Teens Eating for Energy and Nutrition at School

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The following evaluation plan is for a program derived from Teens Eating for Energy and Nutrition at Schools (TEENS). The original TEENS program was a multi-component, school-based behavior modification program in Twin Cities, MN metropolitan area middle schools conducted from 1997 to 2000. It targeted seventh and eighth graders' fruit, vegetable and lower fat foods consumption.[1] In the original program, sixteen middle schools that had 20% of students in their district qualify for free or reduced-price lunch participated in the program. Our proposed evaluation plan maintains the original TEENS activities, participants, roles and duration. However, the program has been relocated to the Bronx, New York. It will start in Fall 2018 and last through 2020.

Background

In the 2011-2012 National Health and Nutrition Examination Survey, adults aged 18-64 scored only 58 out of 100 on Healthy Eating Index (HEI)-2010 Total Score.[2] Children aged 2-17 years scored only 55 out of 100 on HEI for the same period.[2] The association between unhealthy eating behaviors and chronic disease is evidenced by the United States Department of Agriculture (USDA)'s Dietary Guidelines' goal to promote healthy eating behaviors in order to prevent chronic diseases.[3]

The unhealthy eating habits of people in the United States results in diet-related chronic diseases with significant financial and social burdens. Approximately 50% of American adults have one or more preventable diet-related chronic disease.[3] An estimated 12% of adults aged 18 years and older in United States had diabetes in 2015.[4] Diabetes places financial and social burdens on Americans. In 2012, the estimated medical and decreased productivity cost of diagnosed diabetes alone was $245 billion.[5] After adjusting for age group and sex, average medical expenditures among people with diagnosed diabetes are about 2.3 times higher than expenditures for people without diabetes.[5]

Diet-related chronic diseases are less prevalent in adolescents. There are only 12.5 new cases of type 2 diabetes per 100,000 youths aged less than 20 years in 2011-2012.[6] However this incidence rate has risen sharply.[6] Current and lifetime medical cost increases are exacerbated in youths. A 2011 study found that predicted mean annual total per-person medical expenditures for youth with diabetes was 6.2 times that of youth without diabetes.[7] Apart from chronic diseases, "adequate [adolescent] nutrition is crucial for achieving full growth potential … failure to achieve optimal nutrition may lead to delayed and stunted linear growth and impaired organ remodeling."[8]

In relation to national statistics, the Bronx has similarly low scores for healthy eating behavior and high scores for diet-related chronic disease. Almost all of the healthy eating and chronic disease statistics in the Bronx are worse than those of any other New York City borough. In 2016, 6% of adults in the Bronx consumed five or more servings of vegetables or fruits the prior day on an age-adjusted basis versus 10% across all of New York City.[ix] While only 23% of adults across all of New York City consumed one or more sugary drinks per day, 31% of Bronx adults do so.[9] 17% of Bronx respondents have diabetes; 37% have high blood pressure; and 70% are overweight or obese compared to 11%, 28% and 58% respectively for all of New York City.[9] In 2009, 6% of New York City children aged 6 to 12 years had no servings of fruits and vegetables the prior day and 16% had five or more servings of fruits and vegetables the prior day. In contrast, 10% of Bronx children aged 6 to 12 years had no servings of fruits and vegetables at all and only 14% had five or more servings of fruits and vegetables.[10] 44% of NYC

children aged 6 to 12 years consumed sugary drinks daily, compared to 53% of Bronx children of the same age range..[10] Diet-related disease prevalence or incidence are not tracked. However, only 63% of Bronx children aged 6 to 12 years were self-reported to have excellent or very good general health status compared to 71% of all NYC children aged 6 to 12 years.[10]

Program Description[1]

Participants:[1]

TEENS targets students of eight public middle schools in Bronx Community District 7 that have both seventh and eighth graders attending their school and at least 30 students in each of seventh and eighth grades. Bronx Community District 7 has a 5-Year average NYCgov poverty rate of 27.6%.[12]

In addition to seventh graders at participating middle schools, program participants include classroom teachers, families and district food service directors and local school food service managers and school staff. The classroom teachers are typically Family and Consumer Science, Health or Science teachers.

Activities:[1,11]

TEENS is developed using Social Cognitive Theory (SCT). The program's components (classroom, family and school-wide) reflect the theory's reciprocal determinism (individual/personal, behavioral and environmental) constructs.

