THE HEALTHY EATING ACTIVE LIVING TOTAL HEALTH (HEALTH) MODEL IMPROVES THE QUALITY OF PEDIATRIC OBESITY PREVENTION

A thesis submitted to the University of Arizona College of Medicine - Phoenix
in partial fulfillment of the requirements for the Degree of Doctor of Medicine

Megan Fah
Class of 2017

Mentor: Kristen Samaddar, MD

Acknowledgements

Special thanks to Kristen Samaddar, MD, Andrew Muth, MD, Jennifer Farabaugh, BS, Julia Bedard, and Paul Kang, MPH for all their help on this project.

Abstract

BACKGROUND: The prevalence of childhood obesity has tripled in the past 30 years. There are many published recommendations to address pediatric obesity, yet countless physicians are challenged by the time and resources required to provide obesity screening and counseling in a busy practice. OBJECTIVE: To determine the effects of a motivational interviewing (MI) program and an electronic health record (EHR) reminder system to improve physician performance in identifying and counseling patients about obesity prevention and management. METHODS: Baseline and two post-intervention cohorts were created with patients, ages 5-18 years, from 100 consecutive well child visits at an academic teaching practice in Feb 2014, Feb 2015, and Aug 2015. The HEALTH model was created to improve care by providing in-room family education tools, provider training in MI, an evidence-based pathway to standardize care, and family coaching between visits. The model was implemented using quality improvement methodology. A second intervention added an alert in the EHR to notify providers if a patient's body mass index (BMI) was > 85%ile. Outcome measurements included documentation of BMI percentiles, identification of overweight/obesity in the problem list, quantity and quality of healthy lifestyle counseling, and recommending follow up for BMI monitoring per prevention guidelines. P-values were calculated using Chi-Squared or Fisher's Exact tests. RESULTS: Post HEALTH implementation, physicians improved their identification of patients with elevated BMI, improved the quantity and quality of healthy lifestyle counseling, and increased compliance with prevention plus recommendations for follow up. Providers increased their rates of identifying and counseling patients with obesity from a baseline of 50% to 76% (HEALTH) to 85% (EHR alerts). Post HEALTH intervention, physicians increased counseling about screen time and sleep ($p<0.001$) while maintaining high rates of counseling about nutrition, exercise and minimizing sugary beverages. Providers increased documentation of a specific, individualized action plan from 33% of the time at baseline to 59% post HEALTH intervention ($p<0.001$). Physicians increased recommendations for patients with elevations in BMI post intervention ($p<0.005$). CONCLUSIONS: After implementation of the HEALTH model and electronic reminders, physicians significantly improved their performance in identifying and counseling patients with elevated BMI. They also increased performance in counseling about

healthy lifestyle behaviors for patients of all BMI categories. The HEALTH quality improvement model combined with electronic alerts provides a means to implement evidence-based obesity prevention guidelines into clinical practice.

Table of Contents

List of Figures and Tables

1. Introduction/Significance

1.1 Background of Childhood Obesity: A Social, Health, and Financial Burden

The childhood obesity epidemic is among one of the most pressing public health and medical problems in the United States. Prevalence rates of childhood overweight and obesity have tripled in the past 30 years as a result of increased energy intake and insufficient physical activity.[1] Childhood overweight is defined as a BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex, while childhood obesity is defined as a BMI at or above the 95th percentile for children of the same age and sex.[2] Data obtained from the National Health and Nutrition Examination Survey (NHANES) indicate that the prevalence of obesity among adolescents age 2 through 19 years was 16.9% in 2009-2010, and 31.8% were either overweight or obese.[3] Also, 12.3% were at or above the 97th percentile of BMI for age.[3] This data is significant, as the prevalence of obesity in the adolescent population was notably lower at 13.9% in 1999-2000, indicating the prevalence of childhood obesity increased by 3.0% in 10 years.[4] The health implications and consequential medical costs of this obesity epidemic is already evident with continuously increasing rates of chronic, weight-related illnesses being diagnosed in pediatric populations.[1] If these trends continue, studies indicate that by 2030, 86.3% of adults will be overweight or obese, and the prevalence of obesity among children may reach 30%.[5]

