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RESEARCH ARTICLE

Teaching Healthful Food Choices to Elementary School Students and Their Parents: The Nutrition Detectives™ Program*

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ABSTRACT

BACKGROUND: The purpose of this study was to evaluate the effects of a nutrition education program designed to teach elementary school students and their parents, and to distinguish between more healthful and less healthful choices in diverse food categories.

METHODS: Three schools were assigned to receive the Nutrition Detectives™ program and 2 comparable schools served as controls. A total of 1180 second, third, and fourth grade elementary school students were included, with 628 students in the intervention and 552 in the control group. The program, delivered by physical education instructors over several sessions totaling less than 2 hours, taught the children how to read food labels and detect marketing deceptions, while learning to identify and choose healthful foods. Parents were introduced to the program through written materials sent home and at school functions. Assessments included a food label quiz, dietary pattern, and body mass index (BMI).

RESULTS: Students in intervention schools showed a significant increase in nutrition label literacy ($p < .01$). Third grade students showed the most improvement, 23% ($p < .01$). The parents of intervention group students also showed a significant increase in nutrition label literacy by 8% ($p < .01$). Total caloric, sodium, and total sugar intake decreased nonsignificantly among students in the intervention group ($p > .05$). BMI did not change over the short duration of the study.

CONCLUSIONS: Nutrition Detectives effectively enhances the ability of students and their parents to identify more nutritious food choices. Further evaluation of the program and its potential to influence dietary pattern, BMI, and health outcomes in students and their families is warranted.

Keywords: nutrition and diet; health and wellness; family; teaching techniques; literacy; food label; public health; childhood obesity; schools.

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An unprecedented epidemic of childhood obesity is now plaguing the United States[1] and threatening our nation's public health.[2] Obesity raises the risk for type 2 diabetes mellitus, insulin resistance, heart disease, high blood pressure, metabolic syndrome, and other health-related disorders.[3] The best defense against obesity is to exercise daily and eat a healthful diet.[4] Schools can become an effective weapon in the fight against obesity by creating an environment that includes healthy school meals and foods, physical education programs and recess, health education, and school health services. Recent evidence highlights the value of such efforts.[5,6] No other institution has as much continuous and intensive contact with children during their first 2 decades of life.[7]

While schools constitute a vitally important setting in which to combat the trends in childhood obesity and related health concerns, there are considerable barriers

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to the implementation of wellness programing. The primary mission of schools is the proverbial ''reading, writing, and arithmetic,'' not health and wellness. There is pressure, related in part to the No Child Left Behind Act legislation,[8] to focus on preparation for standardized testing. Schools are perennially short on time, person-power, resources, and money.[9]

Therefore, ideal school health promotion programing should require a minimum of school time, effort, and money and should not require specially trained professionals for effective delivery. Programs should directly cultivate practical and ''actionable'' skills related to daily physical activity, healthful eating, or both. In addition, they should reach both students and their parents so that families may reinforce what is taught in school in the home environment.[10-12]

The Nutrition Detectives™ program (www.nutritiondetectives.com)[13] was developed with these imperatives in mind, and because of its responsiveness to them, the program is active in hundreds of schools throughout United States and Canada. We report the initial results of a group-randomized, controlled evaluation of the Nutrition Detectives program in the Independence School District in Independence, Missouri.

METHODS

Study Design

During the 2007-2008 school year, subjects were recruited from among 5 elementary schools in Independence, Missouri. The 5 schools were matched based on their demographic characteristics and then randomly assigned to intervention or control group. Second to fourth grade students with parental consent attending Mill Creek, Southern, Sycamore Hills, Blackburn, and Glendale elementary schools were included. All students in Mill Creek, Southern, and Sycamore Hills, grades K-5, received the Nutrition Detectives curriculum. However, data collection was taken for students in grades 2-4 only. Students were excluded from data collection and program evaluation if parental consent was not received to participate in the study or if the student was unwilling or unable to comply with the study protocol. The Yale Human Subjects Committee and the Griffin institutional review board approved this study and all subjects' parents gave their written informed consent.

