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Three-Year Maintenance of Improved Diet and Physical Activity
The CATCH Cohort

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Abstract

Objective To assess differences through grade 8 in diet, physical activity, and related health indicators of students who participated in the Child and Adolescent Trial for Cardiovascular Health (CATCH) school and family intervention from grades 3 through 5.

Design Follow-up of the 4-center, randomized, controlled field trial with 56 intervention and 40 control elementary schools.

Participants We studied 3714 (73%) of the initial CATCH cohort of 5106 students from ethnically diverse backgrounds in California, Louisiana, Minnesota, and Texas at grades 6, 7, and 8.

Results Self-reported daily energy intake from fat at baseline was virtually identical in the control (32.7%) and intervention (32.6%) groups. At grade 5, the intake for controls remained at 32.2%, while the intake for the intervention group declined to 30.3% (*P*<.001). At grade 8, the between-group differential was maintained (31.6% vs 30.6%, *P*=.01). Intervention students maintained significantly higher self-reported daily vigorous activity than control students (*P*=.001), although the difference declined from 13.6 minutes in grade 5 to 11.2, 10.8, and 8.8 minutes in grades 6, 7, and 8, respectively. Significant differences in favor of the intervention students also persisted at grade 8 for dietary knowledge and dietary intentions, but not for social support for physical activity. No impact on smoking behavior or stages of contemplating smoking was detected at grade 8. No significant

Conclusion The original CATCH results demonstrated that school-level interventions could modify school lunch and school physical education programs as well as influence student behaviors. This 3-year follow-up without further intervention suggests that the behavioral changes initiated during the elementary school years persisted to early adolescence for self-reported dietary and physical activity behaviors.

SUBSTANTIAL epidemiological evidence links health behaviors of a population to cardiovascular disease.[1] These health behaviors include lack of vigorous and regular physical activity, overconsumption of food, especially high-fat food, and smoking tobacco. A great deal of evidence points to the childhood and early adolescent years not only as key for the acquisition of these behaviors, but also as important in establishing the physiological antecedents of adult cardiovascular disease.[2-4] Recent data on the increasing prevalence of obesity,[5] the decline of physical activity,[6] and the importance of dietary habits in the establishment of adult chronic disease[7] underscore the relevance of interventions in childhood to improve diet and activity habits.

The importance of the child and adolescent years for cardiovascular disease risks is based on conclusions of several avenues of research. One body of research is pathologic evidence relating to vascular anatomical changes in children and the tracking of physiological parameters in children.[8-12] This research suggests that cardiovascular disease risk begins in childhood and has some stability during maturation. The acquisition and tracking of health behaviors that predispose children to cardiovascular risk are also being studied.[13] This research suggests that unhealthful behavioral patterns initiated in childhood, such as being sedentary, eating a diet high in fat and saturated fat, and (later) smoking, persist through adolescence.[2,14,15] While the evidence strongly supports implementing population-based risk reduction programs aimed at youth,[14-16] few such studies have examined the maintenance of behavior change after the intervention ceases.

Schools represent potentially important venues for primary prevention programs aimed at youth because they have access to large populations and have existing structures and systems to support health behavior change programs.[16,17] The National Institutes of Health–funded, multisite Child and Adolescent Trial for Cardiovascular Health (CATCH) study was designed to test the effectiveness of a feasible school-based program to reduce cardiovascular risk factors in elementary school–aged children. The CATCH intervention targeted increasing levels of physical activity; consuming foods that are low in fat, saturated fat, and sodium; and avoiding smoking initiation via a multicomponent program that included school environmental changes, a 3-year sequential classroom curriculum, and in some intervention schools, a family component. The details of the CATCH intervention are described elsewhere.[18] Previously reported results[19] indicated that CATCH, after 3 school years of intervention, positively affected the school environment and students' eating and physical activity behaviors. The amount of fat and saturated fat in foods offered in the school cafeteria was decreased. The amount of time students spent in moderate to vigorous physical activity was increased during physical education classes in intervention schools compared with control schools.[20,21] In addition, students exposed to the CATCH intervention reduced their intakes of fat and saturated fat, and reported being more physically active compared with students in the CATCH control schools.[19,22] The additional family component increased knowledge and attitudes, but did not add additional health behavior change.[19]

This article reports the 3-year persistence of intervention effects in dietary and physical activity behaviors among a geographically and ethnically diverse cohort of students at grade 8 who were participants in the elementary school CATCH intervention. No organized intervention was applied to the CATCH cohort beyond grade 5. The

Participants, materials, and methods

Design

The CATCH project's phase I was a feasibility study of 2 schools in each of 4 sites. The CATCH phase II was a 4-center field trial that evaluated the effectiveness of a feasible, elementary school-based cardiovascular health promotion program in 56 intervention schools and 40 control schools during grades 3 through 5. The CATCH phase III (tracking study) was a longitudinal study in which a 3-year follow-up of the CATCH II cohort of students was conducted. The study design[23] and results of CATCH II are described in detail elsewhere.[19,21,22,24,25] Briefly, significant intervention effects were observed in CATCH II for students' levels of vigorous physical activity and daily intakes of energy from total fat and saturated fat as well as dietary knowledge and intention scores.

