and curing regimens that involve participants' willingness to participate and the belief that health is highly valued" (Richards & Digger, 2011, p. 210). In applying the HBM model to this study, it is important to understand that a main concept is that one's health behavior is determined by personal beliefs or perceptions about a disease and the available resources to decrease its incidence (Richards & Digger, 2011). Individual perceptions are one of three interacting components within this framework.

Among individual perceptions, perceived seriousness and perceived susceptibility to a disease are to be addressed. In order to see a change in health behaviors, the person must believe that there is a risk in their present behavior and that there will be severe consequences related to that behavior such as obesity due to increased caloric intake. With perceived benefits, losing weight or maintaining proper BMI and stress management (taking action) the person can reduce their susceptibility or severity of a condition such as obesity, diabetes, & cardiovascular disease. There is also perceived barriers such as lack of time for healthy planning, lower socioeconomic status, a decrease in community resources, and a decrease in knowledge in which the cost outweighs the benefit of taking action. In a cue to action, the individual is exposed to factors that prompt an action, such as an educational intervention on recommended nutrition and recommended BMI and the harmful associated effects of obesity and other associated co-morbid conditions. Self-efficacy was later added to this model in 1988 and is how confident the person is to successfully perform the action to

change a behavior and can be reinforced through training, guidance, and education (Richards & Digger, 2011).

Methods

The purpose of the study was to assess the effect of an educational intervention based on the HBM, on knowledge of recommended nutrition and body mass index, and to describe perceived stress in a rural female faith community. A quantitative quasi-experimental pre-test post-test research design was used. English speaking female participants 18 years of age and older were recruited from two rural community churches and were provided an educational intervention. Participants were asked to complete a demographic survey, self-report height and weight, general nutrition knowledge questionnaire, and perceived stress scale. An educational program was presented. Permission to conduct the study was obtained from each faith-based organization and was approved by a university institutional review board. Informed consent was obtained from each participant. Participants self-generated a unique code to use with each questionnaire.

Subjects

A convenience sample from two rural community churches was obtained. All female members of two rural church locations were invited by church email and mailing list to participate in this study. All males and females under 18 years of age and non-English speaking volunteers were invited to stay for the educational intervention, but were excluded from participation in the study.

Setting

The study was held in the fellowship hall at both locations where comfortable chairs and tables were provided for the subjects to participate. Once participants arrived at the selected time, the study purpose, benefits, risks, confidentiality, and ethical considerations were provided through the consent process. The survey tools were administered when the consent process was complete.

Instruments

Demographic data was collected: age, level of education, marital status, height and weight, number of children, and race. Self-report height and weight was collected to determine BMI. BMI was calculated utilizing the Body Mass Index Table (NIH, 2013).

The General Nutrition Knowledge Questionnaire (GNKQ) (Parmenter & Wardle, 1999) for adults was utilized to assess nutrition knowledge. The GNKQ consists of 88 items (all closed items) split into four sections: Dietary

recommendations; Food groups; Healthy Food Choices and Diet, Disease and Weight management (Parmenter & Wardle, 1999). Each section was validated separately and met the criterion for construct validity. The reliability of each section with Cronbach's alpha correlations of 0.7 ± 0.97 for internal reliability (Parmenter & Wardle, 1999). Pearson's correlation was used to assess test-retest reliability on the scores of the 105 respondents who completed the questionnaire twice (Parmenter & Wardle, 1999) with overall reliability of 0.98. This survey assesses baseline knowledge of current dietary recommendations, sources of nutrients, everyday food choices and diet-disease relationships and assesses participants' knowledge after the educational module (Parmenter & Wardle, 1999). Permission was granted to utilize this tool.

The Perceived Stress Scale (PSS), developed by Sheldon Cohen (1983) was utilized to assess the participants' perceived stress. Permission to utilize this tool was obtained. PSS is a 10 item, 5 point Likert stress scale (0= never - 4= very often) that assesses perceptions of how unpredictable, unmanageable and stressful life had been in the month prior to assessment (Cohen, Karmarck, & Mermelstein, 1983). The PSS has acceptable internal and test-retest reliability. Cohen, Kamarck, & Mermelstein (1983) reported Cronbach's alpha between .84-.86 and test-retest reliability for the PSS was .85. Higher scores on this scale indicate higher levels of perceived stress.