Protocol

The study participants studied during the 2007-2008 school year. Baseline data were collected from students with parental consent to participate in the study and was done with the assistance of teachers, specially trained data collectors, and physical education teachers. Baseline data on the children included gender, grade level, age, weight, height, body mass index (BMI), dietary intake, and nutrition knowledge. Baseline data on the parents consisted of dietary intake and nutrition knowledge only.

School Intervention

The focus of the Nutrition Detectives program was on educating students regarding the selection of healthful foods as defined by foods which were defined as minimally processed and close to nature; relatively high in intrinsic nutrients as compared to calories; relatively low in added sugars and trans-fat; and relatively rich in desirable constituents, such as fiber.

Program Components. The Nutrition Detectives program consists of 5 mini lessons. Mini lessons 1, 2, and 3 convey the link between food choice and health, the struggles of eating well in the modern world, in addition to how and what nutritious foods to choose. The third lesson also introduced the students to the ''5 Clues'' (Table 1) necessary to make practical food selection through the interpretation of food packages and food advertisement. The slide show for this lesson culminated in a demonstration of how food packages can be deceptive and how nutrition labels (nutrition facts panel and ingredient list) can be used to make better choices in nearly every food category. The program included a demonstration in which the actual ingredients of foods are poured into a bowl to show the differences between more and less processed products. The children were taught to look for, or look out for, key food features, such as whole grains, fiber, or partially hydrogenated oil. They received instruction on how to use a short list of key food label findings to inform better choices. Mini lesson 4 was an interactive activity where students were divided into teams of approximately 6 to 10 for a hands-on ''spying on food labels'' game to search through a bag of groceries containing items in one of the following categories: cookies, chips,

Table 1. **''5 Clues'' From the Nutrition Detectives Program**

Clue	Description
1	Don't be fooled by THE BIG LETTERS in the front of the package—Look for the itty-bitty letters on the food label instead!
2	The FIRST ingredient is always the biggest!
3	Avoid partially hydrogenated oil and high fructose corn syrup!
4	Avoid foods with a LONG INGREDIENT LIST!
5	Fiber is your friend, so look out for whole grain imposters!

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crackers, peanut butter, cereal, bread, and beverages. Each grocery bag contained some preferred items and some less preferred items, and the children on each team worked together to decide which is which. The program concluded with the final mini lesson emphasizing the healthy choice of fresh produce as well as summarizing key points and takeaway messages.

Program Development. The Nutrition Detectives program was initially developed in 2002 by Dr David Katz (the primary author of this manuscript) and Catherine Katz, PhD, and offered as an informal session at an elementary school in Hamden, Connecticut. Over time, the program has been expanded and refined into its current design and content based on the input from teachers, school administrators, education experts, and nutrition educators. The program has been placed in the public domain and is freely available to all.

Program Delivery. Using a community-based participatory research approach, the researchers and school district collaborated to plan the timing and methods of program delivery. The Nutrition Detectives program was presented by the physical education instructors to students in the intervention schools in four 20-minute sessions. Since the research team was implementing and evaluating another program (ABC for Fitness™) during the same school year which was being delivered by classroom teachers, the decision was made by the school district to assign the delivery of Nutrition Detectives to physical education instructors. The program was presented in November 2007 as a PowerPoint (Microsoft, Redmond, WA) slide show followed by a hands-on activity. Children who received the Nutrition Detectives program also received a booster training session in February 2008.

