

**Los Angeles Unified School District
Nutrition Network Impact Evaluation
Project: 2005-2006 Final Report**

**Prepared by: UCLA Nutrition Friendly Schools
and Communities Group**

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Los Angeles Unified School District Nutrition Network Impact Evaluation 2005-2006

Executive Summary

Background

The Los Angeles Unified School District (LAUSD) Nutrition Network began in 2000 because of the vision of a dedicated, innovative teacher, Nonnie Korten. Korten's years of experience suggested to her that, given the opportunity, creative teachers could make a difference in the growing epidemic of childhood overweight and obesity. With a grant from the United States Department of Agriculture (USDA) through the California Department of Health Services and in-kind district contributions, the LAUSD established the LAUSD Nutrition Network in October 2000. *The Nutrition Network goal is for children to eat the recommended amount of fruits and vegetables, and enjoy 60 minutes of physical activity, each day.*

Since its inception, the LAUSD Nutrition Network has aimed to assess the success of the program. For the 2005-2006 school year, the LAUSD Nutrition Network awarded grants to 325 low-income schools to develop and implement projects related to the goals of the Nutrition Network. The LAUSD Nutrition Network asked UCLA to assess the impact of LAUSD Nutrition Network programs on the determinants (attitudes and beliefs) of fruit and vegetable consumption and physical activity and the actual fruit and vegetable consumption and physical activity behavior.

The purpose of the current study is to measure the impact of LAUSD Nutrition Network programs on student attitudes, beliefs and behaviors related to fruit and vegetable consumption and physical activity. In this instance, student exposure to nutrition education delivered by the classroom teacher, the key feature of Nutrition Network program as envisioned by Korten, will be measured. This study will also measure the impact of varying levels of this exposure on the determinants of fruit and vegetable consumption and physical activity. Further, data from this study will help LAUSD Nutrition Network to develop a system to document and evaluate the distribution of their teacher nutrition education programs at the school and classroom level.

EVALUATION QUESTIONS

The study aims to answer the following research questions and hypotheses:

1. What is the impact of LAUSD Nutrition Network programs on students' fruit and vegetable consumption and physical activity behavior and on their attitudes and beliefs regarding these behaviors?
 - Students in intervention schools will have higher positive attitude and belief scores toward fruit and vegetable consumption than students in comparison schools.

- Students in intervention schools will have a greater increase in the number of fruits and vegetables eaten per day than students in comparison schools.
 - Students in intervention schools will have a greater increase in the frequency of physical activity per day than students in comparison schools.
2. Does a higher exposure to Nutrition Network programs have a greater impact on student fruit and vegetable consumption and physical activity behavior and on their attitudes and beliefs regarding these behaviors than a lower dose?
- Students with a high exposure to LAUSD Nutrition Network programs will have a greater increase in their attitude and belief scores towards fruit and vegetables than students with lower exposure.
 - Students with a high exposure to LAUSD Nutrition Network programs will have a greater increase in the number of fruits and vegetables eaten per day than students with low exposure.
 - Students with a high exposure to LAUSD Nutrition Network program will have a greater frequency of physical activity compared to students with low exposure.

Key Findings, Opportunities & Recommendations

Fruit and Vegetable Frequency

- 1. On a daily basis children in Nutrition Network are no more likely to eat fruit or vegetables more frequently than are other students.**

Teacher-based nutrition education was not effective in increasing fruit and vegetable consumption in Nutrition Network schools compared to comparison schools. On average all students ate vegetables less than one time daily and fruit slightly more than one time per day.

Recommendations: Nutrition Network efforts to encourage fruit and vegetable consumption should be increased. This should include consideration of different types of programs aimed at increasing fruit and vegetable consumption.

Beliefs and Attitudes: Students

- 2. Nutrition Network Students are significantly more likely to believe everyone, including children, teenagers, adults and grandparents, need to eat fruit and vegetables than comparison school students.**

Most students in both intervention and comparison schools believed everyone should eat fruit and vegetables at baseline but an even higher proportion of Nutrition Network students believed that by the end of the study.

Recommendations: Nutrition Network should continue their messages about the universal importance of fruit and vegetables consumption.

3. Students don't believe they need to eat more fruit and vegetables.

Nutrition Network and comparison students, about 70%, are equally likely to believe the amount of fruit and vegetables they eat every day is "just right" for them. Most students do not believe they need to eat more fruit and vegetables. We learned from the fruit and vegetables frequency questions that all students, on average, ate vegetables less than one time daily and fruit slightly more than one time per day. Students may be overestimating in their belief of the adequacy of the amount of fruit and vegetables they eat *according to nutritional recommendations*. We don't know why students believe their fruit and vegetable intake is "just right" but these findings may indicate that student beliefs may not be in line with nutritional recommendations or Nutrition Network messages.

Recommendation: Nutrition Network should increase their nutrition education efforts to promote the importance of eating more fruit and vegetables every day.

Recommendation: Nutrition Network should promote clear messages about how much or how many fruit and vegetables are "just right".

4. Nutrition Network students are significantly more likely to have positive attitudes about vegetables.

Most students overall agree vegetables are healthy and important to eat. But Nutrition Network students are more likely to believe vegetables are healthy and important to eat, taste good and like to eat vegetables compared to non- Nutrition Network school students.

However, highly positive beliefs about health benefits may not translate favorably into behavior. When compared to their own highly positive beliefs about the health benefits of vegetables, a smaller proportion of students think vegetables taste good or like to eat them. These findings may explain, in part, why students do not eat more vegetables. Students report a discontinuity between what they believe and what they do.

Recommendation: Nutrition Network may want to increase Harvest of the Month (HOM) exposure to preparing and tasting vegetables. While much of HOM has focused on introducing new vegetables to students, readily available vegetables prepared simply, and perhaps more than once, might be offered with a goal of not only increasing positive attitudes about actually eating vegetables but actually eating more vegetables.

5. A majority of students had positive attitudes about fruit.

Positive attitudes regarding fruit are so high, 90% or more in most cases; a "ceiling effect" has been reached. This means there was little room for improvement at baseline and no intervention effect among Nutrition Network students.

Kids like fruit! Students say they like to eat fruit and know fruit is healthy to eat. These highly positive and universal student attitudes about fruit stand in sharp contrast to some of the student attitudes towards vegetables. But these positive attitudes about fruit may not lead to eating fruit. These findings may indicate that consumption of fruit is more complicated than holding positive attitudes and beliefs about fruit.

Recommendation: Nutrition Network may want to increase Harvest of the Month (HOM) exposure to preparing and tasting fruit. As with vegetables, much of HOM has focused on introducing new fruit to students. Readily available fruit prepared simply, and perhaps more than once, might be offered with a goal to increasing positive attitudes about actually eating fruit and increasing fruit consumption.

Social and Environmental Influences: Peers, Parents, and Teachers

6. Students communicate positive attitudes about fruit and vegetables with their friends.

Students do communicate about fruit and vegetables and Nutrition Network has had a positive impact on increasing communication among its students. These findings indicate that while classroom nutrition education has not created a large climate of "peer pressure" or "excitement" about fruit and vegetables, some students do talk about fruit and vegetables. These findings indicate there may be an opportunity to engage students in additional communication strategies about fruit and vegetables.

Recommendations: Nutrition Network may want to increase program efforts to create opportunities for experiences with fruit and vegetables that can be shared and discussed among students.

7. Nutrition Network students are no different from other students in perceiving positive influences, encouragement or behaviors at home about vegetables and fruit.

Most students say that their parents encourage them to eat fruit and vegetables every day but far fewer children encourage their parents to eat vegetables and fruit every day. Also students report few parents eat fruit and vegetables every day.

An objective of Nutrition Network has been to disseminate positive nutrition messages to parents through information brought home by Nutrition Network students. We found no indication that Nutrition Network students are more likely to do this than non-Nutrition Network students. This finding suggests that focusing on nutrition education programs involving parents directly may be more successful in influencing parental behaviors, beliefs and attitudes about fruit and vegetable nutrition.

Recommendation: Nutrition Network should develop and expand nutrition education programs for parents.

8. Students in Nutrition Network schools are significantly more likely to report their teachers deliver positive messages about vegetables and fruit than children in non-Nutrition Network schools.

Nutrition Network students scored their teachers especially high on promoting the health benefits of fruit and vegetables. Although we cannot rule out the possibility that because these figures, upwards of 80-90% at baseline, may represent a cumulative effect of Nutrition Network participation over time rather than an effect of the current study, there were still significant increases.

