

THE IMPACT OF MULTIPLE CHANNEL DELIVERY OF NUTRITION MESSAGES ON STUDENT KNOWLEDGE, MOTIVATION AND BEHAVIOR: RESULTS FROM THE TEAM NUTRITION PILOT STUDY.

R. Craig Lefebvre, Carol Olander & Elyse Levine

Presented at the Innovations in Social Marketing Conference, Montreal, Canada, 1999.

Reprinted in Proceedings of the Conference as:

Lefebvre, RC, Olander C, Levine E. The impact of multiple channel delivery of nutrition messages on student knowledge, motivation and behavior: results from the Team Nutrition Pilot Study. *Social Marketing Quarterly* 1999;5:90–8.

The USDA School Meals Initiative for Healthy Children, published in 1995, is a comprehensive plan that aims to ensure that children have healthy meals at school. A major part of this plan is an update of nutrition standards that requires school meals to meet the Dietary Guidelines for Americans. Recognizing that simply publishing a regulation is not likely to change children's diets, USDA established Team Nutrition to ensure that schools are able to implement the plan, and that students avail themselves of the healthier meals offered. The goals of Team Nutrition include: eating less fat; eating more fruits, vegetables, and grains; and eating a variety of foods. Team Nutrition supports the School Meals Initiative through two interrelated components: Multifaceted Nutrition Education is delivered through the media, in schools, and at home to build skills and motivate children to make food choices for a healthful diet. The nutrition education approach and its components were developed and implemented following the tenets of social cognitive theory (SCT) and social marketing. The objectives of this component were to provide consistent and relevant messages through multiple channels that gain children's attention, motivate them to engage in desired behaviors, increase their self-efficacy in performing desired behaviors and reinforces their actual performance of the behaviors (Bandura, 1986; Lefebvre & Flora, 1988).

Training and Technical Assistance is designed to ensure that school nutrition and food service personnel have the education, motivation, training, and skills necessary to provide healthy meals that appeal to children and meet the Dietary Guidelines for Americans. This component was also based on an SCT foundation of creating an environment in which to observe, practice and receive reinforcement for healthy nutrition behaviors (i.e., "reciprocal determinism").

THE PILOT IMPLEMENTATION OF TEAM NUTRITION

USDA launched a pilot implementation of Team Nutrition with two purposes: to systematically document the implementation process, and to evaluate whether the initiative results in healthier food choices by students.

The pilot project was implemented in two phases—once in the Spring of 1996 and again in the Fall of 1996. The Fall implementation was essentially a replication of Spring with a new set of students. However, participating districts made changes in the activities conducted in Phase II based on their initial experiences. In addition, students who participated in the Phase I pilot were surveyed again during Phase II to ascertain whether any changes that occurred in Phase I are sustained over time.

Seven school districts were selected to participate in the pilot. Four of the seven school districts were selected to participate in an intensive process and outcome evaluation. The remaining three districts were the subject of a more limited process evaluation.

In the four districts participating in the intensive evaluation, one half of the school pairs were randomly assigned to the treatment condition (i.e., to implement Team Nutrition). The others became comparison sites, and did not conduct nutrition lessons during the semesters in which the evaluation took place. In the remaining three districts, all of the nominated schools operated as Team Nutrition sites. Altogether Team Nutrition was implemented at 18 schools and in over 140 classrooms in three grade levels during both phases.

Components of the Pilot Implementation

Each of the schools agreed to conduct a set of grade-specific classroom lessons developed by Scholastic, Inc. There are three grade-specific modules – Pre-K and K, Grades 1-2 and Grades 3-5. Each of the modules consists of a set of eight to nine lessons and contains teacher guides, classroom and cafeteria activities, videos, posters, student magazines, and parent take-home pieces. In addition, the Team Nutrition schools committed to teacher and food service staff training, as well as a set of core school and community activities. Specifically, implementation schools were expected in each phase to:

Conduct at least two school-wide cafeteria events.

Conduct at least three parent contact activities.

Conduct at least two chef activities.

Conduct at least one district-wide Team Nutrition community event.

Conduct at least one district-wide media event.

While some of those activities could overlap, all pilot schools were expected to conduct at least five core activities during each phase.

METHODOLOGY

The process evaluation was designed to measure the nature and magnitude of the Team Nutrition effort in all seven of the pilot districts. A number of data collection efforts were implemented as part of the basic process evaluation, including:

Extant data on school and district characteristics including total student population, students' racial/ethnic background, and percent of students receiving free or reduced school meals.