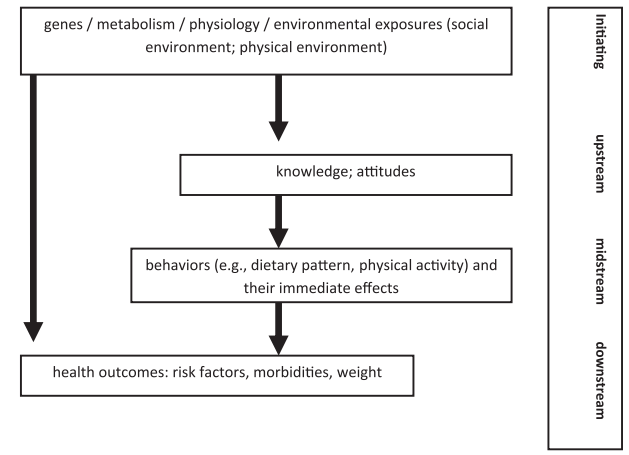
Family Outreach

Parents were formally introduced to the program through written materials and/or parent information nights.

Outcome Measurements

Nutrition Knowledge. The primary study outcome was food label literacy and nutrition-related knowledge regarding healthful food choices (Figure 1). Children's ability to choose ''better for you'' foods was based on a standardized test instrument using nutrition labels from some of the kinds of food products (breads, crackers, cereals, cereal bars, and cookies), discussed in the Nutrition Detectives program. The test instrument consists of 10 questions, with 10 representing the highest possible score on the test. Each question asks students to select which is the more healthful of the 2 food products based on the Nutrition Facts panel and ingredient list for each food product. The selection of each ''better for you'' (ie, ''clued-in'' or more healthful) choice is based on one or more of the program's ''5 clues.'' The clued-in/clue-less (ie, more healthful/less healthful) choices were differentiated using the Overall Nutritional Quality Index (ONQI) algorithm.[14] The ONQI is a universally applicable, objective metric designed to measure the healthfulness of foods and beverages both within food categories and across the full expanse of the food supply. The ONQI was developed based on the best available scientific evidence from the fields of nutrition, epidemiology, and public health.

Figure 1. **A Logic Model for Obesity**[5]



Dietary Pattern

Youth and Adolescent Questionnaire. The Youth and Adolescent Questionnaire (YAQ) was used to assess dietary patterns among students. The YAQ is valid and reproducible in children aged 9 to 19.[15] The YAQ was given to students to bring home to fill out with their parent/guardian. A separate sheet of instructions accompanied the YAQ and parents were encouraged to contact the study coordinator with any questions.

Food Frequency Questionnaire. The questionnaire used in this study to assess the dietary patterns among the parents was the Harvard Services Food Frequency Questionnaire (FFQ), which contained 103 items, including 84 foods and 13 questions about food habits and supplements. This is the most common dietary assessment tool used in studies of diet and health.[16]

BMI. BMI for age and gender was measured preintervention and postintervention. Height and weight were collected from all students in the intervention and comparison schools. Student measurements were taken by the school nurse or wellness coordinator during a specified time set by the school administrators. Children were measured fully clothed, except for shoes, and were not required to fast before school. A computerized BMI assessment tool, BMI4KIDz,[17] was used to measure and record the students' BMI.

Statistical Analysis. To assess groups' differences at baseline between the intervention and control groups, student's *t* test was used. Repeated measures analysis of variance (ANOVA) was used to assess the between group differences for the anthropometric and dietary intake. Nutrition knowledge was assessed through the use of repeated measures ANOVA to assess the within-group differences in the intervention group on the food label quiz from pretest to posttest (students and parents) and from pretest to the prebooster test and postbooster test (students only). Post hoc tests were conducted to assess the influence of within-group factors such as gender, age group, and grade level through either the use of the Tukey's HSD (honest significant differences) test or repeated measures ANOVA. All analyzes were based on intent-to-treat principle. The statistical software package SPSS version 15.0 was used to conduct all analyzes.[18] All tests were conducted with a two-tailed alpha level set at 0.05.

RESULTS

Study Population Characteristics

A total of 1180 students were enrolled in the study: 628 students in the intervention group and 552 students in the control group. The 2 study groups were comparable ($p > .05$) in terms of demographic characteristics: gender, grade level, and age (Table 2). The control group students and their parents had a better nutrition knowledge at baseline as compared to those in the intervention group (students, $p = .04$ and parents, $p < .01$). At baseline, the dietary pattern of students and their parents in the intervention and control groups were comparable ($p > .05$) in terms of calories, protein, total fat, carbohydrates, fiber, saturated fat, monounsaturated fat, polyunsaturated fat, cholesterol, sodium, and folate intake (Table 2).