Classroom: This comprises "10 behaviorally based nutrition education lessons in each of the seventh and eighth grades"[1,p.272] Each forty to forty-five minute-long lesson emphasizes "self-monitoring, goal setting, hands-on snack preparation, and skill development for choosing healthy foods and for overcoming barriers to making healthful choices." [1,p.272] Seventh grade curriculum activities include the preparation of fruit and vegetable snacks in class; food-intake recording and self-assessment; "hands-on experiential learning stations" including "ranking packaged snacks by fat content, estimating fat in fast foods, comparing serving sizes; a relay-race where students compete in teams to count fat grams in food packages; and a card game to practice "Choose-Change-Plan Ahead-Eat A Little" options to eat more fruits, vegetables and low fat foods.[11,p.122] Eighth grade curriculum activities help students "see connections between cues, reinforcements and their eating behaviors" and cover "nutrition topics, including vending machines in school, foods available in convenience stores, vegetarianism, and food advertising."[1,p.273]

Lessons are delivered by regular classroom teachers who receive a full day of training for each grade's curriculum, including the peer involvement aspect. In seventh grade, each class elects six students from their class to be peer leaders who help teach the sessions. Peer leaders receive a day of intensive training that reviews and rehearses the sessions and activities.[11,p.123]

Family: Each grade's family component comprises three newsletters and a pack of ten behavioral coupons. The newsletters have an article on "how parents could help students eat more fruits, vegetables and less fat; a question/answer column; and simple behavioral tips or a family quiz."[1,p.273] Families that complete ten and more behavioral coupons receive financial rewards. Newsletters are used in seventh grade homework assignments to increase family participation.

Schoolwide: District food service directors and local school food service managers and staff increase offerings and promotion of fruits and vegetables and healthier snacks a la carte. Schoolwide councils (School Nutrition Advisory Councils (SNACs) composed of school

administrators and staff, parents, students and TEENS staff work on self-selected topics to foster a school environment where "a healthy food choice [is] the easier and more normative food choice."[1,p.273]

Location:[1]

TEENS is conducted in an urban, school- and community-based setting. It is primarily administered in participating Bronx public middle schools in Bronx Community District 7. The family component occurs in students' homes.

Timing:[1]

The intervention begins with a cohort of seventh graders in Fall 2018 and follows them through eighth grade. A follow-up survey is administered in Fall 2020 after eighth grade completion. Students receive ten in-class nutrition education sessions each grade. Students in SNACs and who participate in the program's family component have additional nutrition-related exposure.

Process Objectives

1. By the end of August 2018, 8 middle school teachers receive a full day teacher training on the TEENS curriculum.
2. By the end of the second week of the Fall semester 2018, 6 seventh grade students from each seventh grade class will be elected by their fellow classmates to be Peer Leaders.
3. By September 2018, the first two editions of the parent newsletter will be assembled and ready for distribution.

Interview Guide

Interviewees: Middle school teachers trained to teach the TEENS curriculum

Overall Question: How does training the TEENS curriculum work in practice and what problems with the implementation of the TEENS program, if any, might exist?

Introduction

My name is ____ and I am evaluating the implementation of the TEENS program at your school. Today we'll be talking about the training you received on the TEENS curriculum, your experiences teaching the curriculum, and your overall impressions of how the program was rolled out at your school. I have some questions for you and I'm sure you will have thoughts to add so let's think of this as an open dialogue, rather than a formal interview.

This interview will last 50-60 minutes. I would like to record this interview, if that's okay with you. This is simply to help me remember what you say, and to help me pay attention to you while we talk. If you want me to turn off the recorder for any reason at any time, please just let me know. I will not share the recording with anyone and I will not share the information from the interview with anyone other than the other evaluators of the TEENS program. And again, your name will not be used at any point. Is it okay with you if I record and take some notes during our interview?

Turn on recorder.

I've now started the recorder and just want to confirm that I have your consent to record our interview?

Interview questions--

1. I'd like to start with you telling me about yourself as a teacher at this school.

Sub-questions:

- What has your experience been teaching at this school?
- How do you see your role at this school?
- How long have you worked in this role?

2. Can you share with me your views on nutrition as a whole?

Sub-questions:

- What role does nutrition play in your life?
- How important is nutrition to you?
- How do you think nutrition affects health?
- What are your views on nutrition education?

Now I'd like to ask your experiences with the implementation of the TEENS program at your school.

3. Can you describe your experience being asked to participate in the TEENS program?

Sub-questions:

- How did you feel about being asked to participate?
- What did you think of the TEENS program when it was described to you?