Recommendation: Nutrition Network should continue programs to promote health benefits of fruit and vegetable nutrition. The Nutrition Network should acknowledge that their teachers are successful in communicating key messages to their students.

9. Positive messages about fruit and vegetables are not delivered uniformly including fruit and vegetables taste good and encouragement to eat fruit and vegetables daily.

Fewer students report positive teacher messages about fruit and vegetables tasting good and encouragement to eat fruit and vegetables daily. This finding may indicate that teachers are selective in the Nutrition Network messages they deliver. Or that students may be selective in the information they retain.

Recommendation: Nutrition Network messages should be clarified for teachers. Teachers should be encouraged to deliver all Nutrition Network messages. New strategies for delivering messages about eating fruit and vegetables every day might be needed.

Accessibility of Vegetables and Fruit

10. Most students report they have fruit or vegetables in their homes every day.

While it is good news that so many homes have fruit and vegetables in their homes, 10-15% do not. Further, the relatively high proportion of students reporting fruit and vegetables in their homes on a daily basis sheds little light on their low consumption.

Recommendations: Nutrition Network should develop new strategies to increase fruit and vegetable consumption at home and in school.

11. By the end of the study Nutrition Network students were less likely than the comparison group to want to eat something other than fruit or vegetables.

Nutrition Network students who had not eaten fruit or vegetables the day before the study were no different from comparison students in reporting reasons for not doing so. The exception was

"wanting to eat something else". Nutrition Network had an effect in an area where their program can be expected to make a difference, helping students make better nutrition choices.

Recommendation: Nutrition Network has an opportunity to do even more nutrition education to help students understand they can make better choices about what they eat.

12. Nutrition Network students reported they were more physically active after the intervention, their frequency of PE was higher, and more believed their physical activity levels were "just right" compared to students in the comparison schools.

Most students believed they were physically active but reported that PE contributed little to activity levels. Fewer than half of the students thought they were in good physical shape and could run around their school. Overall, students had positive attitudes about sports and activity but fewer than three-quarters of students thought they got enough physical activity.

Recommendation: Nutrition Network should be open to creating more opportunities for physical activity linked to nutrition education.

Program Administration

13. Nutrition Network students who remain in the same classroom for a full academic year were no more likely to benefit from teacher based nutrition education programs than students who may not complete a full academic year in the same classroom.

We conducted a "sample within a sample" study in an attempt to address the impact of Nutrition Network programs on the transitory LAUSD student enrollment. Students who were not part of the longitudinal cohort could have been absent, did not assent to participate, were a new member of the classroom or no longer in the classroom. We cannot answer those questions. But that said, we found no difference in intervention effects between the Nutrition Network cross-sectional student samples and the longitudinal student cohort sample. This means that whether or not a classroom population remained stable, an intervention effect was just as likely to be found. This finding may demonstrate a "steady state" of Nutrition Network influence and messages that are sustained across the academic year.

Recommendations: Nutrition Network should continue its focus on delivering nutrition education through classroom teachers.

14. Nutrition Network teachers who log a high number of nutrition education hours are no more likely than teachers who log a low number of nutrition education hours to exert an impact in this study.

One of the Research Questions for this study was to determine if exposure to higher log time (hours) of nutrition education would lead to greater impact than exposure to low or moderate log time hours. We found there was no difference in impact regardless of level of exposure. While there may be a minimum threshold of log time (hours) to induce an intervention effect in the classroom, we were not able to find it in this study. Also, we were not able to account for student

exposure to other Nutrition Network programs that may have promoted Nutrition Network messages in schools or classrooms during the period of the study or at times prior to the study.

Recommendation: Nutrition Network should continue its support of classroom teachers in delivering nutrition education. While logging time for nutrition education activity is mandatory for Nutrition Network teachers as a part of the program process reporting, log time (hours) may not be indicative of teacher performance or input.

Los Angeles Unified School District Nutrition Network Impact Evaluation 2005-2006

BACKGROUND

The Los Angeles Unified School District (LAUSD) Nutrition Network began in 2000 because of the vision of a dedicated, innovative teacher, Nonnie Korten. Korten's years of experience suggested to her that, given the opportunity, creative teachers could make a difference in the growing epidemic of childhood overweight. At that time, nutrition education was not a part of the daily curriculum in the LAUSD. Further, the district's focus on increasing test scores and the implementation of a highly structured reading program had left many teachers feeling frustrated and overwhelmed. Accordingly, Korten felt nutrition education had to be integrated into the existing curriculum to be accepted and successful. After speaking with colleagues and researchers from UCLA, and investigating various models, an idea began to crystallize. Teachers wanted to bring creativity back into their lessons, but the content had to be something that could be easily woven into what they were already required to teach. Nutrition education had to be flexible, meaningful and fun. Korten envisioned that nutrition education would permeate each school campus and become part of the fabric of each site only if each school community member felt responsible for and invested in creating change. Her ambition was to form a grassroots effort that would give each school the opportunity to create a nutrition education program that made sense for their individual school, using the talents and resources available to them.

With a grant from the United States Department of Agriculture (USDA) through the California Department of Health Services and in-kind district contributions through staff time, the LAUSD established the LAUSD Nutrition Network in October 2000. *The Nutrition Network goal is for children to eat the recommended amount of fruits and vegetables, and enjoy 60 minutes of physical activity, each day.*

The LAUSD Nutrition Network was founded on the philosophy that nutrition education should be integrated into existing curriculum in a manner that best suits an individual school's and classroom needs. LAUSD Nutrition Network supports this goal by providing schools with programs, staff development, technical support and resources. Nutrition Network serves LAUSD schools with 50% or more of their students eligible to receive free or reduced priced meals from the National School Meal program. At the beginning of each school year, eligible and interested schools develop individual action plans describing programs and activities they plan to undertake to encourage fruit and vegetable consumption and physical activity in students. Participating teachers are encouraged to integrate nutrition education into classroom curriculum using resources provided by the LAUSD Nutrition Network.

In its first year, Nutrition Network enrolled 200 schools and by 2004, Nutrition Network had grown to include 259 schools with 11,000 teachers and other LAUSD staff, reaching 300,000 students. For the 2005-2006 school year, the LAUSD Nutrition Network awarded grants to 325 low-income schools to develop and implement projects related to the goals of the Nutrition Network. Since its inception, the LAUSD Nutrition Network has aimed to assess the success of the program. To this end, LAUSD Nutrition Network has supported a variety of evaluation activities in collaboration with the UCLA School of Public Health. The first collaborative

evaluation in 2001-2002 identified nutrition and physical activity related programs as well as the opportunities and barriers for physical activity and nutrition education within the LAUSD elementary school environment. The 2003-2004 LAUSD Nutrition Network Evaluation Project focused on one Nutrition Network component, Harvest of the Month. The goal of this program is to increase the consumption and enjoyment of fruits and vegetables. This evaluation found that students from Nutrition Network schools participating in Harvest of the Month were more likely to correctly identify specific fruit and vegetables than non-Nutrition Network students. Further, Nutrition Network students were more likely to know the recommended number of daily fruit and vegetable servings and ate fruit and vegetables significantly more times than non-Nutrition Network students. However, the study also found that students in both groups had gaps in knowledge regarding fruit and vegetable consumption and physical activity.

Additional questions about the impact of LAUSD Nutrition Network remained. The LAUSD Nutrition Network asked UCLA to assess the impact of LAUSD Nutrition Network programs on the determinants (attitudes and beliefs) of fruit and vegetable consumption and physical activity and the actual fruit and vegetable consumption and physical activity.

Purpose of the Study:

The purpose of the current study is to measure the impact of LAUSD Nutrition Network programs on student attitudes, beliefs and behaviors related to fruit and vegetable consumption and physical activity. In this instance, student exposure to nutrition education delivered by the classroom teacher, the key feature of Nutrition Network program as envisioned by Korten, will be measured. This study will also measure the impact of varying levels of this exposure on the determinants of fruit and vegetable consumption and physical activity. Further, data from this study will help LAUSD Nutrition Network to develop a system to document and evaluate the distribution of their teacher nutrition education programs at the school and classroom level.

The study aims to answer the following Research Questions and Hypotheses:

1. What is the impact of LAUSD Nutrition Network programs on students' fruit and vegetable consumption and physical activity behavior and on their attitudes and beliefs regarding these behaviors?
 - Students in intervention schools will have higher positive attitude and belief scores toward fruit and vegetable consumption than students in comparison schools.
 - Students in intervention schools will have a greater increase in the number of fruits and vegetables eaten per day than students in comparison schools.
 - Students in intervention schools will have a greater increase in the frequency of physical activity per day than students in comparison schools.