Nutrition Knowledge

In the initial session of the Nutrition Detectives program, students' nutrition knowledge improved significantly ($18.1\% \pm 26.9$; $p < .01$) compared to baseline. Students in grade 3 showed the greatest improvement of nutrition knowledge compared to baseline among the 3 grade levels ($23.3\% \pm 26.1$). The parents of the students in the intervention group also showed statistically significant improvement in their nutrition knowledge compared to baseline after the delivery of the Nutrition Detectives program ($7.9\% \pm 19.9$; $p < .01$). Reinforcing the delivery of the Nutrition Detectives program with a booster session significantly improved the students' nutrition knowledge from the initial session ($18.1\% \pm 28.1$; $p < .01$) (Table 3).

Table 2. **Demographic Characteristics and Baseline Values**

Variable	Intervention School	Control School	p Value
Gender	(n = 628)	(n = 552)	
Male	312 (49.7%)	265 (47.8%)	.53
Female	316 (50.3%)	288 (52.2%)	
Grade level	(n = 628)	(n = 552)	
Second grade	206 (32.8%)	182 (33.0%)	.99
Third grade	208 (33.1%)	184 (33.3%)	
Fourth grade	214 (34.1%)	186 (33.7%)	
Age	(n = 628)	(n = 550)	
7 years	163 (26.0%)	142 (25.8%)	.89
8 years	207 (33.0%)	175 (31.8%)	
9 years and older	258 (41.1%)	233 (42.4%)	
Nutrition knowledge	(n = 576)	(n = 479)	
Food label quiz score	4.8 ± 2.1	5.1 ± 2.1	.04
Dietary pattern	(n = 414)	(n = 364)	
Calories (kcal)	2050.5 ± 772.8	2015.1 ± 724.0	.51
Protein (g)	80.8 ± 28.6	79.1 ± 29.0	.42
Total fat (g)	73.4 ± 28.4	72.4 ± 27.1	.61
Carbohydrate (g)	273.7 ± 112.7	268.6 ± 103.5	.51
Fiber (g)	15.1 ± 7.0	14.5 ± 6.6	.25
Iron (mg)	17.7 ± 7.4	7.2 ± 7.3	.38
Saturated fat (g)	26.3 ± 10.7	25.4 ± 10.0	.25
Monounsaturated fat (g)	26.5 ± 10.3	26.3 ± 9.8	.85
Polyunsaturated fat (g)	13.7 ± 5.7	13.8 ± 5.5	.80
Cholesterol (mg)	242.3 ± 98.4	234.4 ± 101.0	.27
Sodium (mg)	2529.3 ± 972.0	2480.3 ± 944.2	.48
Folate (μg)	402.3 ± 156.9	388.6 ± 150.7	.22
Body mass index (BMI)	(n = 622)	(n = 526)	
BMI (kg/m^2)	18.4 ± 4.4	18.3 ± 3.6	.71
BMI percentile	66.3 ± 28.7	66.8 ± 25.8	.72