4. Can you describe your experience being trained in the TEENS curriculum?

Sub-questions:

- Can you describe the quality of the content of the training?
- Can you describe the quality of the trainers leading the training?
- How did you feel about the length of the training?
- How did the training differ from other trainings you've had in the past?

5. To what extent did you feel prepared to teach the TEENS curriculum after the training?

Probes:

- Personal comfort
- Feelings about resources provided
- Knowledge gained

6. Can you describe your experiences teaching the TEENS curriculum?

Sub-questions:

- How was your relationship with your students affected?
- How did you feel your students responded to the lessons?
- What aspects of the curriculum 'worked,' if anything?
- What aspects of the curriculum 'did not work,' if anything?
- Did it require you to interact with your students differently than usual?

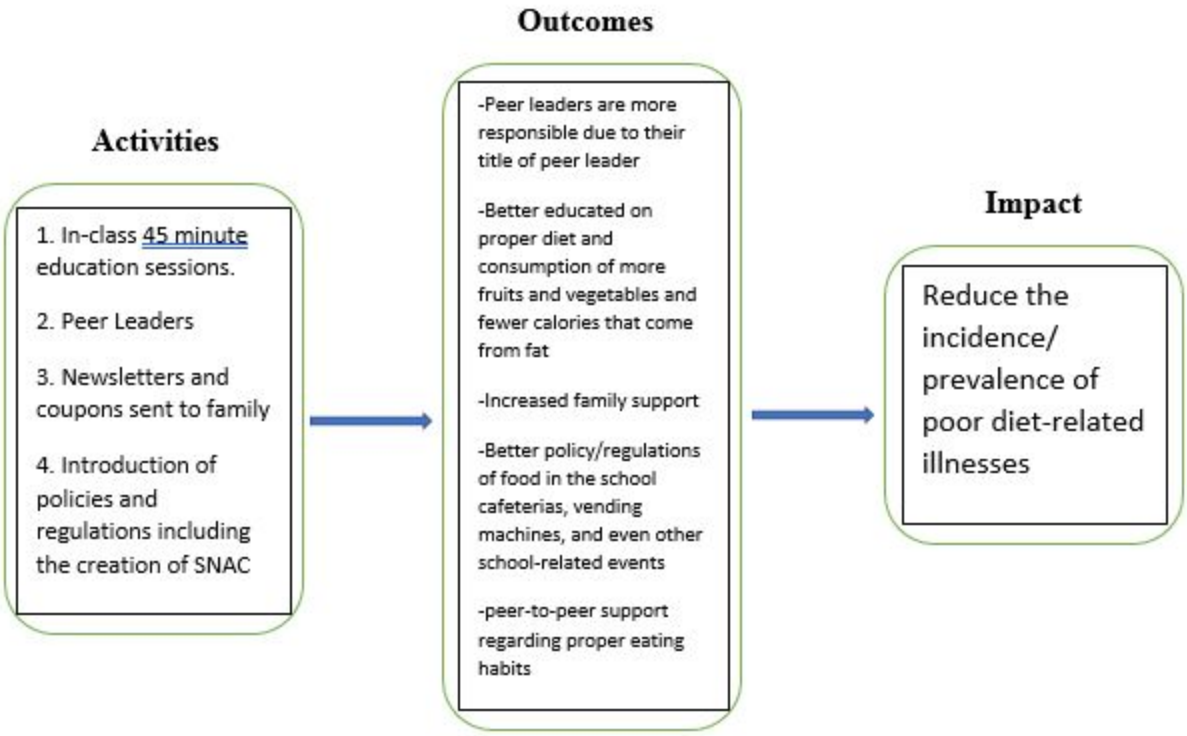
7. Can you describe your experience with the 'peer leaders' in your classroom?

Sub-questions:

- How did other students respond to the peer leaders?
- How comfortable did the peer leaders seem?
- How prepared did the peer leaders seem?
- How comfortable were you with lessons the peer leaders taught?

Thank you very much for your time. Are there any questions you have for me?

Impact Theory



The program seeks to achieve one long-term impact, which is to reduce the incidence and prevalence of poor diet and nutrition-related illnesses. The program aims to achieve the impact through the means of its multidimensional approach. As described above, there are four facets to the intervention: 1. In-class 45-minute educational sessions, 2. Peer leaders that will help deliver the 45 minute lessons and help disseminate personal ideas on policy and regulation objectives, 3. Newsletters and coupons to be given to families to help encourage the students' healthy eating habits, 4. Introduce policies and regulations at each school that lead to the creation of a Student Nutrition Advisory Council (SNAC) and improve the healthiness of foods that are sold at the school. These four facets aim to impact students' health consciousness and increase their overall consumption of healthy foods. These outcomes are expected to lead to a reduction in incidence and overall prevalence of diet and nutrition-related illnesses, as outlined above.