The CATCH III was designed to measure eating and activity attitudes and behaviors as well as cardiovascular disease risk factors in the original CATCH II cohort of students during grades 6 through 8 to assess maintenance of intervention effects achieved at the end of CATCH II (grade 5). End point comparisons were made between students from the 56 CATCH II intervention schools and the 40 CATCH II control schools to determine whether changes observed at the end of the intervention (grade 5) were maintained through grade 8. The intention-to-treat principle was adhered to throughout the study, with students retaining their original school assignment from baseline (grade 3) for all CATCH III analyses. This means that on follow-up, all students possible were measured according to their original study assignment (treatment or control) whether or not they remained in their original school during the study and follow-up period. Primary end points of interest for CATCH III included daily intakes of dietary fat and saturated fat, levels of moderate to vigorous physical activity, and psychosocial factors. In addition, levels of physiological risk factors, including total serum cholesterol, high-density lipoprotein (HDL) cholesterol, and apolipoprotein B levels; body mass index (BMI); skinfold thickness; and blood pressure as well as (self-reported) smoking behavior were examined.

Psychosocial measures and physical activity behavior were assessed at 3 follow-up points: at grades 6, 7, and 8. A measure of food choices, the CATCH Food Checklist (FC), was administered at grades 7 and 8. Physiological measurements, including serum lipid levels, height, weight, skinfold thickness, blood pressure, and self-reported dietary nutrient intakes, were taken at baseline (grade 3), at the end of the intervention (grade 5), and once at follow-up (grade 8). Tracking efforts were designed to contact and measure cohort students within a 100-mile radius of the original CATCH II school districts. Because all students had left the original CATCH II schools, data collectors could be blinded to participants' treatment status for all measures in grades 6 through 8.

Study participants

The CATCH III study involved the grade 3 cohort of students (n=5106) recruited from the 96 CATCH II public elementary schools with parental consent to participate and a blood sample result at baseline.[19,26] The ethnic composition of the baseline cohort of students was 69% white, 14% Hispanic, 13% African American, and 4% other. The study was conducted at the original 4 field centers, located at the University of California at San Diego; University of Minnesota, Minneapolis; University of Texas–Houston Schoolof Public Health, Austin; and Tulane University School of Public Health and Tropical Medicine, New Orleans, La.

At grade 8, 3714 students (73% of the baseline cohort) had parental consent to participate in CATCH measurements. An additional 34 students (1%) had parental consent for all measures except venipuncture, while

Measures

All methods, training techniques, and quality controls developed and implemented as part of CATCH II and used during CATCH III have been described in the literature.[22,24,27,28] These measurements, as well as newly developed measures for CATCH III, are briefly described below.

24-hour dietary recall

During the spring of grade 8, a single 24-hour dietary recall interview was administered to a random subsample (n=1533) of the cohort who had also completed a dietary recall interview in either grade 3 or grade 5. The dietary recall interview measured each student's total daily nutrient intake, including energy from total fat and saturated fat. The face-to-face interviews were conducted using the multiple pass approach according to the standard CATCH protocol.[29] Dietary recall results were entered directly into laptop computers using the Minnesota Nutrition Data System software (Food Database version 12A, Nutrient Database 27; Nutrition Coordinating Center, University of Minnesota, Minneapolis). Based on CATCH quality assurance procedures, results from 49 dietary recall interviews were omitted from the analysis. The final sample size for analysis was 1468 students.

Food checklist

The Food Checklist (FC) was developed during CATCH III to assess whether selected foods high in total fat, saturated fat, or sodium had been consumed within the past 24 hours. The list of high-fat and high-sodium food items was developed from published and nutritionist-accepted standard food tables and an analysis of commonly eaten foods reported on a random sample of CATCH II dietary recall interviews completed during grade 5.[30] A system for scoring the FC was developed in which higher scores reflect higher intakes of total fat, saturated fat, and sodium. The FC was administered during grades 7 and 8 to all cohort students. Test-retest reliability (r, 0.83-0.89) and validity for 24-hour dietary recall data, based on a sample of grade 7 students who completed the FC and a single dietary recall interview, were adequate.[31] Food checklist data were significantly correlated with 24-hour recall data (percentage of total fat: r=0.36; percentage of saturated fat: r=0.36; sodium per 4200 kJ [1000 kcal]: r=0.34).

