

From the Editors:

Strictly speaking, the Centers for Medicare & Medicaid Services do not include obesity as a chronic condition. They do, however, include hyperlipidemia. The editors provide the following context for the inclusion of the article titled “Cookfresh: Feasibility and Acceptability of Teaching Cooking Skills To Adolescents with Obesity.” Obesity in children is defined as a BMI greater than or equal to the 95th percentile based on age and sex (https://www.cdc.gov/nchs/data/hestat/obesity_child_07_08/obesity_child_07_08.pdf).

Obesity is the condition of weighing more than what is considered healthy for a given height. Body Mass Index (BMI) is used as a screening tool: a BMI of 30.0 or higher is considered obese. In 2013 the American Medical Association officially recognized obesity as a chronic disease. Their rationale was that defining obesity as a disease should spur physicians and patients – and insurers – to regard it as a serious medical issue. One in three Americans are obese, according to the Centers for Disease Control and Prevention (CDC) (<https://health.clevelandclinic.org/2013/06/obesity-is-now-considered-a-disease/>).

Hyperlipidemia is a diagnosis based on a blood test indicating an abnormally high concentration of fats or cholesterol in the blood. Dyslipidemia is a condition marked by an abnormal concentration of lipids or lipoproteins in the blood, be that concentration high or low.

Thin people can have a diagnosis of hyperlipidemia and technically obese persons may have normal concentration of fats in their blood stream. However, there is a correlation between obesity and hyperlipidemia, however that relationship is weak and influenced by age. Importantly, the specific distribution of body fat seems to be important (<https://www.ncbi.nlm.nih.gov/pubmed/1950659>).

Klop, Elte, and Cabezas published in 2013 in the journal *Nutrients* that “Obesity increases cardiovascular risk through risk factors such as increased fasting plasma triglycerides, high LDL cholesterol, low HDL cholesterol, elevated blood glucose and insulin levels and high blood pressure” (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3705344/>).

Cook Fresh. Feasibility and Acceptability of Teaching Cooking Skills to Adolescents with Obesity

Michell Fullmer, RD, LDN, CSP, CNSC, Mary M. Stephens, MD, MPH, P. Babu Balagopal, PhD, Karen Anthony, MS, and Sandra Hassink, MD, MSc, FAAP

Introduction

The prevalence of childhood obesity remains at approximately 18% among adolescents despite stabilization in its rates between 2007 and 2010.¹ Adolescent obesity is associated with an increased risk of severe obesity in adulthood and higher prevalence of obesity related comorbidities, particularly cardiovascular disease (CVD), and Type 2 Diabetes Mellitus (Type 2 DM).²⁻⁴ Lifestyle factors play a major role in the development of obesity and its progression to comorbidities such as CVD and Type 2 DM.⁵⁻¹⁰ Adolescents with obesity frequently display

unhealthy eating habits including irregular eating patterns such as skipping breakfast, late-night eating,⁶ frequent intake of fast food,⁷ eating in response to emotional issues or boredom, excessive intake of high-sugar beverages,⁸ inappropriate portion sizes,⁹ and lacking adequate intake of fruits, vegetables, and nutrients.¹¹

Alterations in various risk factors and/or biomarkers of CVD are evident at an early age in the clinical course of obesity,¹²⁻¹⁴ but lifestyle interventions based on diet and physical activity have been shown to have favorable effects, both with and without weight reduction.¹⁵ The development of cooking skills at an early age may play an important role in promoting a healthy lifestyle, but this has been given limited attention in studies examining the impact of lifestyle approaches in the management and/or prevention of adolescent obesity.^{16,17} In one study, lack of cooking skills was inversely related to consumption of fruits and vegetables in college students.¹⁸ A few studies have also suggested that interventions targeting cooking skills could be an effective strategy to promote healthy eating.¹⁹

Cookfresh was designed to study the effect of - as well as feasibility and acceptance of - a community-based cooking skills program, including meal planning and an actual shopping experience, on healthy behavior, quality of life, and health status including Body Mass Index (BMI) and specific biomarkers of cardiometabolic disease.