Table 3. **Change in Outcome Measures**

Variable	Intervention School	Control School	p Value
Nutrition knowledge			
FLQ % Δ pre/post (n = 576)	18.1 ± 26.9	—	<.01
FLQ % Δ pre/booster pre (n = 541)	18.1 ± 28.1	—	<.01
FLQ % Δ pre/booster post (n = 541)	20.3 ± 30.8	—	<.01
Dietary pattern	(n = 136)	(n = 169)	
Calories (kcal)	−64.6 ± 686.7	−28.6 ± 691.9	.65
Protein (g)	−1.9 ± 25.4	−1.9 ± 30.0	.99
Total fat (g)	−2.2 ± 24.6	−1.9 ± 25.8	.92
Carbohydrate (g)	−9.3 ± 106.7	−0.9 ± 99.6	.48
Fiber (g)	0.2 ± 5.9	0.7 ± 5.8	.43
Iron (mg)	−0.1 ± 7.7	0.5 ± 7.3	.50
Saturated fat (g)	−0.6 ± 9.4	−0.9 ± 9.0	.25
Monounsaturated fat (g)	−0.8 ± 9.4	−0.9 ± 9.5	.96
Polyunsaturated fat (g)	−0.6 ± 4.6	0.1 ± 5.6	.27
Cholesterol (mg)	0.3 ± 100.7	−8.4 ± 103.7	.46
Sodium (mg)	−92.8 ± 765.2	−17.3 ± 891.9	.44
Folate (μg)	−10.7 ± 140.8	18.3 ± 146.3	.08
BMI	(n = 622)	(n = 526)	
BMI (kg/m^2)	0.5 ± 1.5	.003 ± 2.1	<.01
BMI percentile (% Δ)	1.9 ± 8.4	−5.6 ± 13.7	.01

BMI, body mass index; FLQ, food label quiz.

Dietary Pattern

There were no statistically significant improvements in dietary patterns from baseline between the intervention and control groups in terms of calories ($p = .65$), protein ($p = .99$), total fat ($p = .92$), carbohydrates ($p = .48$), fiber ($p = .43$), iron ($p = .50$), saturated fat ($p = .25$), monounsaturated fat ($p = .96$), polyunsaturated fat ($p = .27$), cholesterol ($p = .46$), sodium ($p = .44$), and folate ($p = .08$) intake (Table 3).

There were also no statistically significant improvements in dietary patterns from baseline between the parents of students in the intervention group and the parents of students in the control group in terms of calories ($p = .48$), protein ($p = .98$), total fat ($p = .54$), carbohydrates ($p = .29$), fiber ($p = .38$), iron ($p = .87$), saturated fat ($p = .59$), monounsaturated fat ($p = .59$), polyunsaturated fat ($p = .51$), cholesterol ($p = .81$), sodium ($p = .75$), and folate ($p = .56$) intake.

BMI

BMI did not improve from baseline in neither the intervention nor the control group students.

DISCUSSION

This study provides preliminary evidence of the effectiveness of the Nutrition Detectives program in fulfilling its primary objective: enhancing the ability of both students and their parents to distinguish more healthful from less healthful options in a wide variety of food categories. Although little effect was seen on downstream measures of health behaviors and/or health outcomes (Figure 1), this was not surprising given the short duration of the study. The a priori study hypothesis was that knowledge, specifically food label ''literacy,'' would change. The study was predicated on the social-ecological model of behavior change,[19] and thus would not predict significant behavior or outcome changes based on a change in knowledge alone. Such a change in knowledge is deemed necessary, but not sufficient[20-22] for changes in ''downstream'' variables. In this short-term duration study, BMI decreased significantly in the control group when compared to the intervention group. This improvement in BMI may be more of a reflection of natural growth and development rather than of dietary changes. More comprehensive and longer-lasting intervention is likely required to change such measures as BMI or the prevalence of type 2 diabetes.

On average, public schools in the United States must provide at least 175 days of instruction per year, with an average of 6 hours per school day.[23] Assuming children sleep an average of 8 hours per night, there are 5840 waking hours in a year, of which slightly more than 1000, or roughly 20%, are spent in school. This figure suggests that schools will likely have a strong impact on children's health, whether for better or for worse. However, this figure also indicates that 80% of the children's waking hours are spent outside school and therefore what happens in schools cannot be the sole cause or cure of what threatens the health of American children. The implications of this dichotomy must be carefully considered. The hours that children spend in school constitute a significant proportion of their time and lives. During these hours, children eat at least 1, if not 2 meals per day. Therefore, time spent in school is likely to influence the children's dietary and physical activity patterns, thereby influencing their health as well. However, schools can have an impact on the children's lives even outside school. This is evidenced by the very purpose of schools, which is to educate and provide lessons which students will use in their lives. It is, therefore, reasonable to believe that schools can convey messages to children about nutrition and physical activity that can influence behavior outside school.