1.2 Significance and Rationale for Research

A key component to combatting childhood overweight and obesity is through prevention.[9] Child and adolescent weight loss studies involving behavior modification, diet, and exercise have produced significant long term results, and effective components of these programs appear to be multifactorial. Specifically, parental involvement, reduced intake of high energy density foods, and reductions in time engaged in sedentary activities appear to be key components of effective weight loss and management in children.[10] Dietary interventions in combination with exercise programs show better outcomes than diet or exercise alone, since exercise without dietary modification often results in increased energy expenditure matched by increased energy intake.[9] Finally, a whole-family approach appears to play a vital role, as several studies

show that outcomes are improved when parents are engaged in the process of weight loss and lifestyle modifications.[11] Additionally, while very strict dietary interventions have been shown to have better short-term results than moderate dietary interventions, strictly modified diets cannot be maintained for long periods of time and are often marked by significant rebound effects of weight gain after discontinuation of the diet.[9] Overall, it is evident that there are multiple important factors that contribute to effective prevention of child and adolescent obesity, all of which should be taken into account in designing sustainable lifestyle interventions.

Childhood obesity is of central concern to the fields of medicine and public heath given the significant impact of obesity on acute and chronic disease, psychological health and well-being, and the financial burden to the healthcare system. While there is strong evidence supporting prevention efforts that can be implemented to combat obesity, answers regarding exactly what constitutes the best physician treatment strategy remain unclear.[12] Given physicians' longitudinal relationships with families and their regular monitoring of patients' height and weight, the pediatric primary care office represents an important setting for the prevention and treatment of childhood obesity. Nonetheless, almost 80% of pediatricians report frustration with their ability to make an impact on pediatric obesity.[13] An important barrier may be the limited time available during well-child visits, as well as pediatricians' real or perceived deficiencies in behavioral counseling skills for obesity management.[14,15] Thus, the HEALTH program aims to provide readily available tools, training, and evidence-based guidelines to enhance pediatricians' ability to motivate their patients, which might improve confidence in their counseling, alter their feelings about their patients' willingness to change, and ultimately improve clinical outcomes. Results of this study will help guide future research and efforts to provide continuously improved quality care to pediatric populations.

1.3 Hypothesis/Research Question

The aim of this quality improvement project is to utilize the HEALTH model and EHR alerts to improve physician performance of addressing pediatric overweight and obesity at well-child

visits. We hypothesize that after training physicians on how to implement elements of the HEALTH model in well-child visits, there will be an increase in the number of physicians who screen for obesity and educate patients on lifestyle modifications in order to treat and prevent pediatric obesity.

1.4 Goals for the Study

Motivational interviewing and education will provide patients and families with powerful tools to achieve sustainable lifestyle changes. The data we generate from this project will help us determine whether the HEALTH model is effective in increasing physician performance of addressing child obesity in the setting of a busy pediatric practice.

2. Materials and Methods

2.1 Study Population and Design

Retrospective methods were used to establish a baseline cohort and two post-intervention patient cohorts. Patients in all cohorts were identified from the Phoenix Children's Hospital General Pediatrics outpatient clinic. Patients between 5 and 18 years of age were included. The purpose of the patient visit to the PCH General Pediatrics clinic must be for a well-child appointment. We excluded patients from the special needs clinic practice, non-ambulatory patients, and patients not fed orally. The baseline cohort served as a control and was established through a retrospective chart review. Beginning in February 2014, 100 consecutive well-child appointments for patients between 5 and 18 years were identified for data collection. The post-HEALTH intervention cohort consisted of a similar group of 100 consecutive well-child appointments for patients between 5 and 18 years in February 2015, and post-EHR intervention cohort consisted of 266 consecutive well-child appointments for patients between 5 and 18 in August 2015.