Materials and Methods

Participants in a pediatric weight management clinic were screened to determine eligibility by a study investigator and offered participation via letter to their home. Participants for the study were identified through review of the electronic medical record by a study investigator over a three month period. This study was approved by the Institutional Review Board. An initial patient contact letter was sent to eligible patients. Adolescent assent and parental written consent were obtained at the first study visit. The study design, implementation and data collection took place from 2008 to 2012.

Inclusion criteria included age 13-17 years, BMI > 95th% for age and sex, family history of diabetes, and evidence of metabolic abnormalities including one of the following: elevated insulin (fasting insulin >20uU/l), acanthosis nigricans, impaired glucose tolerance (2 hour glucose >140mg/dl on 2 hour glucose tolerance test), elevated blood pressure (>90% for age and sex), polycystic ovarian syndrome, dyslipidemia (Triglycerides >150 mg/dl, HDL cholesterol <40mg/dl, Total cholesterol >170mg/dl), or non-alcoholic steatohepatitis (elevated liver function tests twice normal values in absence of other known cause). Exclusion criteria included diagnosed Type 2 DM, reading level below the fifth grade, inability to travel to location, behavioral/psychiatric condition limiting group participation, and/or pregnancy.

Program Delivery and Intervention

The intervention program was designed to enhance the standard lifestyle-based multidisciplinary medical approach to management of adolescent obesity.^{20,21} The focus was on developing specific skills for cooking, food shopping, and meal planning that are not involved in the current standard clinical approach. Adolescent learning was enhanced by fostering independent decision-making skills. Families were engaged with concurrent educational sessions and sent home examples of appropriately portioned, healthy meals prepared by the adolescents to be eaten with their family.

The Cookfresh intervention consisted of nine food preparation sessions conducted in a community- setting, with a kitchen and a classroom, under the direction of a registered dietitian over a 9 week period (Table 1). Each session was limited to 10 participants, lasted approximately two hours, and was focused on specific skills related to healthy eating. There was a consistent instructor, who was also a study investigator, for all program sessions to maintain the integrity of the information provided during the sessions. During each session, in addition to the intervention focus on food purchase and cooking skills, other topics such as body image, goal planning, label reading, mindful eating, importance of nutrient dense foods and the 5-2-1 Almost None (Figure 1) concept were discussed. Empowerment and self-sufficiency were overarching themes. The participants chose the foods that would be prepared for each session in which food preparation took place.

Table 1. Cooking Session Outline

Week	Focus of Each Session Instruction
1	Meal Planning: Distribute cookbooks, discuss how to plan meals, how to shop on a budget and how to make a grocery list. Concurrent adult session on family health history considering cultural preferences regarding body shape.
2	Supermarket tour for parents. Supermarket tour and purchasing of food for participants.
3	Snacking: Preparation of snack as well as discussion on what are healthy snacks and listening to hunger cues. Food safety was also reviewed.
4	Breakfast: Preparation of breakfast as well as discussion on why breakfast is important and ways to overcome barriers to consuming breakfast.
5	Lunch: Preparation of lunch as well as discussion of how to make healthy choices with school lunch options.
6	Dinner: Preparation of dinner as well as importance of a family meal.
7	Giving Back: Preparation of a meal for a shelter / less fortunate. Review of menu and calorie goals for next week's session on dining out.
8	Dining out: Participants and instructor met at a restaurant chosen by the participants. Ways to improve nutritional quality of food choice at a restaurant was discussion during the meal.
9	Family meal: Participants prepared dinner for their family. Importance of family meals were discussed. Concurrent adult session: Discussion on ways to reward and celebrate without food.

Figure 1. 5-2-1 Almost None Concept



Eat **5 or more** fruits and veggies a day. They fight disease and are full of natural energy. Plus, many farmers' markets accept EBT cards as payment. Visit de.gov/buylocal and download the Delaware Fresh app to find fresh produce near you.