It cannot be assumed that school-based interventions can reverse unfavorable health trends in isolation, as the majority of children's time is spent outside school. Support for this view can be found in the results of a recent study which found that young children are more likely to gain weight during the summer than during the school year.[24] It must be acknowledged that the out-of-school environment plays a critical role in shaping health outcomes in children and that schools cannot be given exclusive responsibility for influencing those outcomes. Therefore, by increasing the nutrition label literacy of students in the school setting and their parents in the school and/or home setting and thereby empowering the entire family to make healthful food choices, the Nutrition Detectives program can exert a positive impact on the health of students in both the school and home environments.

In regards to childhood obesity, schools cannot be considered the only source of the problem nor can they provide the entire solution, but they will necessarily be part of the problem or part of the solution. No single setting is to be blamed. It is the aggregate exposures across settings (Figure 1) in conjunction with personal choices that determine the prevailing pattern of health-related behaviors. The position of the Institute of Medicine (IOM) is in accordance with this view, as expressed in the 2005 report, ''Preventing Childhood Obesity: Health in the Balance.''[25] The report recommended that schools adopt a number of strategies, including daily physical activity totaling 30 minutes or more, and cafeteria offerings conforming to current dietary guidelines, but the report did not identify specific actions schools could take to implement these strategies. The report called for action based on the best evidence currently available. The IOM identified a range of stakeholders in this

crisis, from households to the federal government, and included schools among them. A follow-up publication in 2006, ''Progress in Preventing Childhood Obesity: How Do We Measure Up?''[26] concluded that efforts to reduce or contain childhood obesity are far from sufficient to meet the need.

It may be both unrealistic and unreasonable to expect that school-based interventions in isolation will appreciably ''move the needle'' which points to the health, or weight, of children. It is that much more unreasonable to expect that any single intervention in any given school will do so. Children, like adults, face a veritable flood tide of obesigenic factors on a daily basis, from ubiquitous access to highly palatable, energy-dense foods, to an ever proliferating array of labor-sparing technologies. Any single intervention, in any setting, intended to combat these influences is rather like a single sandbag intended to contain the rising waters of an actual flood. No matter how robust, a single sandbag cannot do the work of an entire levee. No matter how well considered, a single intervention cannot be expected to oppose the obesigenic flood tide either.

Thus, expecting too much of any isolated intervention is an invitation to find success masquerading as failure. There is a need to evaluate programs realistically for the potential contributions they may make as parts of a strategic whole. Doing so warrants consideration of the causal pathway that influences health and weight outcomes, as shown in Figure 1. Most interventions are apt to influence upstream or midstream variables; only an aggregation of effective programing is likely to produce meaningful change in the downstream variables. Evaluation of programs is vital, but unless the right questions are posed, useful answers will prove very elusive.

With such considerations in mind, there are indeed a number of very promising school-based health promotion programs. Among the better known of these are CATCH[27]; Planet Health[28]; and WE CAN.[29] Recent meta-analysis of school-based interventions for obesity control and prevention suggests that these and other programs can indeed be efficacious.

Along with the challenge of efficacy, however, comes the challenge of feasibility. While some schools are able to adopt health promotion programs that require significant curricular restructuring, most are not. There is a need for programs that make a meaningful contribution to public health goals, while demanding as little as possible of schools in time, effort, resource, or cost. Nutrition Detectives is such a program, as is its sister physical activity program, ABC for Fitness (www.davidkatzmd.com/abcforfitness).[30] Both programs were designed to fit into the ''nooks and crannies'' of the school day and contribute to health without interfering with the primary pedagogical imperative of the school day. As noted, Nutrition Detectives can be delivered in less than 2 hours over the course of the school year as it was in this study, although more potent and durable effects are likely with reinforcement over time.