2.2 Study Components

HEALTH Intervention: Motivational Interviewing and 95210 Education

Providers in the PCH outpatient center were trained in motivational interviewing (MI) in the primary care setting for overweight or obese patients. MI is a patient-centered method of counseling that seeks to elicit intrinsic motivation for changing behavior and encourages patients to understand and resolve their uncertainty to such change.[16] In addition to MI, physicians provided education to patients who have identified a desire to change their diet, exercise, or lifestyle habits to support their effort to make this change. Patients chose to create one HEALTH Goal using the Healthy Habits Planning Tool as it relates to the 95210 healthy lifestyle. The 95210 model encourages patients to engage in healthy lifestyle behaviors by obtaining 9 or more hours of sleep per night, consuming 5 servings of fruits and vegetables per day, limiting screen time to 2 hours or less per day, engaging in 1 hour of physical activity per day, and drinking 0 sugary beverages per day. Based on the patient's HEALTH Goal, the patient received a handout and goal tracker from the Healthy Habits Toolbox located in each exam

room. The toolbox provided teaching materials, handouts with tips for obtaining HEALTH goals, and the HEALTH protocol for physicians to follow during well child visits.

EHR Intervention: Alert System

An EHR system specialist assisted in this project to incorporate higher reliability interventions to aid physicians in providing healthy lifestyle counseling. The EHR platform used was Allscripts Sunrise Clinical Manager (SCM). The EHR alert system notified providers when a patient had a BMI greater or equal to the 85th percentile. When this occurred, providers were required to acknowledge this information in the EHR.