Limit yourself to **no more than 2 hours** of screen time each day (this includes TV, computer and gaming).



Get **1 or more** hours of physical activity each day. Delaware is full of parks and playgrounds. Visit dnrec.alpha.delaware.gov/play-outside to see the map and find some outdoor fun.



Stay away from sugary drinks. They're OK as a once-in-a-while treat, but too much sugar can make you gain weight and lead to diseases like diabetes.

5-2-1 Almost None, logo and materials copyrighted by Nemours Health and Prevention Services (NHPS). For queries or possible use, please contact Nemours Health and Prevention Services, Attn: Regulatory Compliance, 252 Chapman Road, Suite 200, Newark, DE 19702

A pre-test/post-test design was employed to evaluate dietary and health status outcomes as well as cardiometabolic markers and anthropometric measures. The primary outcome measures included improvement on “Rate Your Plate”²², improvement in dietary and healthy behaviors as measured by the Cookfresh Questionnaire, and improvement in health status as measured by the Pediatric Quality of Life Questionnaire.²³ Secondary outcomes included BMI, waist circumference, blood pressure and biomarkers of CVD.

Program acceptability and feasibility were determined by an end of program questionnaire, feedback from participants during the intervention, cost, and investigator analysis of process.

Measures

“Rate Your Plate” is a validated 22-item questionnaire about foods that are typically eaten such as red meat intake, serving sizes of meats, eating out, consumption of fried foods and types of grain products. A score of 55-69 is indicative of making healthy choices, while lower scores indicate there are many healthier choices that could be made.

The Cookfresh Questionnaire is a six- item non-validated survey created for this study, with five choices per item that rates total hours of screen time, total minutes of physical activity, number of 8-ounce sugared beverages consumed on a daily basis, number of days per week breakfast is eaten, number of days per week families eat a meal together, and how ‘in charge of healthy eating’ a participant feels.

The validated Pediatric Quality of Life questionnaire (Version 4.0, teen report ages 13-18) is a 23-item questionnaire that asks participants to rate items related to their health and activities (physical functioning), feelings (emotional functioning), how they get along with others (social functioning) and school life (school functioning) on a scale of 0 (never) to 4 (almost always). Higher responses indicate that an item is more of a problem, such as “It is hard for me to do sports activity or exercise.”

BMI, waist circumference, and blood pressure were measured at baseline, three months, six months and twelve months. Blood samples were also collected at each of these time points after an overnight fast (~10 hours) for the measurement of biomarkers of CVD. Methods for the measurements were as follows: glucose (hexokinase assay), insulin (chemiluminescent immunometry), leptin and soluble leptin receptor (sOB-R by radio-immuno assay – RIA), adiponectin (both total and high molecular weight), retinol binding protein 4 (RBP4) and interleukin-6 (IL-6) by enzyme-linked immunosorbent assay (ELISA), and high-sensitivity C-reactive protein (hs-CRP) (immunonephelometry). The homeostasis model assessment – insulin resistance (HOMA-IR) was calculated using the formula: fasting glucose (M) x fasting insulin (uU/mL)/22.5.

Analysis

Descriptive statistics, including means and standard deviations for continuous variables and counts and percentages for categorical variables, were calculated for all baseline data. Change in primary and secondary outcome variables was analyzed by repeated measures analysis of covariance from baseline to three, six, and twelve months post-enrollment adjusting for sex. Comparisons of inflammatory markers at specific post- intervention times with baseline were made by paired T-tests with a Bonferroni correction for multiple testing. Other continuous variables were analyzed in the same way.

Results

Twenty-eight participants completed the program. Those that did not complete at least 8 sessions were not included in subsequent data collection. Table 2 describes characteristics of the study participants.