Interviews with school principals at the start of each phase in each implementation school.

Team Nutrition Core Activity Logs filled out by the person responsible for directing each school-based or community activity to document its key features, participation rates and lessons learned.

Team Nutrition Teacher Activity Logs filled out by all implementing teachers for each Scholastic lesson taught including preparation time, actual classroom time, and which lesson components were utilized.

In addition to the above data collection efforts, the teachers implementing Team Nutrition in their classrooms completed surveys that were conducted in group settings before and after the intervention.

The primary objective of the Team Nutrition outcome evaluation was to determine the degree to which the pilot implementation brings about changes in students' skills, motivations, and behavior as they relate to healthy eating. The focus of the outcome evaluation is on fourth-grade students. This grade level was chosen because children at this age (8 through 10 years) are capable of completing survey instruments and food frequency questionnaires.

Data used for this evaluation included :

- Self-administered questionnaires with fourth-grade students,

- Telephone interviews with the parent/guardian most knowledgeable about the student’s nutrition-related behavior and family’s nutrition practices and attitudes, and
- Observation of these fourth-grade students’ lunchroom food choice and consumption behavior.

Description of Sample

Across the four intensive evaluation districts, about 1650 fourth graders were eligible to participate during each phase, divided about evenly between implementation and comparison school students. The response rates for the self-administered surveys were between 85 percent and 91 percent over the two phases. In addition, over 1400 students participated in the cafeteria observations during Phase I and over 1300 students in Phase II. The majority of parents completed the telephone surveys. In Phase I, the response rates for the pretest and posttest were 87 percent and 79 percent, respectively. In Phase II, response rates were 74 percent and 72 percent.

Analytic Approach

Data were analyzed using a mixed models approach to regression analysis to control for clustering effects introduced by classroom and school assignment. Team Nutrition impact was calculated by totaling the change shown by students in the intervention schools minus the total change shown by students in comparison schools (i.e., double difference). Depending on the specific model that is used, that difference is the same as the regression coefficient representing Team Nutrition participation or the difference in the least square means when comparing intervention to comparison students.

RESULTS

Only three of the school districts identified any formal nutrition education in their curricula prior to the pilot. All four of the districts participating in the pilot outcome evaluation were successful in completing most of the required activities. On average, students received between 12 and 33 hours of classroom curricula and had the opportunity to participate in 4-10 school and community activities during each phase.

Team Nutrition Raised Students' Skill-Based Knowledge

The theoretical model underlying the Team Nutrition initiative suggests that changes in knowledge and motivation are necessary precursors to any changes in voluntary behaviors. From this stand point, measuring changes in students’ knowledge and motivation that may be attributable to their involvement in Team Nutrition is a necessary first step in evaluating the effectiveness of the initiative. If we observe significant changes in knowledge and motivation, then we are more likely, though not assured, to detect behavior changes as well. For the pilot evaluation, regression analyses were used to estimate the effects of participation in Team Nutrition on nutrition-related knowledge, skills, and motivation. The following table shows that at the end of both phases Team Nutrition had a significant positive impact on two of the three skill-based knowledge measures. This positive impact was maintained at the six-month follow-up.

Table 1. Overall Team Nutrition Impact on Number of Correct Answers to Nutrition Skill Questions (Regression Coefficients)

	Immediate Impact by Phase	Impact at 6-Month Follow-up
Students’ Ability to:		

	Phase I	Phase II	Phase I
Identify Healthier Choice	0.31**	0.33**	0.16*
Apply Food Guide Pyramid Knowledge	0.68**	0.83**	0.49**
Apply Balanced Diet Concept	0.02	0.09	0.10

*p <0.05. **p <0.01.

NOTE: Regression coefficients reflect the Team Nutrition-related increase in the number of correct answers in comparison with the scores received in the pretest.

Team Nutrition Sparked Motivation to Eat Healthier

Students who participated in Team Nutrition likewise showed positive and statistically significant changes in their motivation to make healthy food choices when compared to students from comparison schools. These changes were seen for all three measures of motivation in Phase I, Phase II and at follow-up (see Table 2). Although there is some variation in the regression coefficients across phases, none of these differences were significant.