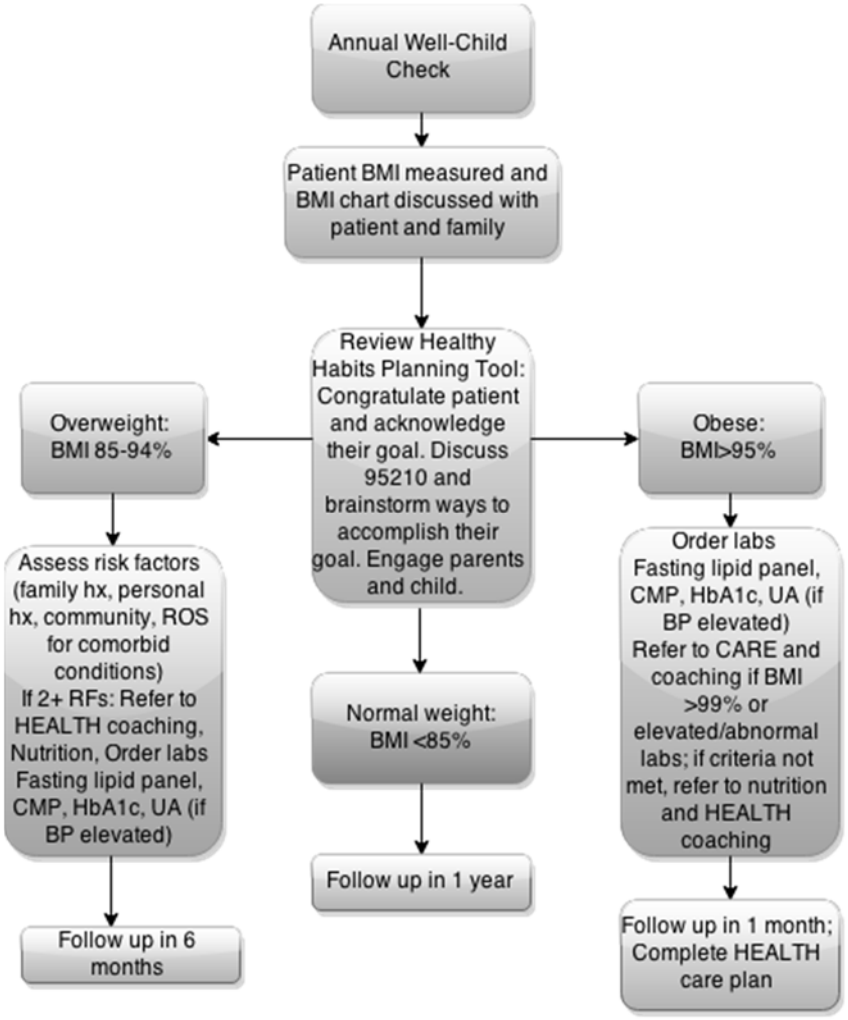
2.3 Measurements/Assessments

The primary measure evaluated was the change in frequency at which physicians identify and address BMI in overweight/obese patients before and after implementation of the HEALTH program and EHR alert system. Baseline physician performance was measured in February 2014 through a retrospective chart review of 100 consecutive well-child appointments. This data was compared to post-HEALTH intervention data and post-EHR intervention data from well-child appointments in February 2015 and August 2015, respectively.

2.4 Data Collection and Analysis

Data was collected in a data collection form. The retrospective chart review was conducted using PCH General Pediatrics medical records. The following information was collected at baseline in February 2014, post-HEALTH intervention in February 2015, and post-EHR alert in August 2015: BMI Measured (Y/N), BMI value with %, BMI addressed by physician (Y/N), Patient counselled on nutrition, physical activity, and healthy behaviors? (Y/N), Health Counseling Documented with Action Plan (Y/N), Labs per Guideline (Y/N), 1-2 month Follow Up if BMI >95% (Y/N). Data was analyzed to compare physician adherence to document patient BMI percentiles, identify overweight/obese BMI status in the problem list, and provide healthy lifestyle counseling and recommendations for follow-up if elevated BMI. P-values were calculated using chi-squared or Fisher's Exact test for categorical variables.

Figure 1: HEALTH Model Flowchart



3. Results

3.1 Baseline cohort

The baseline cohort was comprised of 100 patients from well-child visits in February 2014. In the baseline cohort, 61% were normal weight, 29% were overweight, and 10% were obese. Among the normal weight patients: 16% (10) had healthy lifestyle counseling documented, while 84% (51) did not. Among the overweight patients: 24% (7) were counseled on healthy lifestyle behaviors, and elevated BMI was documented in the problem list; 21% (6) were counseled on healthy lifestyle behaviors, but elevated BMI was not documented in the problem list; and 55% (16) were not counseled on healthy lifestyle behaviors and did not have elevated BMI documented in the problem list. Among the obese patients: 50% (5) had documentation of healthy lifestyle counseling by the provider and elevated BMI in the problem list; and 50% (5) had documentation of healthy lifestyle counseling, but elevated BMI was not in the problem list.

3.2 Post-HEALTH intervention cohort

The post-HEALTH intervention cohort was comprised of 100 patients from well-child visits in February 2015. In this cohort, 60% were normal weight, 15% were overweight, and 25% were obese. Among the normal weight patients: 47% (28) had healthy lifestyle counseling documented, while 53% (32) did not. Among the overweight patients: 20% (3) had documentation of healthy lifestyle counseling by the provider and elevated BMI in the problem list; 53% (8) had documentation of healthy lifestyle counseling, but elevated BMI was not in the problem list; and 27% (4) had no documentation of lifestyle counseling or elevated BMI in the problem list. Among the obese patients: 76% (19) had documentation of healthy lifestyle counseling by the provider and elevated BMI in the problem list; 12% (3) had documentation of healthy lifestyle counseling, but elevated BMI was not in the problem list; and 12% (3) had no documentation of healthy lifestyle counseling or elevated BMI in the problem list.

3.3 Post-EHR alert intervention cohort

The post-EHR alert intervention cohort was comprised of 266 patients from well-child visits in August 2015. In this cohort, 58% were normal weight, 16% were overweight, and 26% were obese. Among the normal weight patients: 56% (149) had healthy lifestyle counseling documented, while 44% (117) did not. Among the overweight patients: 74% had documentation of healthy lifestyle counseling received, and 51% had elevated BMI documented in the problem list. Among the obese patients: 86% had documentation of healthy lifestyle counseling received, and 85% had elevated BMI documented in the problem list.