Table 2. Group Participants and Base Descriptors

Descriptors	Female N	Percent of Total	Male N	Percent of Total	Standard Deviation	Confidence Interval for Mean @ 95%
	Pre-Course N	Minimum	Maximum	Mean		
Sex	19	67.85	9.00	32.14		
Age	27	13	17	14.56	1.22	14.08, 15.04
BMI	28	28.08	54.7	37.70	7.24	34.88, 40.52
BP Sys	28	98	132	113.50	10.21	109.53, 117.47
BP Dias	28	52	102	68.36	10.34	64.34, 72.39

Follow up data was collected on 27 participants at three months, 22 participants at six months, and 19 participants at twelve months.

Primary Outcomes

“Rate Your Plate”: A significant improvement in aggregate Rate Your Plate score was found at the completion of the course, persisted at 6 month follow up and reverted to pre-course findings at 12 months (Table 3).

Table 3. Rate Your Plate and Pediatric Quality of Life Analyses at 3, 6, & 12 Months

Rate your Plate Comparison at N	Mean	Standard Deviation	Confidence Interval 3-, 6-, and 12- month intervals	Confidence Interval for mean @ 95%
RtUrPlt Pre	26	46.58	8.61	46.74, 53.50
RtUrPlt 3-mo	26	50.12	8.37	43.10, 50.06
RtUrPlt Pre	18	45.78	8.56	47.28, 55.05
RtUrPlt 6-mo	18	51.17	7.82	41.52, 50.03
RtUrPlt Pre	17	47.82	9.21	44.14, 53.86
RtUrPlt 12-mo	17	49.00	9.45	43,09, 52.56
PedsQLI Pre-	26	72.99	18.53	46.74, 53.50
PedsQLI 3-mo	26	79.68	16.50	43.10, 50.06
PedsQLI Pre-	19	70.02	19.34	47.28, 55.05
PedsQLI 6-mo	19	77.63	16.73	41.52, 50.03
PedsQLI Pre-	16	68.61	20.49	44.14, 53.86
PedsQLI 12-mo	16	80.04	12.54	43,09, 52.56

Improvement in Dietary and Healthy Behaviors assessment: Analysis of the Cookfresh Questionnaire was notable for trends toward a decrease in screen time, a reduction in number of sugared beverages consumed daily, and an increased frequency of family meals that was still present at twelve months. Quantity of physical activity was unchanged. Tests of statistical significance were not performed.

Quality of Life: There were significant improvements in scores on the teen Pediatric Quality of Life Inventory at the completion of the course (3 months) which persisted at 6 and 12 months (Table 3).

Feasibility: Participant recruitment was affected negatively due to time commitment and transportation requirements. There were a total of 33 participants that had signed parental consent and participant assent, however, three were lost to follow up in the first group and one participant in the second group was excluded at the discretion of the investigator. There was no difficulty delivering the interventions and the study participants did not face any problems during session interventions. There were 27 participants who completed at least 8 out the 10 sessions. Follow up data was available on 27 participants at three months, 22 participants at six months and 19 participants at 12 months.

Due to initial lack of follow up data in the first group, investigators then developed an agreement for parents to sign indicating knowledge of need to participate in all sessions and follow up. Additionally, the local YMCA provided a free three month family membership for participants that completed the Cookfresh program and follow up research visits. Implementing both of these measures improved the retention of study participants, with only two lost to follow up in the following three study groups. There were no recognized characteristics of those that were retained verses those that were lost to follow up.

The total cost of the program without lab fees was approximately \$670 per participant, including staff time. This may be a factor in efforts to replicate it.

Program acceptance/qualitative feedback:

The questions asked as an evaluation of the program by the teens were:

1. I now know how to pick healthy food choices at the supermarket –agree or disagree.
2. I now know how to plan my meals to make them healthier—yes, or no.
3. The Cookfresh program was too many weeks or not long enough?
4. The weekly classes were too long or just enough time?
5. Was the facilitator helpful?
6. If I could add anything to the Cookfresh program I would add.
7. Is there any part of the cook fresh program that you felt was not helpful or necessary?
8. What did you enjoy most about the program?
9. What did Cookfresh mean to you?