Limitations

The current study is limited in important ways. The food label quiz used was developed specifically for the program and not previously validated. However, it is a direct test of the very knowledge Nutrition Detectives is designed to impart, and validated in what it measures by the use of the ONQI. The mean ONQI score of ''clued-in'' choices was significantly greater than the mean ONQI score of the ''clue-less'' choices (27.4 ± 8.5 vs 16.2 ± 9.4; $p = .01$).

In addition, this study did not show effects on downstream variables within the logic model for obesity, such as dietary patterns and weight. This is a common problem for nutritional education programs, especially when there is only one component to the program. Some studies have shown success in these measures when there are multifaceted interventions, involving education combined with physical activity and also involving multiple settings, including school and home.[31] Other studies have only been able to show a reduction in the incidence of overweight children, but not obese.[32]

Another limitation of this study was its relatively short duration of several months. To effect changes in health outcomes, such as weight, likely requires a longer study period in addition to extended follow-up over several years. Finally, our results were obtained from a single school district, potentially limiting generalizability. However, there is no a priori reason why the findings should be in any way site specific.

Conclusion

Despite these limitations, the current study is important in demonstrating that a streamlined, brief intervention in schools can impart a practical skill related to food choice to students and their parents. The influence of a school-based program on knowledge in parents was especially gratifying, as dietary behavior is apt to be a matter of familial choice.[33,34] Further study will be required to verify that this intervention can lead to improvements in actual dietary pattern and related health measures, over time. Also needed is the study of this program in conjunction with other school-based wellness programing addressing physical activity as well as in combination with complementary programing outside school. In the interim, Nutrition Detectives is freely available, and in light of its promise and the low implementation burden, widespread use even as evaluation continues is not at all unreasonable.

IMPLICATIONS FOR SCHOOL HEALTH

Insights gained from implementing and evaluating the Nutrition Detectives program in the Independence School District have several implications for health promotion practices, as described below.

First, a nutrition program that requires minimal time on the school calendar can lead to significant gains in applied nutrition knowledge among elementary school students. In our study, Nutrition Detectives led to an 18% gain in food label literacy scores among students in grades 2 through 4, which was retained 3 months after exposure to the program.

Second, a nutrition program for elementary school students, combined with nutrition guidance for their parents, can lead to significant gains in applied nutrition knowledge among parents, who ultimately make most of the food purchasing decisions for children in this age group. In our study, providing nutrition guidance to parents via written materials and/or parent information nights led to an 8% gain in food label literacy scores among parents.

Third, although Nutrition Detectives can be delivered in less than 2 hours, more potent and durable effects are likely with reinforcement over time. In our study, adding a 3-month booster session led to an additional 2% gain in food label literacy scores compared to baseline.

Fourth, Nutrition Detectives can be taught by a variety of school personnel, such as classroom teachers, health teachers, physical education teachers, and/or college students majoring in education. In addition, the program can be delivered in a variety of settings, including classrooms, gymnasiums, cafeterias, or school assemblies.

Fifth, program delivery can be done in a flexible manner to meet the needs of the school schedule. In this study, the program's 5 mini lessons, including the hands-on activity, were offered in four 20-minute sessions totaling less than 2 hours. However, the mini lessons can also be offered during a single 90-minute session, two 45-minute sessions, or three 30-minute sessions.

Finally, Nutrition Detectives can either serve as a stand-alone program or be offered in conjunction with other school-based wellness programing and/or complementary programing outside school. The program's strengths include (1) conveying the link between food choices and health; (2) acknowledging the struggles of eating well in the modern food environment; (3) motivating students to make healthful food choices; (4) offering 5 key clues to choose healthful foods; (5) providing the chance to practice these clues; and (6) inspiring students to serve as agents of change with regard to family food purchases. Due to these strengths, the program could serve as a key motivational/educational component of a multifaceted intervention which could include promotion of other nutrition messages and expansion of opportunities for physical activity, which could in combination potentially increase the likelihood of improved health outcomes.

Human Subjects Approval Statement

This study was approved by the Yale University Human Subjects Committee and the Griffin Hospital institutional review board.

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