2. Does a higher exposure to Nutrition Network programs have a greater impact on student fruit and vegetable consumption and physical activity behavior and on their attitudes and beliefs regarding these behaviors than a lower dose?
 - Students with a high exposure to LAUSD Nutrition Network programs will have a greater increase in their attitude and belief scores towards fruit and vegetables than students with lower exposure.
 - Students with a high exposure to LAUSD Nutrition Network programs will have a greater increase in the number of fruits and vegetables eaten per day than students with low exposure.
 - Students with a high exposure to LAUSD Nutrition Network program will have a greater frequency of physical activity compared to students with low exposure.

RESEARCH DESIGN AND METHODS

This study was approved by the UCLA Institutional Review Board of the Office for the Protection of Research Subjects and the LAUSD Program Evaluation and Research Branch prior to school, classroom and student recruitment (Appendix A).

Design

This study uses a quasi-experimental mixed research design. This strategy, a "sample within a sample", was designed to address and accommodate simultaneously the acknowledged student attrition rate of as much as 20-30% in LAUSD and a stable classroom population in schools and classrooms during the school year. First, we developed a cross-sectional pre and posttest design to sample students present at the beginning or end of the study. The second design strategy was developed to test the impact of the program intervention on the same student sample over the course of the study. We retroactively created a longitudinal cohort from the students who were present and continuous in the cross-sectional samples at the beginning and the end of the study. Because of the transient nature of classroom enrollment and the classroom-based intervention, this method of retrospective cohort sampling was selected. Cross-sectional and longitudinal research design sampling elements were implemented in both intervention and comparison schools.

Sampling Plan

Schools. A random sample of 9 schools with action award funding participating in the LAUSD Nutrition Network (intervention) and 3 schools that were eligible (schools with 50% or more of their students eligible to receive free or reduced priced meals from the National School Meal program), but not participating in the LAUSD Nutrition Network (comparison) were selected. If a school declined to participate, another school was randomly selected. Participation by the schools was entirely voluntary.

Classrooms: Within each intervention and comparison school site, 3rd, 4th and 5th grade classrooms were randomly selected to participate in the study, approximately 5-7 classrooms per school. Classrooms in Nutrition Network schools were eligible if the teacher participated in Nutrition Network. If a classroom declined to participate, another was randomly selected. Participation by the classrooms was entirely voluntary.

Students: A non-random sample of students was assembled. All students in selected classrooms were eligible to participate in the study. A total of 1000-1400 students were expected to be included in the study. We estimated a 50% response rate, a bit higher than the actual response rate achieved. The UCLA research team met with the students in each participating class to explain the purpose and methods of the study in easy to understand language. The students were given a consent form and letter to take home to their parents/guardian. The letter explained the study, why and how students were selected, that the principal has approved the study and when the research team would return to conduct the surveys. The parents were asked to decide if they wanted their child to participate, sign the consent form, and return it with their child the next day. On the scheduled data collection date, a trained UCLA team member returned to the selected classrooms to administer the questionnaire. Data were not collected on Mondays so that the questions pertaining to "yesterday" would be on a school day. Prior to administering the questionnaire, each student was asked to sign an assent form to participate in the study. Participation by the students was strictly voluntary.

Sample Description

Cross-sectional samples. At baseline students were recruited to participate voluntarily in all selected schools and classrooms in intervention and comparison schools. At posttest all students were again recruited to participate voluntarily in all selected schools and classrooms in intervention and comparison schools.

Cohort sample. The cohort sample was developed retrospectively. All students at baseline were assigned study IDs for the purpose of tracking their recruitment and enrollment into the posttest sample. At the end of the study, IDs of students who participated in the posttest were matched with the IDs of students who had participated at baseline. Students who were present and continuous in the baseline cross sectional sample and the posttest cross sectional sample constitute the longitudinal student cohort sample for this study. The longitudinal cohort included 618 of students overall, 436 from the intervention schools and 155 from the comparison schools.

Baseline sample and data collection

	All	Intervention	Comparison
# Schools	12	9	3
# Classrooms	98	75	23
# Eligible Students	2245	1658	587
# Signed Parent Permission Forms	1074	838	236
# Questionnaire completed	1044	812	232
Response Rate	46.5%	48.9%	39.5%

Posttest sample and data collection

	All	Intervention	Comparison
# Schools	12	9	3
# Classrooms	96	73	23
# Eligible Students	2149	1607	587
# Signed Parent Permission Forms	1034	748	286
# Questionnaire completed	981	720	261
Response Rate	45.6%	44.8%	44.4%

Methods

We measured the exposure to the Nutrition Network program using units (time) of exposure to nutrition education delivered by classroom teachers. To measure the impact of the exposure, student beliefs, attitudes and behaviors towards fruit and vegetables and physical activity were collected using a group-administered questionnaire.

Data Collection

Teacher Logs. LAUSD Nutrition Network teacher activity logs provided data to quantify the amount of nutrition and physical activity education provided to students. As part of their participation in LAUSD Nutrition Network, teachers are required to complete a structured form detailing the type of nutrition education activity and time spent on the activity. The activity logs are completed quarterly (Appendix B).

Student Questionnaire. A questionnaire was developed by the research team to determine student beliefs, attitudes, and behaviors regarding fruit and vegetables. In addition, fruit and vegetable consumption was assessed according to the frequency with which students ate fruit and vegetables using the *Day in the Life* questionnaire (Edmunds and Ziebland, 2002). Student demographics were also collected. Identical questionnaires were group administered by trained UCLA staff in the classroom to students participating in the study at baseline and at the end of the study in Nutrition Network and comparison schools (Appendix C).

Section One: Fruit and Vegetable Frequency: The Day in the Life Questionnaire (Q1-Q23) was used to measure frequency of fruit and vegetable consumption. Small changes to terminology were made to the questionnaire but no additional changes were made from the DILQ used in the 2003-2004 LAUSD Nutrition Network evaluation study. The students filled in the foods and beverages they consumed on the previous day, as well as where they went and what type of activities they did during the day.

Section Two: Beliefs and Attitudes: In this section students were asked about their own beliefs and attitudes about fruit and vegetables. Question 24 was taken unmodified from Baranowski et al., 2000, and was used in the previous Nutrition Network evaluation. This question measures students' beliefs about fruit and vegetable consumption. Questions 25 and 26 were developed by the research team and used in the previous LAUSD Nutrition Network evaluation. The questions measure students' perceptions of their own fruit and vegetable intake. Students were asked to

classify their own fruit and vegetable intake as not enough, just right or too much. Questions 27 and 28, adapted from Vereckeen et al., 2005, include general attitude statements about eating fruit and vegetables. Several changes to the original questions were made to shorten the number of items and use terminology appropriate for American students.

Section Three: Social and Environmental Influences: This section includes questions related to perceived peer and parental encouragement, attitudes and behavior regarding fruit and vegetables. Teacher encouragement is also measured. Questions were adapted from Vereckeen et al., 2005. Please note that "peer" was operationalized as "friends" in the actual question. The term "friends" was not defined and could have been interpreted by student respondents as classmates, school friends, or other friends. This is important because we don't know what exposure to nutrition education, if any, friends might have had. We have no assurance friends are nutrition network classmates. Questions 29 through 36 measure peer influence, encouragement through communication and perceived behaviors towards eating fruit and vegetables. Q31 and Q35 measure the respondent's perception of their friends' fruit and vegetable intake. The research team and LAUSD Nutrition Network developed Q32 and Q36 to measure if students encourage his/her friends to eat fruit and vegetables. Questions 37 through 44 measure parental influence, encouragement and perceived behaviors towards eating fruit and vegetables. Q40 and Q44 measure the respondent's perception of their parents' fruit and vegetable intake. The research team and LAUSD Nutrition Network developed Q32 and Q36 to measure if students encourage his/her parents to eat fruits and vegetables. Questions 45 through 52 measure teacher encouragement related to vegetables and fruit. The LAUSD Nutrition Network places key emphasis on teacher led nutrition related activities and nutrition education. These questions will measure student perceptions of positive teacher encouragement related the benefits of eating vegetables and fruit.