The questions asked as an evaluation of the program by the parents were:

1. My family is now making better choices.
2. The information and food that was sent home with my child was helpful in learning what healthy foods and portion sizes are.
3. The Cookfresh program was too many weeks or not long enough?
4. The parent sessions were helpful or not helpful?
5. If I could add anything to the sessions I would add.
6. Was there any part of the Cookfresh program that you felt was not helpful?
7. What do you feel your child learned as a result of being part of the Cookfresh program?
8. What did Cookfresh mean to you?

Participant subjective evaluation of the program was uniformly positive. With the exception of recommending the meditation/relaxation portion of the sessions be dropped, both teen and parent comments reflected a desire for additional sessions and a follow-up component to the course. The intimate nature of the intervention (less than 10 participants per session) and open discussion at times led to participants sharing very personal information. Many of the participants developed relationships with each other that continued after the program ended.

Most adolescents endorsed wanting to continue the group. The feedback provided by family members about the meals that were sent home were generally positive and made the participants feel empowered to make healthier choices.

Secondary Outcomes

Cardiometabolic risk factors/biomarkers: BMI remained unchanged throughout the study period. Similarly, HOMA-IR and other risk factors of CVD such as adiponectin (total and HMW), CRP,

IL-6, leptin, sOB-R, and RBP4 did not show significant differences between baseline and follow up measures at three, six, or twelve months.

Discussion

This study was designed to test the feasibility and acceptability of a nutrition-focused, skills-based cooking intervention with adolescents to determine if such an intervention would lead to beneficial changes in quality of life, BMI and risk factors of CVD. The data demonstrated sustained improvements in quality of life such as, decrease in screen time, reduction in the number of sugared beverages consumed daily, and an increase in the number of family meals - behaviors recommended in expert guidelines for obesity treatment.²⁴ BMI and cardiometabolic risk factors during the 12-month period of the intervention did not change. The current study is the one of, if not the first, to simultaneously assess the feasibility and acceptability of a nutrition-focused cooking skills intervention and its impact on biological factors including indicators of obesity and biomarkers related to cardiometabolic disease.

In general, this intervention based on developing healthy cooking skills in adolescents was related to overall improvements in behaviors that are closely related to obesity and its management. The program was viewed positively by both adolescents and their families. In addition to the positive feedback from the formalized questionnaires at the end of the program, the instructors found both teen and parent participants to be engaged while both learning and having fun during the sessions. There were opportunities for sharing, comradery and emotional release.

The Cookfresh pilot intervention demonstrates promise as an adjunct to a traditional weight management program and adds a practical education piece on mindful and healthful cooking that cannot occur in a clinical setting. This approach is unique in that it is skills-based, fosters peer interactions, and is patient- and family- centered. Limitations of the study include the lack of a formal control group, small sample size and the loss of participants to follow up.

Suggested modifications to the intervention would include eliminating the use of biomarkers as they were both costly and difficult to obtain. While it was disappointing that no significant improvement in BMI was demonstrated despite the change in healthy behaviors, one could look at the trajectory of the increase in BMI pre intervention compared with the BMI trajectory post intervention to see if this intervention could lead to stabilization of BMI.

While the pilot focused on cooking skills and family involvement, the program would likely be enhanced by adding an exercise component and focus. While the one year follow up period in this study is likely adequate, a longer curriculum initially along with periodic follow up sessions to function as a maintenance phase, could potentially lead to more clinically significant outcomes as nine weeks is a fairly brief time in which to develop sustained behavior change.

Conclusion

This pilot study demonstrated the feasibility and acceptability of an innovative skills-based intervention for teens. The sustained improvements in quality of life and lifestyle behaviors are significant findings. The concept could potentially be adapted for use in other settings, such as schools, as the Cookfresh approach offers the potential to become a practical mechanism to promote health, social and educational skills to better prepare adolescents for adulthood.