Table 1: Demographic Characteristics of Patients

	Total Population N=200	No Intervention N=100	Intervention N=100	P-Value[1]
Variables	**Mean (SD)**			
Age (years)	9.8 (3.5)	10.4 (3.6)	9.2 (3.4)	0.03
BMI (kg/m^2)	19.6 (4.9)	19.5 (4.5)	19.8 (5.5)	0.75
BMI Percentage (%)	51.9 (24.9)	50.04 (24.8)	54.5 (25.9)	0.20
	% (95% CI)			
Gender				0.39
Male	51 (44.0, 57.9)	48 (38.2, 57.9)	54 (44.0, 63.7)	
Female	49 (42.1, 55.9)	52 (42.1, 61.8)	46 (36.3, 55.9)	
Race				0.51
Caucasian	88 (82.7, 91.8)	89 (81.1, 93.9)	87 (78.7, 92.3)	
African American	10 (6.5, 15.0)	8 (4.0, 15.4)	12 (6.8, 20.1)	
Asian	1 (0.25, 3.9)	1 (0.14, 6.9)	1 (0.14, 6.9)	
Other	1 (0.25, 3.9)	2 (0.48, 7.8)	0 (0)	
Ethnicity				0.45
Hispanic	67.5 (60.6, 73.6)	65 (55.0, 73.8)	70 (60.2, 78.3)	
Non-Hispanic	32.5 (26.3, 39.4)	35 (26.2, 44.9)	30 (21.7, 39.8)	
Insurance				0.29
Public	63.5 (56.5, 69.9)	67 (57.1, 75.6)	60 (49.9, 69.3)	
Private	35.5 (29.1, 42.4)	33 (24.3, 42.9)	38 (28.9, 48.0)	
Self-Pay	1 (0.25, 3.9)	0 (0)	2 (0.48, 7.8)	

[1]P-Values calculated using Wilcoxon Rank Sum for continuous variables and Chi-Squared or Fisher's Exact test for categorical variables.

Table 2: Cohort Descriptions

	Baseline (n=100)	Post-HEALTH (n=100)	Post-EHR Alert (n=266)
Normal	61%	60%	58%
Overweight	29%	15%	15%
Obese	10%	25%	26%