Section Four: Accessibility of Vegetables and Fruit in the Home: Questions 53 and 54 measure student reports of daily access to fruit and vegetables in the home. These questions were slightly modified from the previous Nutrition Network evaluation. The UCLA research team and LAUSD Nutrition Network developed question 55. The question itemizes reasons for not consuming fruit or vegetables in the previous day. Students who did not eat fruit or vegetables the day before the questionnaire was administered were asked to select all reasons that applied.

Section Five: Physical Activity: Questions 56 through 62 were developed by the research team. Q56 asks the students if they were physically active the day before. Examples are provided to explain what being "physically active" means. These examples included "the student ran around, played a game like soccer or basketball, walked to school or rode your bike". Question 57 asked how many times per week the student had a Physical Education class. Q58-61: These four questions measure student attitudes towards physical activity. They are adapted from the Hearts – n – Parks child questionnaire (National Heart, Lung, and Blood Institute, 2002). These questions were also used in a previous study of LAUSD students. Q62: This question seeks to determine what, if any, are the barriers to spending time being physically active. Students circled all that applied.

Analysis Plan

Questionnaire responses were input into MS Excel data files. All data were cleaned prior to analysis. Data were analyzed using SPSS and SAS statistical analysis programs. Descriptive statistics of demographic data such as age, race and gender were calculated. Differences in fruit and vegetable attitudes, beliefs and frequency of consumption and physical activity attitudes, beliefs and behavior between intervention and comparison schools and different levels of exposure to teacher-based-nutrition and physical activity education were analyzed in Nutrition Network schools.

Several analytic techniques were used. The correlation analysis was used to test whether the amount of log-time spent was associated with the fruit and vegetable consumption. For the attitudes and beliefs data, two major analyses have been performed according to the nature of the data. Linear Mixed Model ANCOVAs (analysis of covariance) were used to test intervention effects in scale variables. This analysis used two independent variables: 1) pre- and post test scores; and 2) comparison versus intervention school conditions with the gender as a covariate (Analyses in Table 3, Q57, and Q62a-n). The intervention effects were interpreted by the interaction effects in the analyses. For independent dichotomous item analyses, 3-way loglinear analyses were used to test the intervention effect by testing proportions of pre- and post differences by school types by “Yes” and “No” responses of individual items (all other tables).

Please Note

1. All student data were combined in the analysis to include the cross-sectional student sample data and longitudinal student cohort sample data. This is because we found no substantial difference in intervention effects between the cross-sectional student data and the longitudinal student cohort data for either comparison or intervention schools when we analyzed the samples separately. Transitory LAUSD student enrollment has been an issue of ongoing concern for Nutrition Network. We conducted this "sample within a sample" study component in an attempt to address the impact of Nutrition Network programs on this issue. Our finding indicates that whether or not a classroom population remained stable, an intervention effect may be just as likely to occur.
2. Preliminary analyses on Nutrition Network school data found no difference in the impact on student attitudes, beliefs and behaviors related to fruit and vegetable consumption or physical activity when log times were categorized as low, medium or high. Three levels of exposure were considered including less than 35 hours, 35 hours, and more than 35 hours. Teachers are required to log a minimum of 35 hours of nutrition education during regular school day hours during the school year.

Demographic Characteristics

School Characteristics

Table 1. Characteristics of intervention and comparison schools participating in Nutrition Network Impact Evaluation

	Comparison Schools	Intervention Schools
Participating Schools	3 (25%)	9 (75%)
Schools with Salad Bars	0(0%)	2(100%)
Schools with Fruit and Vegetable Bars	0(0%)	3(100%)

Twelve schools participated in the Nutrition Network Impact Evaluation, three of them were comparison schools. Two intervention schools have Salad Bars and three intervention schools have Fruit & Vegetable Bars.

Student Characteristics

Table 2. Demographic characteristics by comparison and intervention groups participating in Nutrition Network Impact Evaluation.

Variables	Comparison	Intervention	Significance Levels @@
Gender			
M	39.2%	41.5%	
F	60.8%	58.5%	
Total	100.0%	100.0%	.377
Grade			
3rd Grade	25.9%	40.1%	
4th Grade	30.9%	25.9%	
5th Grade	43.2%	33.9%	
Total	100.0%	100.0%	<.001**
Ethnicity			
AI/AN	1.1%	2.3%	
Asian	3.3%	8.0%	
Black/AA	1.3%	10.8%	
Hispanic/Latino	71.3%	56.1%	
N. Hawaiian	0.4%	1.3%	
White	6.2%	8.6%	
Other	16.4%	12.9%	
Total	100.0%	100.0%	<.001**

@@ - Pearson Chi-Square analysis.

The designated “*” or “**” shows a significant intervention effect.

*=p<.05

**=p<.001

Results: There were no significant differences between comparison and intervention groups on gender but there were significant differences in grades and ethnicity. In terms of grades, there were higher proportions of 3rd graders in the intervention schools but higher proportions of 5th graders in the comparison group. In terms of ethnicity, over a half of the subjects were Hispanics in both groups. The comparison group shows a relatively greater proportion of Other ethnicity group whereas the intervention group shows a higher proportion of Asian and Black ethnicities.

Nutrition Network student exposure to nutrition and physical activity education

Data collected from LAUSD Nutrition Network teacher activity logs were used to quantify the amount of nutrition and physical activity education provided to students. The teacher log time (hours) constitute the intervention exposure for this part of the study. The following tables describe these data.

Average Log Time Hours Recorded by Intervention Schools in Study

School Number	Average Classroom Log Time (Hours) by School ^^
1	33.53
2	34.72
3	48.01
5	50.77
6	60.47
10	38.32
11	56.46
12	30.19
13	48.01
Mean	44.50

^^ - combined hours recorded for all categories on activity logs.

We averaged the log time (hours) Nutrition Network teachers recorded on activity logs in each intervention school and then averaged these to arrive at the Mean for all intervention schools.

Average Log Time (Hours) by Activity Category

Teacher log activity categories	Average Log Time (Hours) by Category ^^
1 Nutrition Education for Students	40.65
2 Nutrition Education at Special Events	1.35
3 Nutrition Education for Parents	0.29
4 School-wide Nutrition Promotion/Marketing/School Leadership	1.03
5 Staff Training and Professional Development	0.11
6. Other Activities	0.26

^^ - combined hours recorded for each category on activity logs.

We used the categories on the teacher activity log form to look at the distribution of log time (hours) all classroom teachers recorded during the study period. Teachers logged more time (hours), on average, for nutrition education for students.

Total Log Time (Hours) Exposed by Intervention School Classrooms

Total Log Hours Exposure	Number of Classrooms ^^
15-20 Hours	2
21-30 Hours	11
31-40 Hours	15
41-50 Hours	25
51-60 Hours	5
61-70 Hours	5
71-80 Hours	3

^^ - There were 3 outlier classrooms not included in the chart. Three classroom teachers recorded log time (hours) equal to or greater than 100.

We arbitrarily categorized the distribution of log time (hours) classroom teachers recorded during the study period in order to describe the range of exposure to nutrition education for students in the intervention schools. These figures are presented here to show a distribution of the log times recorded by teachers at the classroom level. Log time (hours) were recorded only by teachers in the Nutrition Network schools.

Results: We did not find that high exposure to Nutrition Network programs had a greater impact on student fruit and vegetable consumption and physical activity behavior and on their attitudes and beliefs regarding fruit and vegetables than low exposure in Nutrition Network schools (tables not shown).

Discussion: As we noted earlier, no data presented in this final report were analyzed using varying exposure levels of log time categorized by intensity as low, moderate or high. This is because our preliminary analyses found no differences in the intervention schools when log times were categorized by intensity. This finding satisfies Research Question 2 and the hypotheses associated with it. In other words, a higher exposure to Nutrition Network programs did not have a greater impact on student fruit and vegetable consumption or physical activity behavior or on student attitudes and beliefs regarding fruit and vegetables than did a low or moderate exposure.

RESULTS: INTERVENTION EFFECTS

The results and intervention effects that follow are in response to Research Question 1 and its hypotheses and compare differences between Nutrition Network intervention schools and non-Nutrition Network comparison schools.

Section One: Fruit and Vegetable Frequency

Students were asked to recall what they ate during the day before the study data were collected. Responses were coded as fruit and vegetables using the Minnesota Cancer Prevention Research Unit fruit and vegetable classification scheme (Smith, et al., 1995). Beans, French fries and

condiments, classified as vegetables by the Minnesota Cancer Prevention Research Unit, were excluded for this study.

Table 3. Daily frequency of fruit, vegetables and combined fruit and vegetables consumption comparing all students at intervention schools and control schools at baseline and at posttest.