Self-administered physical activity checklist

The Self-Administered Physical Activity Checklist (SAPAC), developed, tested, and administered during CATCH II, was administered to all cohort members during grades 6, 7, and 8 to assess the type, duration, and intensity of physical activity performed by the student during the previous day. The SAPAC was a group-administered 1-day recall of 22 common physical activities. The instrument also asked whether and for how long the child watched television or played video games. During CATCH II, the SAPAC was validated against heart rate monitors (r=0.57) and Caltrac accelerometers (Hemokinetics Inc, Madison, Wis) (r=0.30) in grade 5 children.[32]

Health behavior survey

The Health Behavior Survey (HBS) was a 45-minute group-administered instrument designed to measure the psychosocial variables thought to influence the dietary, physical activity, and smoking behaviors targeted by the CATCH II interventions. These factors included knowledge of foods low in fat and sodium, intentions for heart-healthy food selections, perceived reinforcement and social support for physical activity, and smoking behavior and acquisition, with reference to the transtheoretical model of change theory.[33] No physiological measure of exposed to the different school conditions during each spring of grades 6, 7, and 8. Reliability of the instrument assessed during the pilot phase of CATCH II was found to be adequate (for diet knowledge, α=.75; for diet intentions, α=.78).[34] The CATCH III HBS was revised for age appropriateness during grade 6.

Physiological variables

A full risk-factor screening profile, including blood samples for total cholesterol, HDL cholesterol, and apolipoprotein B levels, and measurements of height, weight, skinfold thickness, and blood pressure, was conducted once during the spring of grade 8 (1997).

Nonfasting blood samples were obtained via venipuncture, and serum was analyzed for total cholesterol, HDL cholesterol, and apolipoprotein B levels in the same central laboratory (Miriam Hospital, Providence, RI) used for the CATCH II baseline and follow-up determinations. The laboratory participates in the Centers for Disease Control and Prevention Lipid Standardization Program. Reliability was assessed by taking blind duplicate blood samples from a 10% random sample of subjects. Intraclass correlation coefficients for serum total cholesterol, HDL cholesterol, and apolipoprotein B levels were high: 0.996, 0.977, and 0.993, respectively.

Five recordings (1 minute apart) of systolic and diastolic blood pressure and heart rate were obtained for each subject after a 5-minute rest period using the Dinamap automatic blood pressure device (model 8100XT; Critikon Inc, Tampa, Fla). Cuff size selection was based on arm length and circumference measurements.[35] The average of the last 3 readings was used for analysis. The Dinamap device was calibrated against a mercury manometer at the start of each day of blood pressure measurement.

Three consecutive replicate measurements of triceps and subscapular skinfolds were conducted using Lange calipers. The average of the 3 measurements was used for analysis. Height was measured using a portable stadiometer, and weight was measured using the SECA electronic portable scale (SECA Ltd, Birmingham, England). Height was measured to the nearest 0.1 cm, weight to the nearest 0.1 kg, and skinfolds to the nearest millimeter. Body mass index was calculated as the weight in kilograms divided by the square of the height in meters.[2] Interrater reliability was assessed by repeating a set of anthropometric measurements on 2 randomly selected children on each day of measurement. Intraclass correlation coefficients were 0.998 for height and weight scales. The intraclass correlation coefficients were similarly high for triceps and subscapular skinfolds, 0.981 and 0.983, respectively.

Statistical methods

Multivariate repeated-measures analysis was used for virtually all of the outcome variables (the exceptions are explained below).[36-38] For dietary recall and physiological risk factors, each participant's observation vector included up to 3 measurements (grades 3, 5, and 8); for self-reported physical activity, up to 4 measurements (grades 5, 6, 7, and 8); and for health behavior surveys, up to 7 measurements (semesters 1, 2, 4, 6, 8, 10, and 12). Cases with 1 or more observations missing were included as well as complete cases, on the assumption that missing observations were random. Some anomalous data and some plausible but extreme values were deleted to avoid undue influence, as follows: height decreasing more than 1 cm between grades (8 cases); BMI greater than 50 kg/m^2 (1 case); serum cholesterol level greater than 10.35 mmol/L (400 mg/dL) (3 cases); 1 day's energy intake greater than 50,200 kJ (12,000 kcal) (1 case); and 1 day's physical activity greater than 10.5 hours (99 cases).

intervention group, time, and group×time interaction). Random effect was included for the student's CATCH school of origin (the randomized unit) and for students within the school. Inclusion of student random effect was equivalent to assuming compound-symmetric covariance for the observation vector, ie, uniform pairwise correlation between time points within student.