Figure 2: Proportion of Patients Who Received Healthy Lifestyle Counseling

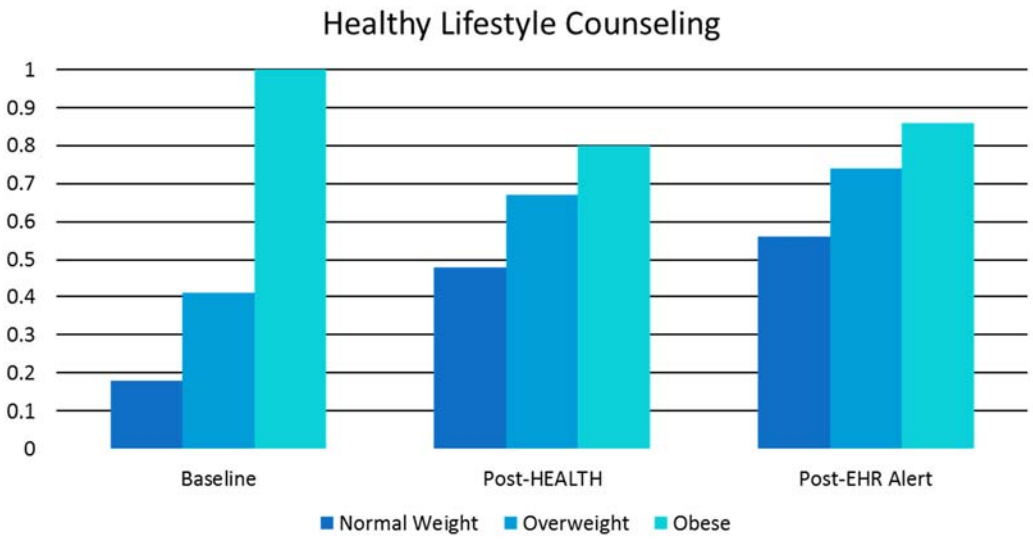
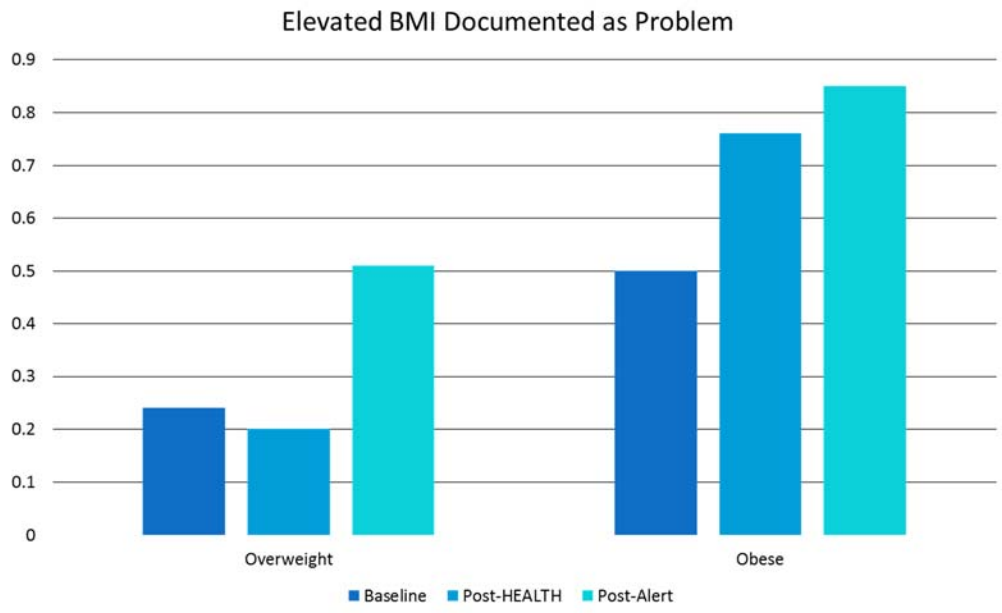


Figure 3: Proportion of Patients with Elevated BMI Documented in Problem List



4. Discussion

We used quality improvement methodology to substantially increase the frequency by which physicians counsel pediatric patients and families on healthy lifestyle behaviors and obesity prevention. Post-HEALTH and post-EHR alert implementation, physicians improved their identification of patients with elevated BMI, improved the quantity and quality of healthy lifestyle counseling, and increased compliance with prevention recommendations for follow up.

There was some improvement in the percentage of normal weight patients counseled on healthy lifestyle behaviors, from 18% at baseline, 48% after HEALTH intervention, and 56% after EHR-alert intervention (p-value<0.001). Similarly, there was a significant improvement in counseling of the overweight group, from 41% at baseline, 67% after HEALTH intervention, and 74% after EHR-alert intervention (p-value<0.001). Among the obese group, 100% of the patients in the baseline group received healthy lifestyle counseling; however, this proportion decreased to 80% after HEALTH intervention, and 86% after the EHR-alert system (p-value<0.001).

In addition to notable improvements in the counseling provided to patients, there was an overall improvement in physician documentation of overweight and obesity after implementing the HEALTH intervention and EHR-alert system. At baseline, 24% of overweight patients and 50% of obese patients had elevated BMI documented as a problem. After the HEALTH intervention, 20% of overweight patients and 76% of obese patients had elevated BMI documented as a problem. Finally, after implementation of the EHR-alert system, 51% of overweight patients and 85% of obese patients had elevated BMI documented as a problem. Additionally, physicians improved the quality of healthy lifestyle counseling by increasing counseling on screen time and sleep (p<0.001), while maintaining high rates of counseling about nutrition, exercise, and sugary beverages. Physicians also significantly increased recommendations for follow-up to monitor BMI compared to baseline (p<0.005).