The impact theory is the Social Cognitive Theory (SCT). SCT helps build the framework for evaluation of behavior changes. Specifically, SCT looks at how factors such as a person's environment, social networks, and observational learning lead to their behavior changes. In the TEENS program, the intervention uses all social networks available to the student, as well as the school and home environment in order to impact the specific behavior change(s), including increasing fruit and vegetable consumption, decreasing the consumption of fatty foods, and increasing overall awareness of nutrition and health eating.

As with any theory that is used as a framework to build a program, SCT makes several assumptions. The first assumption is that people will learn by observing other people. The other assumption is that people will eventually be self-motivated enough to regulate their own learning. The two assumptions that essentially guide the theory is that learning will lead to a

behavior change and that by implementing a reinforcement or punishment system, behavior change will be achieved.

Evaluation Study Design

To evaluate the program's impact on adolescent students in South Bronx middle schools, an experimental study design is utilized. Of the thirteen public middle schools in South Bronx (Community District 7), eight member schools with the most similar baseline readings are selected to participate in the study. Baseline readings are necessary at the beginning of the evaluation process to ensure that findings of different schools are compared without an added variable to complicate potential findings. Baseline readings are obtained with a baseline survey administered by the school district to all students in seventh and eighth grades. The survey includes eating habits of the students specifically regarding consumption of fruits and vegetables, and of energy acquired through the consumption of the fats/lipids macronutrient. The survey also gauges prevalence of certain diet-related illnesses in the students' families, such as heart disease, various cancers, etc.

Additionally, a control group is necessary in order to understand the true effects of the intervention. Therefore, the eight schools are randomly split into two groups of four. One group of four schools receives the intervention over the course of the next two school years (seventh graders in the year 2018-2019 and then former seventh graders who are now eighth graders in the year 2019-2020). One group of four schools will serve as the control group; this group does not receive any nutrition-related intervention until after the study is complete.

Because of the various components of the program (classroom, family and school-wide), a mixed-methods approach to evaluation and data collection is most useful. The program's full impact is evaluated by comparing intervention group data collected after the program with both a) control group data collected a similar period after program implementation in intervention schools and b) intervention group data collected at prior to program implementation. Both pre and post intervention surveys will be administered to students, parents, teachers, and other program staff. Students in the control group will receive pre and post intervention surveys as well. However control group parents and teachers will not receive any surveys. Student surveys will include qualitative and quantitative data such as a) a simple quiz assessing their self-perceived and actual knowledge and understanding of healthy eating and food choices; b) data to adjust for possible confounders such as age, sex, gender, physical and extracurricular activities, and home proximity to supermarkets; and c) daily fruit and vegetable consumption. Pre and post intervention surveys will be identical to one another. There will also be a quantitative measure of healthy eating habits. This will come in the form of a brief interview administered every time the TEENS class meets once every other week for five weeks in the first semester of the school year and five weeks in the second semester. In the course of the interview, each student will dictate a 24 hour recall of the foods they consumed. Students will receive a post-intervention interview focused on their attitudes toward food, understanding of healthy choices, and behaviors related to any or all of the lessons given in the program. Students, parents, teachers and other program staff will also receive qualitative pre and post intervention surveys to gain insight into the experiences and attitudes held about the program.

The experimental design is the best design to evaluate the impact of the TEENS program in the Bronx because the aim is to highlight a difference between the intervention group of students and the control group. In order to generalize our findings, it is better to randomly assign

the schools to groups as opposed to indicating which group they should be in, as in the case of a quasi-experimental design.

There are a few limitations to the study design as its outcomes could be distorted by confounders. As with most studies these could include gender, sex and age. Across cultures, there are many different 'acceptable' diets, so race/ethnicity may be a confounder that could affect the findings. Other confounders include the extracurricular activities a student may participate in, as they may change a person's diet based on when they have the time to eat. Access to healthy foods, or proximity to locations that will have nutritious foods would also be a confounding variable in this study. A final confounder that may pose a challenge is the physical activity level of students. Conceivably, those with different levels of physical activity have different dietary needs.