Acknowledgments

Mary M. Stephens: Dr. Stephens reviewed the curriculum and data, drafted the initial manuscript, revised the manuscript and approved the final manuscript as submitted.

Michell Fullmer: Ms. Fullmer conceptualized and designed the intervention, wrote the curriculum, reviewed the data and manuscript, and approved the final manuscript as submitted.

Karen Anthony: Ms. Anthony reviewed data, reviewed the manuscript, and approved the final manuscript as submitted.

P. Babu Balagopal: Dr. Balagopal reviewed and interpreted the data and reviewed, edited, and approved the final manuscript as submitted.

Sandra Hassink: Dr. Hassink conceptualized and designed the intervention, reviewed the curriculum and data, reviewed the manuscript, and approved the final manuscript as submitted.

We would like to thank all the volunteers for their participation in this study. We also thank James F. Reed III, PhD and Brian Rahmer, PhD, MS for their assistance with statistical analysis and Lee McCormick and Kristen Isaac for their help with manuscript preparation. We also thank the University of Delaware Nutrition interns for their help and support.

References

1. Ogden, C. L., Carroll, M. D., Kit, B. K., & Flegal, K. M. (2012, February 1). Prevalence of obesity and trends in body mass index among US children and adolescents, 1999-2010. *JAMA*, 307(5), 483–490. [PubMed https://doi.org/10.1001/jama.2012.40](https://doi.org/10.1001/jama.2012.40)
2. Juonala, M., Magnussen, C. G., Berenson, G. S., Venn, A., Burns, T. L., Sabin, M. A., . . . Raitakari, O. T. (2011, November 17). Childhood adiposity, adult adiposity, and cardiovascular risk factors. *The New England Journal of Medicine*, 365(20), 1876–1885. [PubMed https://doi.org/10.1056/NEJMoa1010112](https://doi.org/10.1056/NEJMoa1010112)
3. Shay, C. M., Ning, H., Daniels, S. R., Rooks, C. R., Gidding, S. S., & Lloyd-Jones, D. M. (2013, April 2). Status of cardiovascular health in US adolescents: Prevalence estimates from the National Health and Nutrition Examination Surveys (NHANES) 2005-2010. *Circulation*, 127(13), 1369–1376. [PubMed https://doi.org/10.1161/CIRCULATIONAHA.113.001559](https://doi.org/10.1161/CIRCULATIONAHA.113.001559)
4. Cornier, M. A., Marshall, J. A., Hill, J. O., Maahs, D. M., & Eckel, R. H. (2011, August 16). Prevention of overweight/obesity as a strategy to optimize cardiovascular health. *Circulation*, 124(7), 840–850. [PubMed https://doi.org/10.1161/CIRCULATIONAHA.110.968461](https://doi.org/10.1161/CIRCULATIONAHA.110.968461)
5. Daniels, S. R., Arnett, D. K., Eckel, R. H., Gidding, S. S., Hayman, L. L., Kumanyika, S., . . . Williams, C. L. (2005, April 19). Overweight in children and adolescents: Pathophysiology, consequences, prevention, and treatment. *Circulation*, 111(15), 1999–2012. [PubMed https://doi.org/10.1161/01.CIR.0000161369.71722.10](https://doi.org/10.1161/01.CIR.0000161369.71722.10)
6. Rampersaud, G. C., Pereira, M. A., Girard, B. L., Adams, J., & Metz, J. D. (2005, May). Breakfast habits, nutritional status, body weight, and academic performance in children and adolescents. *Journal of the American Dietetic Association*, 105(5), 743–760. [PubMed https://doi.org/10.1016/j.jada.2005.02.007](https://doi.org/10.1016/j.jada.2005.02.007)