Student Consumption	Baseline		Posttest		Significance Levels
	Comparison	Intervention	Comparison	Intervention	
Average Daily Unit Consumption					
Fruit	.849	.913	1.122	1.169	.7358\$
Vegetables	.754	.803	.862	.858	.7285\$
Combined Fruit & Vegetables	1.603	1.716	1.984	2.027	.6454\$

\$ - Linear Mixed Model – Significance Levels are Interaction effect by Pre- and Post-Test by School type. The designated “*” or “**” shows a significant Intervention effect in the tables that follow.

*=p<.05

**=p<.001

Results: There was no intervention effect on any of the three daily consumption values or frequencies. This means that teacher nutrition education was not effective in increasing fruit and vegetable consumption in Nutrition Network schools compared to comparison schools. However, students in both Nutrition Network and comparison schools consumed fruit more times, just over one time, on a daily basis than vegetables, just under one time.

Discussion: Daily student consumption of fruit or vegetables or fruit and vegetables combined was no greater in Nutrition Network Schools over the course of the study even though more than half, five of nine, of the intervention schools had either a salad bar or a fruit/vegetable bar. All students, regardless of school site, report they eat fruit and vegetables infrequently.

Section Two: Beliefs and Attitudes

In this section students were asked about their own beliefs and attitudes related to fruit and vegetables.

Table 4. Comparison of "yes" answers to questions on student beliefs about fruit and vegetables at baseline and posttest. Data are from questions 24-26.

Food and Nutrition	Baseline		Posttest		Significance Levels @@
	Comparison %	Intervention %	Comparison %	Intervention %	
Q24. Children, teenagers, adults and grandparents all need to eat vegetables and fruit.	87.8	80.6	83.1	84.1	.026*
Q 25. The amount of vegetables I eat each day is just right.	73.2	71.6	76.8	70.3	.094
Q 26. The amount of fruit I eat each day is just right.	69.7	68.6	73.3	71.2	.185

@@ 3-way Loglinear analysis across Pre-Post test by Comparison/Intervention group by "Yes" or "No" response difference. The designated "*" or "***" shows a significant Intervention effect. Unless otherwise specified, the following section analyses were done by 3-way Loglinear Analysis.

*=p<.05

**=p<.001

Results: There was an intervention effect for Q24 where students told us who they believe needs to eat fruit and vegetables. The table shows the increasing trend from the intervention group and the decreasing trend from comparison group. By the end of the study, a greater proportion of students in the intervention group believe children, teenagers, adults and grandparents all need to eat vegetables and fruit compared to the students in the comparison group.

For Q25 and Q26 no intervention effect was seen. The majority of students in both intervention and comparison schools were equally likely to believe the amount of fruit and vegetables they ate each day was just right for them.

Discussion: Even though more Nutrition Network students grew to believe that everyone, including children, teenagers, adults and grandparents, needs to eat more fruit and vegetables, this is a belief held by more than 80 percent of all students.

Most students do not believe they need to eat more fruit and vegetables. Nutrition Network and comparison students are equally likely to believe the amount of fruit and vegetables they eat every day is "just right" for them. We learned from the fruit and vegetables frequency questions that all students, on average, ate vegetables less than one time daily and fruit slightly more than one time per day. Students may be overestimating in their belief of the adequacy of the amount of fruit and vegetables they eat *according to nutritional recommendations*. We don't know why students believe their fruit and vegetable intake is "just right" but these findings may indicate

that student beliefs may not be in line with nutritional recommendations or Nutrition Network messages.

Table 5. Comparison of "yes" answers to questions regarding students' attitudes about vegetables comparing intervention and comparison schools.

Q 27. Attitudes about Vegetables	Baseline		Posttest		Significance Levels
	Comparison %	Intervention %	Comparison %	Intervention %	
I think vegetables taste good.	67.5	67.3	57.4	64.0	.013*
I feel good when I eat vegetables.	70.1	67.1	60.6	66.5	.066
Vegetables are healthy for me.	97.8	97.0	94.0	96.1	.031*
Vegetables are important for me to eat.	94.4	92.4	88.0	92.8	.026*
I like to eat vegetables.	69.3	61.5	51.6	59.2	.001*

Results: Intervention effects are seen as Nutrition Network students are more likely to perceive that vegetables taste good, are healthy and important, and they like to eat them. Students were no different in believing eating vegetables made them feel good. This table also indicates that most students agree that vegetables are healthy and important for them to eat. But a smaller proportion of students think vegetables taste good, feel good when they eat vegetables or like to eat vegetables.

Discussion: Students overwhelmingly think vegetables are important for their good health. However, highly positive beliefs about health benefits may not translate favorably into behavior. When compared to their own highly positive beliefs about the health benefits of vegetables, a smaller proportion of students think vegetables taste good or like to eat them. These findings may explain, in part, why students do not eat more vegetables. Students report a discontinuity between what they believe and what they do.

Table 6. Comparison of "yes" answers to questions regarding students' attitudes about fruit comparing intervention and comparison schools.

Q 28. Attitudes about Fruit	Baseline		Posttest		Significance Levels
	Comparison %	Intervention %	Comparison %	Intervention %	
I think fruit tastes good.	96.5	97.3	98.0	95.4	.050
I feel good when I eat fruit.	90.0	91.3	88.3	88.1	.085
Fruit is healthy for me.	94.8	97.4	97.6	97.3	.086
Fruit is important for me to eat.	93.1	93.4	91.2	94.0	.205
I like to eat fruit.	94.3	95.4	95.2	93.8	.217

Results: There is no intervention effect here. Nutrition Network Students are no more likely than comparison students to have very positive attitudes about fruit. This table also indicates that almost all students have very positive attitudes about fruit. Fruit is healthy and important for students to eat, taste good, students feel good when they eat fruit and they like to eat fruit. These data show a *ceiling effect*, which means that there is little room for improvement in increasing positive attitudes about fruit for intervention or comparison students.

Discussion: All students have positive attitudes about fruit. They like to eat fruit and know fruit is healthy to eat. These highly positive and universal student attitudes about fruit stand in sharp contrast to some student attitudes towards vegetables. But these responses on positive attitudes about health benefits and liking fruit may not lead to consumption of fruit. These findings may indicate that consumption of fruit is more complicated than having positive attitudes about fruit. Even though students have very positive attitudes about fruit, this may not translate into behavior and eating more fruit.

Section Three: Social and Environmental Influences, Peers, Parents and Teachers

The following series of questions (Table 7-10) measure student perceptions of peer and parental influence, encouragement and behaviors towards eating fruit and vegetables. In addition, questions were developed to measure whether students reciprocate and encourage their friends or parents to eat fruit and vegetables.

Peers

Table 7. Comparison of "yes" answers to questions on student perceptions of peer influence about vegetables.

Peers and vegetables	Baseline		Posttest		Significance Levels
	Comparison %	Intervention %	Comparison %	Intervention %	
Q 29. My friends tell me that I should eat vegetables everyday.	34.6	29.9	22.7	27.4	.010*
Q 30. Most of my friends like to eat vegetables.	22.5	26.5	28.3	23.7	.114
Q 31. Most of my friends eat vegetables every day.	19.5	23.5	22.8	24.7	.189
Q. 32. I tell my friends that they should eat vegetables everyday.	54.5	43.3	36.3	44.4	<.001**

Results: There were two intervention effects regarding student perceptions of attitudes their friends have about vegetables. The intervention group had slight changes (increase or decrease) on the communication items with friends between pre- and post-test while the comparison group showed large declines on these items. There were no intervention effects regarding perceptions of friends eating or liking to eat vegetables.

Table 8. Comparison of "yes" answers to questions on student perceptions of peer influence about fruit.

Peers and Fruit	Baseline		Posttest		Significance Levels
	Comparison %	Intervention %	Comparison %	Intervention %	
Q 33. My friends tell me that I should eat fruit everyday.	44.5	38.1	31.5	32.9	.002*
Q 34. Most of my friends like to eat fruit.	59.1	60.6	60.2	58.5	.366
Q 35. Most of my friends eat fruit every day.	36.1	40.1	33.5	40.3	.062
Q.36 I tell my friends that they should eat fruit everyday.	51.5	43.5	39.6	45.5	.022*

Results: Consistent with Q29-32, there are two intervention effects on Q33 and Q36, indicating an increasing (less decrease) trend in communication about fruit. Also, there was no intervention effect seen in student reports regarding friends liking to eat fruit or eating fruit, a trend found in perceived friends' attitudes and behaviors about vegetables as well.