Intervention and Data Collection

Prior to the educational intervention, the demographic survey, GNKQ, and PSS were given to all participants. The educational presentation consisted of current evidenced-based recommendations on nutritional information, criteria for food selection and portion sizes according to the United States Department of Agriculture 2010 dietary recommendations (USDA, 2010) and recommended BMI based on the 2015 CDC guidelines (CDC, 2015). The intervention was designed based on HBM concepts. Inclusion of the HBM concepts was applied during the intervention with perceived benefits given priority. The intervention was divided into sections for education of dietary recommendations, sources of nutrients, everyday food choices and diet-disease relationships. Handouts for participants were provided. After the educational intervention, the participants had light, healthy refreshments and a social time of approximately 30 minutes. The follow up GNKQ was administered three weeks later at each site. The data collection process was replicated in each faith based organization.

Statistical Analysis

Data was analyzed utilizing Statistical Analysis Software. Descriptive and correlational statistics were utilized. Descriptive statistics and frequency procedure was utilized for pre and post GNKQ. To identify correlates of

demographics and BMI with perceived stress, a *t*-test and Pearson's correlation analysis were performed. Statistical significance was set at $p < 0.05$.

Results

Complete data on demographics, perceived stress, BMI, and general nutrition knowledge was available for 51female participants from a combined convenience sample from two faith-based locations. There were significantly more females ($n = 15$) in the 40-49 age group. The sample predominantly consisted of females of white ethnicity. There were also ($n = 36$) of the sample that had completed either technical/trade school or college/graduate education. Also, ($n = 42$) were either married or living as married with ($n = 38$) having children. All 51 participants met eligibility requirements to complete the baseline surveys and the pre-test. The following table summarizes the demographic sample by body mass index.

Table 1
Description of Pre-GNKQ Sample by Body Mass Index N=51[a]

Demographics	*n*	BMI M(SD)	BMI Range
Age group (y)			
1-19	4	22.87 (5.80)	19.0-31.5
20-29	9	26.50 (2.59)	23.0-30.5
30-39	8	27.06 (3.52)	22.0-32.0
40-49	15	28.76 (5.86)	19.0-45.0
50-59	5	28.80 (3.21)	24.0-33.0
60-69	4	27.00 (2.16)	25.0-30.0
70-79	2	28.25 (1.06)	27.5-29.0
Ethnic Origin			
White British	1	26.00	
White Irish	5	24.50 (4.97)	19.0-32.0
White (Other)	44	27.12 (3.39)	19.0-33.0
Other	1	45.00	
Education			
Secondary	3	24.00 (3.46)	20.0-26.0
Tech/Trade School	15	27.00 (3.43)	19.0-32.0
Diploma	12	26.50 (4.40)	19.0-33.0
College Degree	17	27.23 (3.33)	22.5-33.0
Graduate Degree	4	32.25 (8.77)	25.0-45.0
Marital Status			
Single	7	25.92 (5.10)	20.0-32.0
Married	39	27.14 (4.39)	19.0-45.0
Living as Married	3	28.83 (2.75)	27.0-32.0
Divorced/Widowed/ Separated	2	30.25 (2.47)	28.5-32.0
Number of Children			
0	13	25.73 (4.58)	19.0-32.0
1	4	25.87 (2.83)	23.0-29.0
2	21	28.11 (2.74)	24.0-33.0
3	6	29.83 (8.46)	19.0-45.0
4	7	25.64 (3.00)	22.0-30.0

[a]CI = 95% confidence interval

There was a lower response rate at site 1 than site 2 for Demographics, PSS, and Pre-GNKQ, and Post-GNKQ. The post-test response was slightly lower with 49 participants. This total included the combined locations.

