Medical Students Pilot Nutrition and Cooking Program for Children in Underserved Communities

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Abstract:
Background: To describe the development and implementation of a pilot pediatric nutrition curriculum created by medical students for underserved communities.

Methods: Medical students designed an interactive cooking and nutrition curriculum for children to address local community needs. Children participated in the four-module pilot program offered over the summer. Participants completed pretest and posttest surveys before and after the four-week curriculum. A post curriculum implementation survey was filled out by parents to assess long-term effectiveness of the program.

Results: The course was divided into four themed nutrition classes that represented major staples of the diet. Within each themed class existed supporting objectives involving kitchen safety, serving sizes, nutrition labels, etc. The pretest group (n=44) scored an average of 59% (n= 3.55/6) on six nutrition knowledge questions. The posttest group (n=21) scored an average of 68% (n = 4.1/6). Post implementation survey response rate was 16% (n = 7/44) with 100% (n = 7/7) of respondents reporting that they would definitely recommend the program. Using a ranking scale (1-5), parents strongly agreed (4.6-5.0) that their children exhibited more confidence in the kitchen (5.0), developed more interest in preparing meals and snacks (4.7), demonstrated greater awareness of kitchen safety (4.7) and displayed more knowledge about nutrition (4.6) after participating in the nutrition program.

Conclusion: After piloting the program for two seasons, surveys identified baseline participant characteristics, nutrition knowledge, expected retention rates and longitudinal behavior changes. Further optimization of surveys is needed to better assess the efficacy of the program.

Introduction:
The positive effects of pediatric nutrition programs is well documented in the literature.¹ Pediatric nutrition programs promote enjoyment and create a positive learning atmosphere for children.² Most successful programs involve hands-on, interactive curriculums to reinforce course content.³ Data indicates that children who help grow and/or prepare their own food are more likely to taste it, as well as increase meal consumption.⁴,⁵ This phenomenon is thought to be attributed to the pride children feel when creating their own meals.⁶

Recently, the literature has identified substantial gaps in pediatric nutrition program education. Among others, there is a lack of pediatric nutrition programs being offered over the summer.⁷,⁸ Offering nutrition programs over the summer could help combat the food scarcity that exists when students do not have access to free/reduced-price school meals.⁸

This paper aims to describe a summer nutrition program created by medical students that serves children within underserved communities. The program was adopted after other well-established curricula and modified to better fit the needs of a community program run entirely by volunteer medical students. Thus far, the program
has been piloted over two years as a four-class curriculum offered over the summer.

**Methods:**

**PROJECT TIMELINE:** Curriculum remodeling and survey development was launched six months before program implementation. Program approval, contract negotiations and funding was already established from the previous curriculum. Medical student volunteers were oriented to the facility and trained on kitchen safety one week before module one. The program was instituted over four classes within four weeks during July and August. At the end of year two, a thorough program evaluation was conducted and preliminary data from surveys were analyzed.

**BUDGET:** The goal of the budget was to create an effective program that was absolutely free to participants. The program is fully funded by grants and donations from local grocery stores, hospitals and academic institutions. The curriculum was designed to be cost-effective by selecting recipes with healthy, yet relatively inexpensive ingredients that could be realistically fulfilled by families. The program is run by volunteer medical students and overseen by a volunteer physician facilitator which altogether, drastically cuts program costs.

**NEEDS ASSESSMENT:** A formal needs assessment was not conducted. Need was based upon community characteristics including poverty level. The community of children served in the program is diverse. Many children live within the small urban city where the community center kitchen is also located. A large portion of participants are helped daily by the equal opportunity community center and stay at the facility to participate in the nutrition program. The other participants are brought by guardians and live either in the urban city or surrounding communities.

According to the county’s community health assessment, a substantial dispersion exists between the small urban city and the surrounding communities. The small urban city of 27,000 is considered a dichotomy economically. Half of the city contains poverty levels of greater than 25%, while the remaining neighborhoods have as little as 10% of residents living in poverty. The county as a whole has 16% of its inhabitants living under the federal poverty level, with an additional 19% living near it.

**CURRICULUM:** The curriculum was revamped with three goals in mind; introduce children to the kitchen, teach basic nutrition knowledge, and promote positive attitudes toward nutrition using a fun, interactive curriculum. The course content was designed to be appropriate for children ages 8-15 with varying skills and education levels. The curriculum was also designed to be suitable for a full staff of ever-changing medical students.

**SURVEYS:** Surveys were the major source of data collection and program evaluation during the two-year pilot. Surveys were filled out by child participants and parents. All surveys filled out by children had prior parental authorization with signed permission forms outlining the intents and purposes of the surveys being collected.