Discussion: Students do communicate about fruit and vegetables and Nutrition Network has had a positive impact on increasing communication among its students. Students believe few of their friends eat fruit or vegetables every day even though more students think their friends like fruit and there was no intervention effect seen here. These findings indicate that while classroom nutrition education has not created a large climate of "peer pressure" or "excitement" about fruit and vegetables, some students do talk about nutrition.

Parents

Table 9 and 10. Comparison of "yes" answers to questions on student perceptions of what their parents say and do about vegetables and fruit.

Parents and vegetables	Baseline		Posttest		Significance Levels
	Comparison %	Intervention %	Comparison %	Intervention %	
Q 37. Do your parents tell you that you should eat vegetables everyday?	92.6	94.8	92.0	92.7	.092
Q 38. Do your parents like to eat vegetables?	89.9	87.6	86.8	88.7	.231
Q. 39. Do your parents eat vegetables everyday?	67.7	63.9	68.0	66.8	.173
Q 40. Do you tell your parents that they should eat vegetables everyday?	48.0	42.7	40.8	45.0	.121

Parents and fruit	Baseline		Posttest		Significance Levels
	Comparison %	Intervention %	Comparison %	Intervention %	
Q 41. Do your parents tell you that you should eat fruit everyday?	90.8	91.6	87.6	90.1	.107
Q 42. Do your parents like to eat fruit?	91.3	89.3	90.0	87.3	.123
Q 43. Do your parents eat fruit everyday?	66.1	63.0	66.4	65.1	.265
Q 44. Do you tell your parents that they should eat fruit everyday?	52.2	44.1	46.2	46.7	.083

Results: There were no intervention effects here and Nutrition Network students were no more likely than students in comparison schools to report positive influences, encouragement or perceived behaviors exchanged between students and their parents regarding vegetables or fruit. Most students believe their parents tell them to eat fruit and vegetables every day and also like to eat fruit and vegetables. However, far fewer students believe their parents consume fruit and vegetables every day. Importantly, Nutrition Network students are no more likely to reciprocate and encourage their parents to eat vegetables and fruit every day.

Discussion: Nutrition Network students were no different from other students when it came to perceiving positive influences, encouragement or behaviors at home about vegetables and fruit. An objective of Nutrition Network has been to disseminate positive nutrition messages indirectly to parents through information brought home by Nutrition Network students. This apparently has not happened according to student reports. This finding may suggest that focusing on nutrition education programs involving parents directly may be more successful in influencing parental behaviors, beliefs and attitudes about fruit and vegetable nutrition.

Teachers

Questions 45 through 52 in Tables 11 and 12 measure positive teacher encouragement related to vegetables and fruit. The LAUSD Nutrition Network places key emphasis on teacher-led nutrition related activities and nutrition education.

Table 11. Comparison of "yes" responses on what teachers tell students about vegetables comparing intervention and comparison schools

Teacher messages about vegetables	Baseline		Post		Significance Levels
	Comparison %	Intervention %	Comparison %	Intervention %	
Q 45. Does your teacher tell you that vegetables are good for you?	63.3	82.2	62.2	85.1	<.001**
Q 46. Does your teacher tell you that vegetables are healthy?	77.1	89.5	72.1	90.4	<.001**
Q 47. Does your teacher tell you that vegetables taste good?	51.1	60.5	42.4	58.2	<.001**
Q 48. Does your teacher tell you that you should eat vegetables everyday?	58.3	67.5	51.4	76.2	<.001**

Table 12. Comparison of "yes" responses to questions on what teachers tell students about fruit comparing intervention and comparison schools.

Teacher messages about fruit	Baseline		Post		Significance Levels
	Comparison %	Intervention %	Comparison %	Intervention %	
Q 49. Does your teacher tell you that fruit is good for you?	69.7	85.3	67.7	87.6	<.001**
Q 50. Does your teacher tell you that fruit is healthy?	75.8	89.6	75.7	91.4	<.001**
Q 51. Does your teacher tell you that fruit taste good?	60.0	69.8	54.2	69.5	<.001**
Q 52. Does your teacher tell you that you should eat fruit everyday?	59.7	67.6	56.4	76.5	<.001**

Results: There were intervention effects in all questions regarding positive teacher messages about vegetables and fruit. Over the course of the study, intervention school students were significantly more likely to say their teachers told them vegetables and fruit were good for them, healthy, taste good and that they should eat vegetables and fruit every day when compared to comparison students. While a large majority of teachers promoted the health benefits of fruit and vegetables, a smaller majority of students reported they delivered positive messages about taste and eating fruit and vegetables every day.

Discussion: Students in Nutrition Network schools are much more likely to report their teachers deliver positive messages about vegetables and fruit than children in non- Nutrition Network schools. Nutrition Network students scored their teachers especially high on health benefits of fruit and vegetables. We cannot rule out the possibility that those figures represent a cumulative effect of Nutrition Network participation over time rather than an effect of the current study.

Fewer students reported positive teacher messages about fruit and vegetables tasting good and encouragement to eat fruit and vegetables daily. This may indicate that teachers are selective in the Nutrition Network messages they deliver. Or that students may be selective in the information they retain.

Section Four: Accessibility of Vegetables and Fruit in the home

Table 13. Student access to fruit and vegetables at home

Barriers to eating Fruit and Vegetables	Baseline		Posttest		Significance Levels
	Comparison %	Intervention %	Comparison %	Intervention %	
Q 53. Are there vegetables in your home every day?	85.3	83.2	86.8	84.4	.220
Q 54. Is there fruit in your home every day?	90.9	87.5	94.4	90.9	.003*

Results: Most children report they have fruit and vegetables at home every day. However, it is difficult to determine by observing the percentage values in this analysis whether the significance effect found for fruit is an intervention effect or an artifact.

Discussion: The relatively high proportion of students reporting fruit and vegetables in their homes on a daily basis sheds little light on consumption which, on average, is low for all students.

Perceived barriers to eating fruits and vegetables

Students were asked about the factors they perceived as barriers to eating fruit and vegetables. Question 55a asked students if they had eaten vegetables or fruit yesterday. Students who had not eaten fruit or vegetables "yesterday" did not go on to answer Q55b-j about barriers to eating fruit or vegetables. Students could select more than one answer.

Table 14. Perceived barriers to eating fruit or vegetables.

Barriers	Baseline		Posttest		Significance levels
	Comparison %	Intervention %	Comparison %	Intervention %	
Q55a - I did eat fruit and/or vegetables yesterday	80.1	78.2	75.6	79.6	.205
Q55b - I don't like fruit or vegetables	0.4	2.5	3.2	1.8	.059
Q55c - I did not have enough time	6.9	5.6	5.6	5.7	.360
Q55d - I was sick or hurt	1.3	2.5	3.6	1.7	.085
Q55e – My teeth hurt	2.2	2.5	4.0	2.5	.199
Q55f - I couldn't get any fruit or vegetables	1.3	2.7	2.0	2.4	.246
Q55g - I wanted to eat something else	6.9	7.1	11.6	8.4	.042*
Q55h – My parents did not have time to prepare them	1.3	3.1	2.4	2.4	.185
Q55i – My parents cannot afford fruits and vegetables	0.0	0.9	0.8	0.3	.104
Q55j – Other	2.2	5.4	4.8	3.9	.065

Results: Most students had eaten fruit or vegetables "yesterday". Among the small proportion of students who had not eaten fruit or vegetables, Nutrition Network students were no different from comparison students in reporting reasons for not doing so. The exception is "wanting to eat something else". There is an intervention effect for this item and Nutrition Network students were less likely than comparison students to report they wanted to eat something else at the end of the study.

Discussion: Nutrition Network had an effect in an area where their program can be expected to make a difference in encouraging students to make better choices about what they want to eat.

Section Five: Physical Activity

Students were asked to report about physical activity and barriers to physical activity.

Table 15. Student "yes" responses to questions about physical activity.

Physical Activity	Baseline		Posttest		Significance Levels
	Comparison %	Intervention %	Comparison %	Intervention %	
56. Were you physically active yesterday? ^	92.6	85.9	93.2	88.5	.001*
57. How frequently do you have PE every week	1.53	1.48	1.41	1.65	.049*\$
58. I would rather watch TV, use the computer or play video games than play sports or be active.	31.3	29.1	27.6	26.5	.301
59. People who play sports or are active seem to have a lot of fun doing it.	81.4	78.9	76.0	77.6	.258
60. Do you think you could run around the outside of your school without stopping?	40.7	42.1	38.2	40.6	.367
61. The amount of physical activity you get each day is "just right".	69.7	61.6	71.6	68.7	.002*
62a – 62n PA Barrier Scale	7.7	7.6	7.7	7.7	.8193\$

\$ Mixed Linear Model with Gender covariate.