5. Future Directions

Future directions of this QI project include updating training sessions for residents/faculty in order to reach those who missed prior training sessions. We also would like to enhance EHR functionality to include automatic blood pressure percentile calculations and new templates for goal setting and counseling.

6. Conclusions

This QI project reveals that obesity identification and prevention is not always addressed by physicians during well-child visits. However, after implementing the HEALTH model and EHR-alert system, physicians improved their performance in identifying overweight and obesity and addressing healthy lifestyles for patients of all BMI categories. The HEALTH quality improvement model combined with electronic alerts provides a means to implement evidence-based obesity prevention guidelines into clinical practice.

References

1. Lytle LA. Dealing with the childhood obesity epidemic: A public health approach. *Abdom Imaging*. 2012;37(5):719-724.
2. Barlow SE and the Expert Committee. Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: summary report. *Pediatrics.* 2007;120:S164-S192.
3. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of Obesity and Trends in Body Mass Index Among US Children and Adolescents, 1999-2010. *JAMA*. 2012;307(5):483-490.
4. Ogden CL, Flegal KM, Carroll MD, Johnson CL. Prevalence and trends in overweight among U.S. children and adolescents, 1999-2000. *JAMA*. 2002;288:1728-32.
5. Wang Y, Beydoun MA, Liang L, Caballero B, Kumanyika SK. Will all Americans become overweight or obese? Estimating the progression and cost of the US obesity epidemic. *Obesity*. 2008;16(10):2323-2330.
6. Prevalence of obesity among children and adolescents: United States, trends 1963-1965 through 2007-2008. *Centers for Disease Control and Prevention*. 2010. Retrieved from http://www.cdc.gov/nchs/data/hestat/obesity_child_07_08/obesity_child_07_08.htm#table1
7. Withrow D, Alter DA. The economic burden of obesity worldwide: A systematic review of the direct costs of obesity. *Obesity Reviews*. 2011;12(2):131-141.
8. Swartz MB, Puhl R. Childhood obesity: a societal problem to solve. *Obesity Reviews.* 2003; 4(1):57-71.
9. Lobstein T, Baur L, Uauy R. Obesity in children and young people: A crisis in public health. *Obesity Reviews*. 2004;5:4-85.
10. Fulton JE, McGuire MT, Caspersen CJ, Dietz WH. Interventions for weight loss and weight gain prevention among youth: Current issues. *Sports Med*. 2001;31(3):153-165.
11. Golan M, Fainaru M, Weizman A. Role of behaviour modification in the treatment of childhood obesity with the parents as the exclusive agents of change. *Int J Obes Relat Metab Disord*. 1998;22(12):1217-1224.

12. Waters E, de Silva-Sanigorski A, Hall BJ, Brown T, Campbell KJ, Gao Y, Armstrong R, Prosser L, Summerbell CD. Interventions for preventing obesity in children (Review). *Cochrane Database of Systematic Reviews*. 2011;(12):CD001871.
13. West F, Sanders MR. The Lifestyle Behaviour Checklist: A measure of weight-related problem behavior in obese children. *International Journal of Pediatric Obesity*. 2009;4(4):266-73.
14. Becher ST. Adolescents' Self-Efficacy Toward Healthy Lifestyle Behaviors after Attending a School-Based Intervention Course Focused on Physical Activity and Healthy Eating. *OhioLINK Electronic Theses and Dissertations Center.* 2009. Retrieved from https://etd.ohiolink.edu/
15. Sallis JF, Pinski RB, Grossman RM, Patterson TL, and Nader PR. The development of self-efficacy scales for health-related diet and exercise behaviors. *Health Education Research*. 1988;3(3):283-292.