Some of these confounders may be accounted by adjusting outcomes for gender, sex, age, physical activity levels, extracurricular activities and proximity of participants' homes to supermarkets. Data to do so is collected as part of pre and post intervention student surveys.

Impact Objectives

1. An increase in fruit and vegetable consumption in at least 80% of participants compared to pre-intervention by the end of the two-year TEENS program.
2. Increase in self-perceived knowledge and understanding of healthy eating and food choices at the end of the two-year TEENS program compared to pre-intervention, based on interviews.
3. A long-term objective of seeing a 10% decrease in the percentage of Bronx children who had eaten no fruits or vegetables the prior day on the 2021 NYC Child Community Health Survey compared to 2009 (the last time the NYC Child Community Health Survey was executed).

Indicators

Measuring the increase in reported fruit and vegetable consumption will be performed by comparing the consumption reported in the pre-intervention survey for each student to the survey completed at the end of the intervention. Results are generated for both individual participants and averaged across the respective intervention and control groups. A statistical analysis will be performed using SPSS or SAS to examine any potential changes; comparison to the control group will also be performed. These results are subject to recall bias, as students may over- or under-report their consumption; the statistical analysis itself is also subject to mathematical or random error and will be repeated for confirmation.

To measure an increase in knowledge a simple quiz will be utilized covering facts about nutrition—the same quiz implemented at the beginning of the study—but measuring understanding is much more subjective. Post-intervention surveys and interviews will be designed for specific indicators: those that address attitudes toward food, understanding of healthy choices, and behaviors related to any or all of the lessons given in the program. Excerpts from interviews relating to these will be given codes and analyzed via a qualitative software such as Dedoose. Interviewer bias and reflexivity are issues with this research, as interviews are being performed and measured by adults, but the excerpts analyzed are spoken by adolescents. It is possible that interviewers and analysts could misinterpret what an adolescent means based on a

generational gap in slang and phrasing, as well as the risk of the adolescent misinterpreting the initial question.

The third, long-term objective of seeing an increase in fruit and vegetable consumption in NYC Child Community Health Survey for the Bronx uses the Child Community Health Survey itself as a datasource. The survey asks parents how many servings of fruits and vegetables their child ate the previous day. This data is collected at the city-level and not by TEENS program staff. The intervention will be complete by the time the data is released. Retrospective analysis may be done in order to determine how much of an impact the intervention may have had. This objective has a much higher potential lack of construct validity than the others, as it is assessing Bronx children *overall*, in the entire borough rather than simply covering the participants in the study. It is entirely plausible that environmental, social and economic changes may occur across the entire borough of the Bronx, impacting other members of the Bronx community districts, which would lead to these borough-level numbers increasing. In addition, the surveyed population in 2021 may be a significantly different population than was surveyed in 2009; families relocate, residents age and are no longer counted as "adolescents." Making additional comparisons to the community health data collected in interim periods may be useful for future analysis.

Every measured indicator is subject to the risk of threat to validity due to the fact that the students are aging and maturing from one survey to the next; this also leaves room for interfering events. With adolescents in a school, non-random loss to follow up is always possible due to families leaving the area or students leaving the school for other reasons. In none of these cases is it possible to determine without a doubt that there is a causal relationship between the intervention and the results of measurement of indicators, so internal validity cannot be guaranteed. This is adjusted for using the adjustments for confounders addressed in the previous section.

Conclusion

Study design and evaluation planning are multi-factorial iterative processes. Clarity of the program's goal, activities, impact and process objectives and context limitations impact both study design and evaluation planning. Generalizability to the rest of the Bronx is important given the goal of decreasing the incidence and prevalence of illnesses related to poor diets and long-term impact objective of increasing the prior day's fruit and vegetable consumption in Bronx children. This results in the selection of an experimental study design. Impact and process objectives inform decisions around data collection. Data collection tools such as surveys and interview guides are developed depending on the type of qualitative and quantitative data necessary to provide measurable and meaningful analysis in support or refute of the objectives. The manner and timing of such data collection need to account for available resources, participants' likely behavior and program implementation. For example surveys are used for parents, teachers, other program staff and control group students but a combination of brief interviews and surveys are used for intervention group students. The combination of interviews and surveys provide nuanced context to understand our findings. However interviews are time and resource intensive and thus their use is limited.. While attempts are made to be as comprehensive as possible when designing a study and its evaluation, resource limitations, confounders and unforeseen implementation challenges affect outcomes; much remains unknown and untested until the study is implemented and evaluated.

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