^ In Q56, being physically active was defined as "the student ran around, played a game like soccer or basketball, walked to school or rode your bike".

Results: There were intervention effects in Q56, Q57, and Q61. The students in the intervention schools reported that they were more likely to be physically active after the intervention, their frequency of PE was higher, and believing their physical activity levels were "just right" compared to the students in the comparison schools.

Most students were physically active but PE contributed little to activity levels. Fewer than half the students thought they were in good enough physical shape to run around their school. Students had positive attitudes about sports and activity, less than a majority would choose inactivity over activity and fewer than three-quarters of students thought they got enough physical activity.

Discussion: These findings suggest that students might be open to more opportunities for physical activity links to nutrition education.

For Q62a-62n (PA Barrier scale), among the small number of students who were not physically active "yesterday" (Q62a), these are some of the answers students gave for not being physically active. There were no intervention effects seen in reducing perceived barriers among Nutrition Network students.

- Didn't have enough time
- Watched TV/video games/computer
- Wanted to do something else
- Don't have friends to play with
- Don't have a place to play

Result Summary

- There were no intervention effects on fruit and vegetable consumption.
- There was an intervention effect on a student's belief category, "all of us need fruit and vegetables". The percentage proportion increase from pre to post test in the intervention group was significantly higher than the comparison group.
- There were several items showing intervention effects about students' attitudes about vegetables. The percentage proportion increase from pre to post test in the intervention group was significantly higher than the comparison group. A higher proportion of the intervention school students felt more positive about the taste of vegetables, they thought vegetables are healthy and important, and they liked vegetables more after the intervention program compared to the comparison group.
- There were two intervention effects on student perceptions of what their friends think about vegetables. The intervention group had slight changes (increase or decrease) on the communication items with friends between pre- and post-test while the comparison group showed large declines on these items.
- There were two intervention effects on students' perceptions of what their friends think about fruit. The results were generally the same with vegetables.
- There were no intervention effects on students' perceptions of what their parents say about fruit and vegetables, parents' likes regarding FV, or parents' daily frequency of FV.
- There was no intervention effect on student communication with their parents about FV.
- There were strong intervention effects about teachers' messages regarding vegetables. The percentage proportion increase from the pre to post test in the intervention group was significantly higher than the comparison group. The intervention group showed mostly

increases (except one condition) on the post-test while the comparison group showed slight to substantial declines.

- There were strong intervention effects about teachers' messages regarding fruits. The results were generally consistent with vegetable questions.
- There was an intervention effects on the eating barrier scale variables. The percentage proportion increase from pre to post test in the intervention group was significantly lower than the comparison group. The intervention group reported fewer barriers after the intervention program compared to the comparison group.
- There were intervention effects on physical activity. The students in the intervention schools reported they were more physically active after the intervention, their frequency of PE was higher, and in their belief their physical activity levels were "just right" compared to the students in the comparison group.

DISCUSSION

The Nutrition Network has achieved a great deal since its inception six years ago in reaching its goal for children to eat the recommended amount of fruits and vegetables, and enjoy 60 minutes of physical activity, each day. And this evaluation points to a tremendous opportunity to do more. Further, findings from this study can serve as a benchmark for the future growth of Nutrition Network especially in areas of teacher delivered nutrition education messages.

Nutrition Network Intervention Effect

The purpose of this evaluation was twofold. First we wanted to see if students at Nutrition Network schools performed better than children in non-Nutrition Network schools on measures related to positive attitudes and beliefs about fruit and vegetables and in positive behaviors related to fruit and vegetable consumption and physical activity. We found that there were few differences. The striking exception is in the classroom, the main focus of the study. Students in Nutrition Network schools benefit greatly from having the Nutrition Network program come into their classrooms. Nutrition Network classroom teachers are doing a terrific job in teaching students about the importance of eating fruit and vegetables.

Fruit and vegetable consumption

Currently, the Nutrition Network may not be as successful in teaching students to eat the recommended amount of fruit and vegetable. Students say they eat fruit and vegetables every day, on average about two times a day. And the majority of students believe the amount of fruit and vegetables they eat is "just right" for them. How many vegetables are good for them? How much fruit makes them healthy? What amount of fruit and vegetables is just right for them? Until Nutrition Network can answer these questions, the message Nutrition Network teachers will be asked to deliver to students may be confusing and ineffective. The challenge for Nutrition Network will be to help students make the connection between what they already believe about

the goodness of fruit and vegetables and eating the recommended amount of fruit and vegetables. In addition, access and availability to fruit and vegetables may complicate the relationship between belief, attitudes and behavior related to fruit and vegetable consumption.

Bringing the Nutrition Network program to parents

Children are not carrying the Nutrition Network message home to their parents. And parents are not able to reinforce Nutrition Network messages their children learn in school. Parents could be strong allies in helping children to eat the recommended amount of fruit and vegetables and providing additional educational opportunities for their children. This is an area of growth and opportunity for nutrition Network.

Nutrition Network is currently revising a program component aimed towards supporting parent nutrition education directly. This report indicates that this is a good place for Nutrition Network efforts to exchange information with parents and to learn what parents want to know about nutrition.

Physical Activity

Nutrition Network has struggled with its investment in promoting physical activity since the beginning of the program. It seems clear from this evaluation that Nutrition Network can have a positive effect on physical activity. The majority of students believe the amount of physical activity they get is "just right". Is that 60 minutes per day? As with fruit and vegetables, students have positive attitudes and beliefs about physical activity that aren't carried through into behavior. This study does not have the answer to this question. Again we believe this relationship may be complicated by access to opportunities to be physically active.

Nutrition Network has an opportunity to emphasize the importance between physical activity and nutrition. Here is a chance for Nutrition Network to work with teachers to get out the message on physical activity, too, and repeat their success with nutrition education messages.

Program intensity

The second purpose of the study was to explore possible differences in the impact of the program within Nutrition Network based on logged hours of nutrition education, program intensity. We found that teachers, on average, logged a wide range of hours in nutrition education. We wanted to know if teachers who logged more nutrition education hours had a greater positive impact on their students' beliefs, attitudes and behaviors regarding fruit and vegetables and physical activity than teachers who logged fewer hours did. We found this was not the case. Varying levels of log time had no impact on student attitudes, beliefs or behaviors. The good news is that classroom teachers turned in strong performances regardless of the number of hours they logged.

We were not able to account for student exposure to other Nutrition Network program components that may also have promoted Nutrition Network messages in schools or classrooms during the period of the study or at times prior to the study. But teacher activity logs do not appear to be a good measure of teacher effectiveness in the classroom.

Limitations

Since the inception of the program, teachers have been delivering nutrition education to their students so we acknowledge we were not evaluating a new program component. Some students may have been exposed to the same or similar messages long before our evaluation and we were not able to account for that. With the maturing of the program this will be a continuing issue unless new program components are developed and evaluated. The new parent program is an example of an evaluation opportunity.

The limitations met in this evaluation are not new. Students have always been free to self-select and participate in these evaluations or not. We have not used observation to assess fruit and vegetable consumption and so rely on student recall. On the other hand, schools and classrooms were randomly selected.

Teacher activity logs constitute a mandatory reporting process for Nutrition Network teachers. We have no reason to believe teachers inflated the nutrition education hours they recorded because of study participation. But we cannot comment on the validity of the activity logs as recorded. We did not observe teachers in the classroom or elsewhere in order to measure the number of hours teachers actually participated in nutrition education

Key Findings, Opportunities & Recommendations

Fruit and Vegetable Frequency

- 1. On a daily basis children in Nutrition Network are no more likely to eat fruit or vegetables more frequently than are other students.**

Teacher-based nutrition education was not effective in increasing fruit and vegetable consumption in Nutrition Network schools compared to comparison schools. On average all students ate vegetables less than one time daily and fruit slightly more than one time per day.

Recommendations: Nutrition Network efforts to encourage fruit and vegetable consumption should be increased. This should include consideration of different types of programs aimed at increasing fruit and vegetable consumption.