Table 2
Survey Population

Location	Demographics , PSS, and Pre-GNKQ,	Post-GNKQ
Site 1	*n* = 18	*n* = 17
Site 2	*n* = 33	*n* = 32

The primary purpose of this study was to explore: In females in a rural faith community, how does an educational intervention affect retention of knowledge over time?

Research question one, "*What is the general nutrition knowledge of females in a rural faith community?"* The participants were asked to complete the general nutrition knowledge questionnaire (GNKQ) to obtain baseline nutritional knowledge. The overall mean score on the 88 item pre-test GNKQ questionnaire, with maximum achieved score of 79.0, was (*M*= 52.45, *SD* of 13.09). The mean score on the pre-GNKQ was 52 (59%), a median of 53, and with the mode slightly higher at 59, thus indicating a general nutrition knowledge deficit.

To answer research question number two, the participants were asked to complete the PSS to identify "*What is the perceived stress level in females in a rural faith community?"* PSS is a 10 item, 5 point Likert stress scale (0=never, 1= almost never, 2= sometimes, 3= fairly often, 4= very often). The mean total PSS score was 18.8 (SD 4.5) with a minimum of 10.0 and a maximum score at 28.0 out of 40 possible points. The higher the PSS score indicates higher perceptions of how unpredictable, unmanageable and stressful life had been in the month prior to the assessment.

Table 3
Summary of Means, Standard Deviations and Range for Scores on the Pre-GNKQ, BMI, and PSS

Variable	*n*	M (SD)	Range
Pre-GNKQ	51	52.45 (13.09)	23.0-79.0
BMI	49	27.4 (4.29)	19.0-45.0
PSS	49	18.8 (4.5)	10.0-28.0

Research question number three: "*Is there a correlation between BMI and perceived stress in females in a rural faith community?"* The relationship between perceived stress (as measured by the PSS) and BMI (as measured by self-report height and weight) was investigated using Pearson product-moment correlation coefficient. There was a strong, positive correlation between the two variables, r=0.003, n=49, p<0.05, with perceived stress associated with BMI. A one-way between-groups analysis of variance was conducted to explore the impact of BMI on perceived stress as measured by the perceived stress scale (PSS). Participants were divided into three groups according to their BMI (Normal 18.5-24.9, Overweight 25-29.9, Obese 30 or greater). There was a statistically significant difference at the $p < .05$ level in the PSS scores for BMI: F (2, 48) = 5.55, p = .0069. The eta squared statistic was 0.19, indicating a large effect size. Post-hoc comparisons using the Tukey HSD test indicated that the mean PSS score for Overweight BMI (M =20.62, SD = 4.62) was significantly higher from normal BMI (M = 16.19, SD = 3.49), Obese BMI (M = 18.66, SD = 3.70) did not differ significantly from the normal or overweight group.

Table 4
Summary of PSS scores among Normal, Overweight, and Obese groups ^{a}N = 49

BMI 3 Groups	BMI 3 groups	Mean Difference	95% Confidence Interval	
			Lower Bound	Upper Bound
Normal	Overweight	-4.438	-7.664	-1.211
(18.5 - 24.9)	Obese	-2.479	-6.645	1.687
Overweight	Obese	1.958	-1.950	5.866
(25 - 29.9)	Normal	4.438	1.211	7.664
Obese	Overweight	-1.958	-5.866	1.950
($\geq$ 30)	Normal	2.479	-1.687	6.645

*The mean difference is significant at the p< .05

Research question number four: "*Is there a correlation between perceived stress and nutrition knowledge in females in a rural faith community?"* The relationship between perceived stress (as measured by the perceived stress scale) and pre-general nutrition knowledge (as measured by the GNKQ) was investigated using Pearson product-moment correlation coefficient. There was a statistically significant correlation between perceived stress and general nutrition knowledge (r = 0.039, p < 0.05) indicating that as perceived stress levels increase, general nutrition knowledge scores decrease.