The participant surveys contained demographic information, basic questions on nutrition knowledge, and attitudes about nutrition. Questions assessing nutrition knowledge were designed so that all the answer choices were pictures to decrease disparities among reading levels. All other questions used simple language to make the questions suitable for children. The pretest and posttest group used the same survey described above.

Over two years, children filled out the pretest and posttest surveys. Pretest surveys were filled out immediately before the start of the first module and posttest surveys were filled out immediately after the fourth module. The questions were read aloud to a large group by one group leader while small groups simultaneously received help from medical student volunteers.

Post implementation surveys were designed for parents of child participants who completed at least two of the four module curricula. The purpose of the survey was to determine if parents observed any long-term changes in their children after the program. The surveys were collected online via Survey Monkey and by telephone. Parents were instructed to fill out one survey per child. Besides standard multiple-choice questions, the survey also contained 14 questions regarding observed...
behaviors in children witnessed by parents. Parents used a ranking scale from 1-5 to either strongly agree (5), remain neutral (3), or strongly disagree (1) to the defined behavior. Average ranges were assigned a qualitative description including strongly agree (5.0-4.6), agree (4.5-3.6), neutral (3.5-2.6), disagree (2.5-1.6) and strongly disagree (1.5-1.0). The survey also allowed for additional comments and suggestions.

**Results:**

**PILOT CURRICULUM DEVELOPMENT**

The course was broken down into four themed nutrition classes that represented major staples of the diet including proteins, vegetables, whole grains and fats. Within each themed class existed supporting objectives involving kitchen safety, serving sizes, nutrition labels, etc. Curriculum objectives were reinforced through recipes, cooking, worksheets and group presentations during meals.

**PILOT CURRICULUM IMPLEMENTATION:**

Each class was two hours long and followed a similar schedule including recipe introduction, cooking in the kitchen, teaching lesson, and group meal with portion presentations. The majority of a two hour class was devoted to cooking in the kitchen to purposely highlight the interactive curriculum. Volunteer to participant ratio was kept at one volunteer to two participants to augment kitchen safety.

**KNOWLEDGE PRETEST SCORES:** The pretest group (n= 44) was almost equal among sex (males = 48%, females = 52%) with 10-12 year old children (7-9 = 32%, 10-12 = 55%, 13-15 = 13%) (Table 1). The overall average nutrition knowledge score of the pretest group was 59% (n= 3.55/6) (Figure 1).

| Age Range | Pretest | Posttest |
|-----------|---------|----------|
| 7-9       | 14 (32%) | 4 (19%)  |
| 10-12     | 24 (54%) | 15 (71%) |
| 13-15     | 6 (14%)  | 2 (10%)  |
| Total     | 44       | 21       |

Distribution in age ranges: pretest and posttest group

| Figure 1: Correct Responses 2018-2019 |
|--------------------------------------|
| Correct Response Pre Survey | Correct Response Post Survey |
| 39% | 22% | 82% | 12% |
| 65% | 39% | 62% | 38% |
| 52% | 28% | 45% | 55% |
| 40% | 40% | 40% | 60% |
| 65% | 35% | 65% | 35% |

Average percentage of correct responses for each nutrition knowledge question on the pretest surveys and posttest surveys

**KNOWLEDGE POSTTEST SCORES:** Almost half (48%) of the participants who completed the pretest (n= 44) also completed the posttest (n=21). The posttest group had slightly less males (males = 40%, females = 60%) and consisted mainly of 10-12 year old children (7-9 = 19%, 10-12 = 71%, 13-15 = 10%) (Table 1). The average score of the posttest group was 68% (n = 4.1/6). The posttest group improved in almost all categories including identifying foods rich in vitamin A (41/44 = 93% vs. 20/21 = 95%), potassium (27/44 = 61% vs. 13/21 = 62%), healthy fat (32/44 = 73% vs. 18/21 = 86%), and low in vitamins and minerals (20/44 = 45% vs. 13/21 = 62%). The posttest group did not improve when correctly identifying proteins (17/44 = 39% vs. 8/21 = 38%) (Figure 1).

**POST- IMPLEMENTATION SURVEYS RESULTS:** Of the children who participated in the course, 16% also had longitudinal surveys filled out by their parents/guardians (n= 7/44). Length of time between completed survey and participation in the course ranged from three months to 2 years. Most of the responses (n=5/7) indicated that the participant completed the entire curriculum.

Responses to the scaled observed behaviors were averaged and assigned an average qualitative response (Table 2). All respondents (n=7/7) strongly agreed (5.0) that their children; exhibited more confidence in the kitchen, developed more interest in preparing meals and snacks (4.7), demonstrated greater awareness of kitchen safety
(4.7) and displayed more knowledge about nutrition (4.6) after the course (Table 2). Observed behavior change was less prominent regarding more interest in nutrition labels and serving sizes (3.9) and more interest in healthy dairy products like low-fat yogurt, cheese and milk (3.6). Of the completed post-implementation surveys, 100% of respondents would definitely recommend the program to other parents (n=7/7).