Table 2. Overall Team Nutrition Impact on Nutrition Motivation (Regression Coefficients)

Students' Motivation	Immediate Impact by Phase		Impact at 6-Month Follow-up
	Phase I	Phase II	Phase I
General Attitudes	0.48**	0.50**	0.49**
Perceived Consequences of More Fruits, Vegetables, and Grains	0.28**	0.41**	0.53**
Cognitive Rules for Healthy Choices	0.71**	0.64**	0.50**

*p <0.05. **p <0.01.

NOTE: Regression coefficients reflect the Team Nutrition-related increase in the number of answers that indicate positive nutrition motivation, in comparison with the scores received in the pretest.

Team Nutrition Encouraged Students to Eat Healthier

Finally, and perhaps most importantly, Team Nutrition students showed healthful changes in their self-reported and observed nutrition behaviors. At post-test, students in Team Nutrition were significantly more likely than students in the comparison schools to give more healthy responses when asked about their usual food choices, food choices made in the last two weeks, and the variety of foods they reported eating “yesterday” (Table 3). However, these differences were not maintained at the six-month follow-up.

Table 3. Overall Team Nutrition Impact on Self-Reported Nutrition Behavior (Regression Coefficients)

Students' Behavior	Immediate Impact by Phase		Impact at 6-Month Follow-up
	Phase I	Phase II	Phase I
Usual Food Choices	0.53**	0.96**	0.11

Choices in Last 2 Weeks	0.43**	0.53**	0.17
Variety of Food Choices Yesterday	0.38**	0.34**	0.07

**p <0.01.

NOTE: Regression coefficients reflect the Team Nutrition-related increase in the number of answers that indicate healthy eating behavior, in comparison with the scores received in the pretest.

Cafeteria observations indicated modest but statistically significant increases in the variety of foods consumed and the amount of grains consumed when they participated in Team Nutrition (see Table 4). In most districts, consumption of vegetables low-fat milk, and the overall diversity of tasted items also increased, although the participants' behavior often was not significantly different from the comparison group.

Table 4. Summary Effect Size Statistics for Team Nutrition Implementations

Food Group	Measure	Mean Effect Size ¹	Homogeneity Across Districts and Phases ²
Grains	Number Selected	0.13*	No
	Number Tasted	0.20*	Yes
	Amount Consumed	0.13*	Yes
Fruits	Number Selected	-0.01	No
	Number Tasted	0.18*	No
	Amount Consumed	0.01	No
Vegetables	Number Selected	0.04	No
	Number Tasted	0.03	No
	Amount Consumed	0.09	No
% Fat, Milk	% Fat, Milk Selected	0.01	Yes
	% Fat, Milk Tasted	0.04	Yes
Diversity	Group/Day, Tasted	0.22*	Yes
	Item/Day, Tasted	0.22*	Yes

¹ Effect size was calculated by district and phase by dividing each raw unit impact estimate by the corresponding statistical index of student variability. Thus, mean effect size depends on both raw unit impact estimates and between-student variability. In cases when raw effect size is large relative to the variability index, effect size can be substantially larger than the raw unit impact

estimate from which it was calculated. The mean effect size can exceed any raw unit impact estimate.

2 For the χ^2 test of the hypothesis of no mean effect difference across districts and phases, 'No' means the hypothesis was rejected, so that effect means are not homogeneous, 'Yes' means that this hypothesis was not rejected, so that effect means are homogeneous.

* $p < 0.05$.

Multiple Channels Strengthened Team Nutrition Effects

Multivariate modeling was utilized to attempt to explain what factors influence the students' self-reported changes in behaviors. Students' nutrition behavior was found to be significantly related to having high nutrition knowledge and motivation at baseline, being female, having a high household income, having a greater number of positive role models, and having a parent who attempted to influence their nutrition behavior.

Three different multivariate models of Team Nutrition impact on nutrition behavior were examined: a "uniform treatment" model that treats the Team Nutrition initiative as a single intervention, a "discrete components" model that looks at the effectiveness of each Team Nutrition intervention component, and a "level of exposure" model that treats the initiative as an accumulation of students' exposure to Team Nutrition messages through a variety of channels. The elements included in the analyses were: student exposure to a Team Nutrition public service announcement, receipt of the Team Nutrition curriculum, participation in cafeteria events, participation in community events, parent participation in nutrition events at school, and parent participation in nutrition events at home. All three models supported the general overall finding that:

Team Nutrition has a small, but statistically significant positive impact on students' eating behavior even after adjusting for other predictive factors.