Research question number five: "*Is there an increase in knowledge of recommended nutrition and BMI in females in a rural faith community?"* Descriptive statistics and paired t-test were utilized to assess the pre-test general nutrition knowledge and the post-test general nutrition knowledge. An

independent-samples t-test was conducted to compare the impact of the intervention on participants' scores on the GNKQ. There was a statistically significant increase in the GNKQ scores from Time 1 (*M*=52.44, *SD*=13.08) to Time 2 (*M*=68.42, *SD*= 10.30), *t* (48) = -7.79, *p* < .0001. The magnitude of the differences in the means (mean difference = 15.97, 95% *CI*: 11.8-20.10) was significant. The eta squared statistic (.55) indicated a large effect size.

Discussion

The present analysis explores the use of an educational intervention based on the HBM to influence knowledge of recommended nutrition and BMI and described perceived stress in females in a rural faith community. The sample is predominantly of white race/ethnicity (*n* = 44) with the majority (*n* = 36) completing post-high school education. The largest age group of participants in this study (*n*=15) are in the 40-49 year old category and (*n* = 21) completed a college or graduate degree. The sample assessed in this study is located in a rural south-eastern town with 26% of this population obese (CDC, 2012). This sample is composed of 49% overweight and 18% obese women, which is less than the state reported statistics of 66% and 31% respectively (CDC, 2012). The general nutrition knowledge pre-test scores of females in a rural faith community ranged from 23.0 - 79.0 out of a maximum 88 points. The mean score on the pre-GNKQ was 52 (59%), a median of 53, and with the mode slightly higher at 59. These scores indicated a need for an educational intervention regarding recommended dietary guidelines.

Table 5
Summary of Means, Standard Deviations and Range for Scores on the GNKQ

		Mean	Std. Dev	Std. Error	95% CL Mean Lower	Upper	*t*	*df*	Sig
Pair 1	Pre-GNKQ Post-GNKQ	-15.97	14.35	2.05	-20.10	-11.86	-7.79	48	.001

The PSS scores of this sample ranged from 10.0 - 28.0 out of a maximum of 40 points with a mean of 18.8. PSS scores around 13 are considered average (Cohen et al., 1983). This sample is considered by Cohen et al. (1983) to be in a moderate stress group with high stress groups scoring 20 points or higher). Scores in the moderate to high categories have been linked to risk factors for cardiovascular disease as this tool measures high psychological stress and is associated with high blood pressure, higher BMI, larger waist to hip ratio, higher cortisol levels, suppressed immune function, decreased sleep, and increased alcohol consumption (Cohen et al., 1983).

As expected, findings from this study indicate an increase in mean knowledge scores on the GNKQ three weeks after the educational intervention in a rural female faith community with a mean increase on the post GNKQ scores. Expected associations were seen between the general nutrition knowledge scores, perceived stress, and BMI. Women with lower BMI, scored overall higher on the GNKQ and had a significantly lower perceived stress score. An unexpected finding was that women who were overweight had a significantly higher perceived stress score indicating an area possibly to focus nutritional education. The score for perceived stress (M = 18.8, SD = 4.5) among participants and BMI (M = 27.4, SD = 4.29) was similar to a previous study conducted by Cho, Jai, Choo, & Choo (2014) which reported a PSS mean sore of 17.2 for women with a mean BMI 28.4. These findings indicate a need for implementing general nutrition knowledge and perceived stress awareness into the faith community nurse's health ministry curriculum.

This study utilized the HBM as a theoretical framework to increase knowledge of recommended nutrition and recommended BMI through an educational intervention. The nutrition education presentation was designed to increase nutrition knowledge in females in a rural faith community. This study is unique to examine the role of perceived stress in association with BMI and general nutrition knowledge in a rural female faith population and is valuable to community faith nurses. It is important "when thinking of implementing a health ministry program" (Abell, 2016, p. 2) to establish a baseline knowledge (pre-test) of recommended general nutrition, recommended BMI, and perceived stress. Then provide education on recommended nutrition, recommended BMI, and assess the level of improvement after the educational intervention (post-test). This study adds to previous research and can guide further investigation on the role of perceived stress in relation to general nutrition knowledge.