Table 2: Post implementation surveys

| Parent Observed Behavior of Child After Course | Average Response | Interpreted Response |
|-----------------------------------------------|------------------|----------------------|
| More confidence in the kitchen                 | 5.0              | Strongly Agree       |
| More interest in preparing meals and snacks    | 4.7              | Strongly Agree       |
| More interest in nutrition labels and serving sizes | 3.9            | Agree                |
| More knowledge about nutrition                 | 4.6              | Strongly Agree       |
| Greater desire to prepare their own food       | 4.4              | Agree                |
| More use of measuring tools and equipment      | 4.3              | Agree                |
| Greater awareness of kitchen safety            | 4.7              | Strongly Agree       |
| More interest in eating, healthy nutritious foods | 4.1             | Agree                |
| Greater interest in asking for healthy, nutritious foods | 4.1            | Agree                |
| Greater interest in trying new foods           | 4.0              | Agree                |
| More interest in fruits and vegetables         | 4.1              | Agree                |
| More interest in healthy dairy products like low-fat yogurt, cheese and milk | 3.6          | Agree                |
| More interest in whole grain options of bread, oatmeal and pasta | 4.1      | Agree                |
| More interest in plant proteins like beans, nuts and hummus | 4.4      | Agree                |

Responses were based on the following scale: Strongly Disagree (1), Disagree (2), Neutral (3), Agree (4), Strongly Agree (5). Answers were averaged and assigned an interpreted response; Strongly Agree (5.0-4.6), Agree (4.5-3.6), Neutral (3.5-2.6), Disagree (2.5-1.6) and Strongly Disagree (1.5-1.0).

Discussion:

This program addresses gaps in nutrition education identified in recent literature by providing free nutrition classes to children over the summer. The geographic location allows the program to serve children from economically diverse communities. This comes with distinct challenges regarding data collection as individuals represent communities with varying degrees of socioeconomic status.

More data will be collected from parents in the initial permission slip. Questions about demographics and community of residence can help identify families that are impacted by socioeconomic disparities. This data can also bolster understanding of retention rates to determine if location, demographics, or participation in other programs from a trusted organization impacts retention. The program averaged a retention rate of 50% from week one to week four. In the future, the program will explore if vacation and travel impacts participation in programs hosted over the summer.

Surveys indicated that 10-12 year old children were the most predominate age group in both the pretest and posttest group. Both cohorts had similar ratios between male and females with females slightly predominating. Knowing that the program attracts more children and retains more children in the 10-12 year old age range, a more focused effort regarding advertising and teaching delivery will be directed at this specific age group.

Although the posttest group showed an average improvement in nutrition knowledge over the pretest group, this finding may be inconsequential since posttest groups only improved by 0.6 of a question overall. Hereafter, participants will be randomly assigned numbers to track individual development from pretest surveys to posttest surveys. Pretest and posttest groups may not have achieved an equal distribution of children representing urban communities and surrounding county. To minimize this phenomenon, future data should compare individuals to themselves rather than groups.

The surveys primarily assessed the value of the program by nutrition knowledge gained and percentage of correct responses. This may not be the best way to evaluate program efficacy. The program will follow suit of other successful programs and ask children to rate their enthusiasm, confidence and willingness to try new foods before and after the program; however, the program will continue to quantify nutrition knowledge. From past experience, pictures alone are not adequate...
when attempting to control disparity in reading levels. Moving forward, surveys will be officially evaluated by professionals to determine appropriateness concerning reading levels for this age group.11

There were substantial issues with parent follow-up. Only 16% of participants had longitudinal surveys filled out by their parents. Going forward, the program will apply several strategies in the literature to improve survey response rates.12 Of the parents that did answer surveys, 100% would recommend our course to other parents. Among the fourteen behavioral questions, parents positively agreed or strongly agreed to all scenarios, indicating that children exhibited positive, long-term behavioral changes after participating in the nutrition curriculum.

Conclusion:
A summer nutrition program was designed by medical students to serve local children in underserved communities. The four-week program is free to children and offers a fun, interactive cooking curriculum that facilitates understanding of fundamental nutrition knowledge. After piloting the program for two seasons, preliminary data shows positive trends in acquired nutrition knowledge and behavioral change. Further optimization of surveys is needed to better assess the efficacy of the program.

Author Contributions:
Bethany Burns, D.O. and Beth Dollinger, M.D. equally contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

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