Beliefs and Attitudes: Students

- 2. Nutrition Network Students are significantly more likely to believe everyone, including children, teenagers, adults and grandparents, need to eat fruit and vegetables than comparison school students.**

Most students in both intervention and comparison schools believed everyone should eat fruit and vegetables at baseline but an even higher proportion of Nutrition Network students believed that by the end of the study.

Recommendations: Nutrition Network should continue their messages about the universal importance of fruit and vegetables consumption.

3. Students don't believe they need to eat more fruit and vegetables.

Nutrition Network and comparison students, about 70%, are equally likely to believe the amount of fruit and vegetables they eat every day is "just right" for them. Most students do not believe they need to eat more fruit and vegetables. We learned from the fruit and vegetables frequency questions that all students, on average, ate vegetables less than one time daily and fruit slightly more than one time per day. Students may be overestimating in their belief of the adequacy of the amount of fruit and vegetables they eat *according to nutritional recommendations*. We don't know why students believe their fruit and vegetable intake is "just right" but these findings may indicate that student beliefs may not be in line with nutritional recommendations or Nutrition Network messages.

Recommendation: Nutrition Network should increase their nutrition education efforts to promote the importance of eating more fruit and vegetables every day.

Recommendation: Nutrition Network should promote clear messages about how much or how many fruit and vegetables are "just right".

4. Nutrition Network students are significantly more likely to have positive attitudes about vegetables.

Most students overall agree vegetables are healthy and important to eat. But Nutrition Network students are more likely to believe vegetables are healthy and important to eat, taste good and like to eat vegetables compared to non- Nutrition Network school students.

However, highly positive beliefs about health benefits may not translate favorably into behavior. When compared to their own highly positive beliefs about the health benefits of vegetables, a smaller proportion of students think vegetables taste good or like to eat them. These findings may explain, in part, why students do not eat more vegetables. Students report a discontinuity between what they believe and what they do.

Recommendation: Nutrition Network may want to increase Harvest of the Month (HOM) exposure to preparing and tasting vegetables. While much of HOM has focused on introducing new vegetables to students, readily available vegetables prepared simply, and perhaps more than once, might be offered with a goal of not only increasing positive attitudes about actually eating vegetables but actually eating more vegetables.

5. A majority of students had positive attitudes about fruit.

Positive attitudes regarding fruit are so high, 90% or more in most cases; a "ceiling effect" has been reached. This means there was little room for improvement at baseline and no intervention effect among Nutrition Network students.

Kids like fruit! Students say they like to eat fruit and know fruit is healthy to eat. These highly positive and universal student attitudes about fruit stand in sharp contrast to some of the student attitudes towards vegetables. But these positive attitudes about fruit may not lead to eating fruit. These findings may indicate that consumption of fruit is more complicated than holding positive attitudes and beliefs about fruit.

Recommendation: Nutrition Network may want to increase Harvest of the Month (HOM) exposure to preparing and tasting fruit. As with vegetables, much of HOM has focused on introducing new fruit to students. Readily available fruit prepared simply, and perhaps more than once, might be offered with a goal to increasing positive attitudes about actually eating fruit and increasing fruit consumption.

Social and Environmental Influences: Peers, Parents, and Teachers

6. Students communicate positive attitudes about fruit and vegetables with their friends.

Students do communicate about fruit and vegetables and Nutrition Network has had a positive impact on increasing communication among its students. These findings indicate that while classroom nutrition education has not created a large climate of "peer pressure" or "excitement" about fruit and vegetables, some students do talk about fruit and vegetables. These findings indicate there may be an opportunity to engage students in additional communication strategies about fruit and vegetables.

Recommendations: Nutrition Network may want to increase program efforts to create opportunities for experiences with fruit and vegetables that can be shared and discussed among students.

7. Nutrition Network students are no different from other students in perceiving positive influences, encouragement or behaviors at home about vegetables and fruit.

Most students say that their parents encourage them to eat fruit and vegetables every day but far fewer children encourage their parents to eat vegetables and fruit every day. Also students report few parents eat fruit and vegetables every day.

An objective of Nutrition Network has been to disseminate positive nutrition messages to parents through information brought home by Nutrition Network students. We found no indication that Nutrition Network students are more likely to do this than non-Nutrition Network students. This finding suggests that focusing on nutrition education programs involving parents directly may be more successful in influencing parental behaviors, beliefs and attitudes about fruit and vegetable nutrition.

Recommendation: Nutrition Network should develop and expand nutrition education programs for parents.

8. Students in Nutrition Network schools are significantly more likely to report their teachers deliver positive messages about vegetables and fruit than children in non-Nutrition Network schools.

Nutrition Network students scored their teachers especially high on promoting the health benefits of fruit and vegetables. Although we cannot rule out the possibility that because these figures, upwards of 80-90% at baseline, may represent a cumulative effect of Nutrition Network participation over time rather than an effect of the current study, there were still significant increases.

Recommendation: Nutrition Network should continue programs to promote health benefits of fruit and vegetable nutrition. The Nutrition Network should acknowledge that their teachers are successful in communicating key messages to their students.

9. Positive messages about fruit and vegetables are not delivered uniformly including fruit and vegetables taste good and encouragement to eat fruit and vegetables daily.

Fewer students report positive teacher messages about fruit and vegetables tasting good and encouragement to eat fruit and vegetables daily. This finding may indicate that teachers are selective in the Nutrition Network messages they deliver. Or that students may be selective in the information they retain.

Recommendation: Nutrition Network messages should be clarified for teachers. Teachers should be encouraged to deliver all Nutrition Network messages. New strategies for delivering messages about eating fruit and vegetables every day might be needed.

Accessibility of Vegetables and Fruit

10. Most students report they have fruit or vegetables in their homes every day.

While it is good news that so many homes have fruit and vegetables in their homes, 10-15% do not. Further, the relatively high proportion of students reporting fruit and vegetables in their homes on a daily basis sheds little light on their low consumption.

Recommendations: Nutrition Network should develop new strategies to increase fruit and vegetable consumption at home and in school.

11. By the end of the study Nutrition Network students were less likely than the comparison group to want to eat something other than fruit or vegetables.

Nutrition Network students who had not eaten fruit or vegetables the day before the study were no different from comparison students in reporting reasons for not doing so. The exception was "wanting to eat something else". Nutrition Network had an effect in an area where their program can be expected to make a difference, helping students make better nutrition choices.

Recommendation: Nutrition Network has an opportunity to do even more nutrition education to help students understand they can make better choices about what they eat.

12 Nutrition Network students reported they were more physically active after the intervention, their frequency of PE was higher, and more believed their physical activity levels were "just right" compared to students in the comparison schools.

Most students believed they were physically active but reported that PE contributed little to activity levels. Fewer than half of the students thought they were in good physical shape and could run around their school. Overall, students had positive attitudes about sports and activity but fewer than three-quarters of students thought they got enough physical activity.

Recommendation: Nutrition Network should be open to creating more opportunities for physical activity linked to nutrition education.

Program Administration

13 Nutrition Network students who remain in the same classroom for a full academic year were no more likely to benefit from teacher based nutrition education programs than students who may not complete a full academic year in the same classroom.

We conducted a "sample within a sample" study in an attempt to address the impact of Nutrition Network programs on the transitory LAUSD student enrollment. Students who were not part of the longitudinal cohort could have been absent, did not assent to participate, were a new member of the classroom or no longer in the classroom. We cannot answer those questions. But that said, we found no difference in intervention effects between the Nutrition Network cross-sectional student samples and the longitudinal student cohort sample. This means that whether or not a classroom population remained stable, an intervention effect was just as likely to be found. This finding may demonstrate a "steady state" of Nutrition Network influence and messages that are sustained across the academic year.

Recommendations: Nutrition Network should continue its focus on delivering nutrition education through classroom teachers.

14 Nutrition Network teachers who log a high number of nutrition education hours are no more likely than teachers who log a low number of nutrition education hours to exert an impact in this study.

One of the Research Questions for this study was to determine if exposure to higher log time (hours) of nutrition education would lead to greater impact than exposure to low or moderate log time hours. We found there was no difference in impact regardless of level of exposure. While there may be a minimum threshold of log time (hours) to induce an intervention effect in the classroom, we were not able to find it in this study. Also, we were not able to account for student exposure to other Nutrition Network programs that may have promoted Nutrition Network messages in schools or classrooms during the period of the study or at times prior to the study.

Recommendation: Nutrition Network should continue its support of classroom teachers in delivering nutrition education. While logging time for nutrition education activity is mandatory for Nutrition Network teachers as a part of the program process reporting, log time (hours) may not be indicative of teacher performance or input.

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