Clinical Implications for Faith Community Nurses Figure 2
Faith community nurses could have profound impact on obesity prevention by: • Assessing community needs and resources in relation to obesity prevention • Enhancing community development efforts • Improving access to healthy foods • Provide educational interventions on recommended nutrition and recommended BMI

Limitations

Limitations include a small convenience sample size, participants with a faith expression in the churches surveyed. These limitations affect the ability to generalize the findings. A major limitation is self-reported height and weight was

utilized for calculation of BMI and would have been more accurate if measured on site. Future studies are needed with a larger sample size in other faith-based organizations.

Conclusion

Findings from this study provide information on perceived stress, general nutrition knowledge, and body mass index among females in a rural faith community. Findings include an increase in knowledge to the educational intervention implemented and associations were seen between the general nutrition knowledge scores and BMI, general nutrition knowledge and perceived stress, as well as a significant positive correlation between BMI and perceived stress. The HBM was successfully utilized as a theoretical framework to encourage recommended dietary intake by increasing nutrition knowledge and recommended BMI. This study may serve as a framework for future applications of similar programs among faith community populations. Faith community nurses could utilize the educational strategies discussed to develop and implement in their health ministry community. Implementing education in obesity prevention efforts and stress identification and reduction may have a profound impact on healthcare costs due to decreasing obesity related illnesses, thus improving health in the long-term for the faith community.

References

Abell, C.H. (2016). Church-based health education: Topics of interest. *International Journal of Faith Community Nursing,* 2 (2), 1-10. Retrieved from digitalcommons.wku.edu/cgi/viewcontent.cgi?article=1027&context=ijfcn

Abood, D. A., Black, D. R., & Feral, D. (2003). Nutrition education worksite intervention for university staff: Application of the health belief model. *Journal of Nutrition Education and Behavior*, *35*(5), 260-267.

Barrington, W.E., Beresford, S.A., McGregor, B.A., & White, E. (2014). Perceived stress and eating behaviors by sex, obesity status, and stress vulnerability: Findings from the vitamins and lifestyle (VITAL) study. *Journal of the Academy of Nutrition and Dietetics,* 114(11):1791-9. Retrieved from http://doi: 10.1016/j.jand.2014.03.015

Centers for Disease Control and Prevention. (2012). *Overweight and obesity: Kentucky state nutrition, physical activity, and obesity profile*. Retrieved from www.cdc.gov/obesity/stateprograms/fundedstates/pdf/kentucky-state-profile.pdf

Centers for Disease Control and Prevention. (2015). *Healthy weight: Assessing your weight.* Retrieved from http://www.cdc.gov/healthyweight/assessing/bmi/adult_bmi/index.html

Cho, J. H., Jae, S. Y., Choo, I. H., & Choo, J. (2014). Health-promoting behavior among women with abdominal obesity: a conceptual link to social support and perceived stress. *Journal of Advanced Nursing*, 70(6), 1381-1390. Retrieved from http://doi:10.1111/jan.12300

Cohen, S., Karmarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, 24(4), 385-396. Retrieved from http://www.psy.cmu.edu/~scohen/globalmeas83.pdf

Gatineau M & Dent M. (2011). National Obesity Observatory, *Obesity and mental health.* Retrieved from http://www.noo.org.uk/uploads/doc/vid_10266_Obesity%20and%20mental%20health_FINAL_070311_MG.pdf

Glickman, D., Parker, L., Sim, L. J., Cook, H. D., & Miller, E. A. (Ed.). (2012). *Accelerating progress in obesity prevention: Solving the weight of the nation*. Retrieved from http://www.nap.edu/download.php?record_id=13275

Institute of Medicine. (2010). *Future directions for the national healthcare quality and disparities reports*. Washington, DC: The National Academies Press. Retrieved from http://www.ahrq.gov/sites/default/files/wysiwyg/research/findings/final-reports/iomqrdrreport/iomqrdrreport.pdf