Analysis of the three models demonstrates that the "level of exposure" was the strongest model and was also theoretically plausible within the SLT and social marketing frameworks. As shown in Table 5, the mean scores of students' self-reported nutrition behavior increases directly with the number of channels through which they report participating in the Team Nutrition initiative (all p-values for each nutrition behavior = 0.0001). This suggests that future Team Nutrition initiatives, as well as other nutrition education efforts, focus more clearly on maximizing the exposure of their target audiences to multiple channels of communication.

Table 5. Level of Exposure Model: Mean Scores for Students' Self-Reported Nutrition Behavior, by Number of Channels of Participation

Number of Channels of Participation	Usual Food Choices		Choices in Last 2 Weeks		Variety of Food Choices Yesterday	
	Phase I	Phase II	Phase I	Phase II	Phase I	Phase II
0	4.3	4.0	4.4	3.9	3.1	3.0
1	4.5	4.5	4.8	4.7	3.3	3.3
2	4.7	4.6	5.3	5.3	3.4	3.0
3	4.8	4.7	5.5	5.5	3.5	3.3
4	5.4	5.5	5.4	5.6	3.7	3.7
5	5.6	5.9	5.6	6.4	4.0	3.9

6	5.1	6.6	5.9	6.7	4.3	3.8
---	-----	-----	-----	-----	-----	-----

CONCLUSIONS

The results demonstrate that Team Nutrition does lead to modest but significant changes in self-reported nutrition knowledge, motivation and behavior. Especially when examining behavior change, this pilot evaluation utilized several different sources of data including student self-reports, parental reports (not shown), and observed behavior in the school cafeteria. Each methodology has its strengths and limitations, and each method shed a different perspective on whether students involved in the Team Nutrition initiative changed their behavior. Yet, all three methods converged in demonstrating some behavior change.

At six-month follow-up, changes are maintained for knowledge and motivation, but not for behavior. This finding underscores that nutrition education needs to be a sustained process over time if it is to result in long-term behavioral changes—though this notion itself requires further empirical study.

It was found that exposure to multiple Team Nutrition components, rather than a particular one, was most predictive of behavior change. This finding is the first empirical evidence we are aware of that supports the social marketing maxim of utilizing multiple distribution channels in message delivery. Indeed, the degree of self-reported behavior change was directly related to the number of channels students reported being exposed to during implementation. This finding has potentially significant implications for the development and design of social marketing programs for other audiences and content.

The self-reported changes in nutrition knowledge, motivation and behavior among students in Team Nutrition were comparable, and in some instances better, than what one would expect from the available research in this area (c.f., Contento et al,1995; Domel et al, 1994; & Perry et al,1990). While it is not possible to definitively attribute these findings to any one aspect of Team Nutrition, as noted above, the multiple channel strategy of Team Nutrition may be the explanation.

The Team Nutrition intervention also incorporated new strategies and tactics that future research efforts will need to examine to enhance their relative effectiveness. These included linkages with food and nutrition resources in the community to develop and implement nutrition education activities in the schools and at community sites, as well as active media outreach to promote child nutrition generally and Team Nutrition activities occurring in the schools. Finally, the use of existing district staff to coordinate and manage the Team Nutrition effort offers a special degree of support and impetus for nutrition education activities in our schools.

REFERENCES

- Bandura, A. (1986). *Social Foundations of Thought and Action: A Social Cognitive Theory*. Englewood Cliffs, NJ: Prentice Hall.
- Contento, I., Balch, G. I., Bronner, Y. L., Lytle, L. A., Maloney, S. K., White, S. L., Olson, C. M., & Swadener, S. S. (1995). The effectiveness of nutrition education and implications for nutrition education policy, programs, and research: A review of research. *Journal of Nutrition Education, 27*(6), 277-422.
- Domel, S. B., Baranowski, T., Davis, H., Leonard, S. B., Riley, P., & Baranowski, J. (1994). Fruit and vegetable food frequencies by fourth and fifth grade students: Validity and reliability. *Journal of the American College of Nutrition, 13*(1), 33-39.
- Lefebvre, R.C. & Flora, J.A. (1988). *Social marketing and public health intervention*. Health

Education Quarterly, 15, 299-315.

Perry, C. L., Stone, E. G., Parcel, G. S., Ellison, R. C., Nader, P. R., Webber, L. S., & Luepker, R. V. (1990). School-based cardiovascular health promotion: The Child and Adolescent Trial for Cardiovascular Health (CATCH). *Journal of School Health*, 60(8), 406-413.