7. Pereira, M. A., Kartashov, A. I., Ebbeling, C. B., Van Horn, L., Slattery, M. L., Jacobs, D. R., Jr., & Ludwig, D. S. (2005, January 1-7). Fast-food habits, weight gain, and insulin resistance (the CARDIA study): 15-year prospective analysis. *Lancet*, 365(9453), 36–42. [PubMed https://doi.org/10.1016/S0140-6736\(04\)17663-0](https://doi.org/10.1016/S0140-6736(04)17663-0)
8. Ludwig, D. S., Peterson, K. E., & Gortmaker, S. L. (2001, February 17). Relation between consumption of sugar-sweetened drinks and childhood obesity: A prospective, observational analysis. *Lancet*, 357(9255), 505–508. [PubMed https://doi.org/10.1016/S0140-6736\(00\)04041-1](https://doi.org/10.1016/S0140-6736(00)04041-1)
9. Nestle, M. (2003, January). Increasing portion sizes in American diets: More calories, more obesity. *Journal of the American Dietetic Association*, 103(1), 39–40. [PubMed https://doi.org/10.1053/jada.2003.50007](https://doi.org/10.1053/jada.2003.50007)
10. Sesé, M. A., Jiménez-Pavón, D., Gilbert, C. C., González-Gross, M., Gottrand, F., de Henauw, S., . . . Moreno, L. A., & the HELENA Study Group. (2012, August). Eating behaviour, insulin resistance and cluster of metabolic risk factors in European adolescents. The HELENA study. *Appetite*, 59(1), 140–147. [PubMed https://doi.org/10.1016/j.appet.2012.07.011](https://doi.org/10.1016/j.appet.2012.07.011)
11. Langevin, D. D., Kwiatkowski, C., McKay, M. G., Maillet, J. O., Touger-Decker, R., Smith, J. K., & Perlman, A. (2007, November). Evaluation of diet quality and weight status of children from a low socioeconomic urban environment supports “at risk” classification. *Journal of the American Dietetic Association*, 107(11), 1973–1977. [PubMed https://doi.org/10.1016/j.jada.2007.08.008](https://doi.org/10.1016/j.jada.2007.08.008)
12. Balagopal, P. B., de Ferranti, S. D., Cook, S., Daniels, S. R., Gidding, S. S., Hayman, L. L., . . . Steinberger, J., & the American Heart Association Committee on Atherosclerosis Hypertension and Obesity in Youth of the Council on Cardiovascular Disease in the Young, & the Council on Nutrition, Physical Activity and Metabolism, & the Council on Epidemiology and Prevention. (2011, June 14). Nontraditional risk factors and biomarkers for cardiovascular disease: mechanistic, research, and clinical considerations for youth: a scientific statement from the American Heart Association. *Circulation*, 123(23), 2749–2769. [PubMed https://doi.org/10.1161/CIRCULATIONAHA.110.1934](https://doi.org/10.1161/CIRCULATIONAHA.110.1934)
13. Steinberger, J., Daniels, S. R., Eckel, R. H., Hayman, L., Lustig, R. H., McCrindle, B., & Mietus-Snyder, M. L., & the American Heart Association Atherosclerosis, Hypertension, and Obesity in the Young Committee of the Council on Cardiovascular Disease in the Young, Council on Cardiovascular Nursing; and Council on Nutrition, Physical Activity, and Metabolism. (2009, February 3). Progress and challenges in metabolic syndrome in children and adolescents: A scientific statement from the American Heart Association Atherosclerosis, Hypertension, and Obesity in the Young Committee of the Council on Cardiovascular Disease in the Young; Council on Cardiovascular Nursing; and Council on Nutrition, Physical Activity, and Metabolism. *Circulation*, 119(4), 628–647. [PubMed https://doi.org/10.1161/CIRCULATIONAHA.108.1609](https://doi.org/10.1161/CIRCULATIONAHA.108.1609)
14. Kelly, A. S., Barlow, S. E., Rao, G., Inge, T. H., Hayman, L. L., Steinberger, J., . . . Daniels, S. R., & the American Heart Association Atherosclerosis, Hypertension, and Obesity in the Young Committee of the Council on Cardiovascular Disease in the Young, Council on Nutrition, Physical Activity and Metabolism, and Council on Clinical Cardiology. (2013, October 8). Severe obesity in children and adolescents: identification,