Jenkins-Howard, S., Stephenson, L., & Mains, M. (2013). Cooperative Extension Nutrition Education Program: Outreach to Southeast Kentucky Families in Poverty. *PRISM: A Journal of Regional Engagement*, 2(2) 117-132. Retrieved from http://encompass.eku.edu/prism/vol2/iss2/2

Kruger, H. S., Steyn, N. P., Swart, E. C., Maunder, E. M., Nel, J. H., Moeng, L. & Labadarios, D. (2012). Overweight among children decreased, but obesity prevalence remained high among women in South Africa, 1999-2005. *Public Health Nutrition*, 15 (4), 594-599. Retrieved from doi: 10.1017/S136898001100262X

Lee, J., Sheer, J. L., Lopez, N., & Rosenbaum, S. (2010). Coverage of obesity treatment: A state-by-state analysis of Medicaid and state insurance laws. *Public Health Reports*, *125*, 596-604. Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2882611/pdf/phr125000596.pdf

Moore, C. J., & Cunningham, S. A. (2012). Social position, psychological stress, and obesity: A systematic review. *Journal of the Academy of Nutrition and Dietetics*, *112*(4), 518-526. Retrieved from doi:10.1016/j.jand.2011.12.001

Moyer, V. A. (2012). Screening for and management of obesity in adults: U.S. preventive services task force recommendation statement. *Annals of Internal Medicine*, 157, 373-378. Retrieved from https://www.uspreventiveservicestaskforce.org/Page/Document/UpdateSummaryFinal/obesity-in-adults-screening-and-management

National Institutes of Health (NIH), National Heart, Lung, and Blood Institute. (2013). *Managing overweight and obesity in adults: Systematic evidence review from the obesity expert panel* (NIH, Evidence Report). Retrieved from http://www.nhlbi.nih.gov/sites/www.nhlbi.nih.gov/files/obesity-evidence-review.pdf

Parmenter, K., & Wardle, J. (1999). Development of a general nutrition knowledge questionnaire for adults. *European Journal of Clinical Nutrition*, *53*, 298-308. Retrieved from https://www.ucl.ac.uk/hbrc/resources/resources_eb/parmenter_1999_NKQ.pdf

Richards, E., & Digger, K. (2011). Compliance, motivation, and health behaviors of the learner. In S.B. Bastable, P. Gramet, K. Jacobs, & D. L. Sopczyk (Eds.) *Health professional as educator: Principles of teaching and learning* (pp. 199-225). Sudbury, MA: Jones and Bartlett Learning.

Roberts, C. J., Campbell, I. C., & Troop, N. (2013). *Increases in weight during chronic stress are partially associated with a switch in food choice towards increased carbohydrate and saturated fat intake,* 77-82. Retrieved from http://dx.doi.org/10.1002/erv.2264

Tom, S. E., & Berenson, A. B. (2013). Associations between poor sleep quality and psychosocial stress with obesity in reproductive-age women of lower socioeconomic status. *Women's Health Issues*, *23*(5), e295-300. Retrieved from doi:10.1016/j.whi.2013.06.002

Trogdon JG, Finkelstein EA, Hylands T, Dellea PS, Kamal-Bahl. (2008) Indirect costs of obesity: a review of the current literature. *Obesity Review*,*9*(5): 489–500.

U.S. Department of Agriculture. (2009) *A report from the economic research service: Health status and health care access of farm and rural populations.* 57th Bulletin, Washington, DC: U.S. Government Printing Office. Retrieved from https://www.ers.usda.gov/webdocs/publications/44424/9371_eib57_1_.pdf?v=41136

U.S. Department of Agriculture Economic Research Service. (2016). *Rural education.* Retrieved from http://www.ers.usda.gov/topics/rural-economy-population/employment-education/rural-education.aspx

U.S. Department of Agriculture and U.S. Department of Health and Human Services. (2010) *Dietary guidelines for Americans*. 7th Edition, Washington, DC: U.S. Government Printing Office. Retrieved from https://www.cnpp.usda.gov/sites/default/files/dietary_guidelines_for_americans/PolicyDoc.pdf