- associated health risks, and treatment approaches: a scientific statement from the American Heart Association. *Circulation*, 128(15), 1689–1712. [PubMed](#)
15. Balagopal, P., George, D., Patton, N., Yarandi, H., Roberts, W. L., Bayne, E., & Gidding, S. (2005, March). Lifestyle-only intervention attenuates the inflammatory state associated with obesity: A randomized controlled study in adolescents. *The Journal of Pediatrics*, 146(3), 342–348. [PubMed](#) <https://doi.org/10.1016/j.jpeds.2004.11.033>
 16. Hyland, R., Stacy, R., Adamson, A., & Moynihan, P. (2006, February). Nutrition-related health promotion through an after-school project: The responses of children and their families. *Soc Sci Med*, 62(3), 758–768. [PubMed](#) <https://doi.org/10.1016/j.socscimed.2005.06.032>
 17. Carleton, R. A., Sennett, L., Gans, K. M., Levin, S., Lefebvre, C., & Lasater, T. M. (1991). The Pawtucket Heart Health Program. Influencing adolescent eating patterns. *Annals of the New York Academy of Sciences*, 623, 322–326. [PubMed](#) <https://doi.org/10.1111/j.1749-6632.1991.tb43741.x>
 18. Larson, N. I., Perry, C. L., Story, M., & Neumark-Sztainer, D. (2006, December). Food preparation by young adults is associated with better diet quality. *Journal of the American Dietetic Association*, 106(12), 2001–2007. [PubMed](#) <https://doi.org/10.1016/j.jada.2006.09.008>
 19. Bucher, T., van der Horst, K., & Siegrist, M. (2011, August). Improvement of meal composition by vegetable variety. *Public Health Nutrition*, 14(8), 1357–1363. [PubMed](#) <https://doi.org/10.1017/S136898001100067X>
 20. Barlow, S. E., & the Expert Committee. (2007, December). Expert committee recommendations regarding the prevention, assessment, and treatment of child and adolescent overweight and obesity: Summary report. *Pediatrics*, 120(Suppl 4), S164–S192. [PubMed](#) <https://doi.org/10.1542/peds.2007-2329C>
 21. Whitlock, E. P., O'Connor, E. A., Williams, S. B., Beil, T. L., & Lutz, K. W. (2010, February). Effectiveness of weight management interventions in children: A targeted systematic review for the USPSTF. *Pediatrics*, 125(2), e396–e418. [PubMed](#) <https://doi.org/10.1542/peds.2009-1955>
 22. Gans, K., Hixson, M. L., Eaton, C. B., & Lasater, T. M. (2000). Rate your plate: A dietary assessment and educational tool for blood cholesterol control. *Nutrition in Clinical Care*, 3(3), 163–169. <https://doi.org/10.1046/j.1523-5408.2000.00045.x>
 23. Carleton, R. A., Sennett, L., Gans, K. M., Levin, S., Lefebvre, C., & Lasater, T. M. (1991). The Pawtucket Heart Health Program. Influencing adolescent eating patterns. *Annals of the New York Academy of Sciences*, 623, 322–326. [PubMed](#) <https://doi.org/10.1111/j.1749-6632.1991.tb43741.x>
 24. Spear, B. A., Barlow, S. E., Ervin, C., Ludwig, D. S., Saelens, B. E., Schetzina, K. E., & Taveras, E. M. (2007, December). Recommendations for treatment of child and adolescent overweight and obesity. *Pediatrics*, 120(Suppl 4), S254–S288. [PubMed](#) <https://doi.org/10.1542/peds.2007-2329F>

Copyright (c) 2017 Delaware Academy of Medicine / Delaware Public Health Association.

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<https://creativecommons.org/licenses/by-nc-nd/4.0/>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.