The group×time interaction term was used to test whether the time course of the end point mean was parallel in intervention-school and control-school students. A nonparallel course represented a significant impact of the CATCH intervention (except in the case of physical activity, which did not include baseline measurements).

Scalar contrasts were constructed from the fitted model to estimate the mean outcome at each time point in intervention-school and control-school participants and the difference between them, adjusted for all other factors in the model. The contrast at grade 8 was used to test the particular hypothesis of CATCH III: that a difference still existed 3 years after the end of intervention.

Smoking, a dichotomous variable, was analyzed by a repeated-measures logistic regression model similar to the linear model, omitting only the student random effect for computational stability.

To control type I error in the presence of multiple outcome measures and time points, we limited formal inference to a single test (with a critical value of *P*=.05) of the primary CATCH hypothesis for each end point: group×time interaction for end points measured at baseline (dietary recall, risk factors, health behavior) and group main effect for end points measured only at follow-up (physical activity, FC). The expected number of type I errors was therefore 1.05 (0.05×21) for the variables reported in Table 2, Table 3, Table 4, and Table 5.

Table 2.

Dietary Intake (24-Hour Recall), Child and Adolescent Trial for Cardiovascular Health, Phases II and III, 1991 Through 1997*

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Dietary Intake (24-Hour Recall), Child and Adolescent Trial for Cardiovascular Health, Phases II and III, 1991 Through 1997*

Table 3.

Self-reported Physical Activity, Children and Adolescent Trial for Cardiovascular Health, Phases II and III, 1991 Through 1997*

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Self-reported Physical Activity, Children and Adolescent Trial for Cardiovascular Health, Phases II and III, 1991 Through 1997*

Table 4.

Physiological Measures, Child and Adolescent Trial for Cardiovascular Health, Phases II and III, 1991 Through 1997*

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Physiological Measures, Child and Adolescent Trial for Cardiovascular Health, Phases II and III, 1991 Through 1997*

Table 5.

Health Behavior Survey, Child and Adolescent Trial for Cardiovascular Health, Phases II and III, 1991 Through 1997*

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Health Behavior Survey, Child and Adolescent Trial for Cardiovascular Health, Phases II and III, 1991 Through 1997*

Multiple logistic regression analysis was conducted to determine whether the likelihood of grade 8 participation, given baseline participation, differed by site, sex, race, intervention group, or baseline end point variables. The participants' and nonparticipants' baseline levels of CATCH III end points were compared using a mixed model, controlling for site, sex, race, sex×race interaction, intervention group, and the same additional individual-level covariates used in repeated-measures analysis.

Results

Participation

Approximately 70% of the CATCH II baseline cohort participated in CATCH risk factor or questionnaire measurements during grade 8. The participation rate did not differ significantly between the CATCH II intervention and control school conditions (Table 1). There were minor but statistically significant differences in participation rates according to sex, race, and site on selected measures (Table 1). Participation in the dietary recall interview was slightly lower for boys than for girls, and participation in risk factor screening and HBS was higher for white students than for others. For all measures, higher participation was recorded in Louisiana and Minnesota than in California and Texas. These demographic effects were comparable for control and intervention schools ($P \geq .12$). Nonparticipants were slightly older at baseline screening (age 8.81 vs 8.74 years, $P < .001$) and had greater mean age-adjusted body mass index (17.81 vs 17.52 kg/m^2, $P = .002$) and skinfold thickness (12.6 vs 12.3 mm for triceps, $P = .03$; 8.7 vs 8.1 mm for subscapular, $P = .007$), but these differences applied equally to control and intervention schools ($P \geq .28$ for interactions). No significant difference in participation was found with respect to age-adjusted baseline levels of serum cholesterol and blood pressure, dietary intake, HBS responses, or self-reported physical activity (with grade 5 as baseline). These results suggest that valid inferences can be made with regard to the

Table 1.

Participation Rates, Child and Adolescent Trial for Cardiovascular Health, Phase III, 1991 Through 1997

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Participation Rates, Child and Adolescent Trial for Cardiovascular Health, Phase III, 1991 Through 1997

Diet

Table 2 shows the results from the 24-hour dietary recall interviews. Target nutrients for CATCH included percentage of energy from total fat and saturated fat, intake of sodium in milligrams, sodium per 4200 kJ (1000 kcal), and dietary cholesterol. At the end of the trial, students in the intervention schools had a significant reduction in energy intake relative to students in the control schools, although intake still met the recommended dietary allowances.[39] By the end of grade 8, the difference in change in energy intake by treatment group was not statistically significant.

At the end of grade 5, a significant reduction in energy from total and saturated fat was seen in the intervention students compared with the control students. At the end of grade 5, students in the intervention schools had nearly reached the national and study goals of 30% of energy from total fat (Figure 1). A difference of 1.8% in energy from total fat was noted between experimental and control students at the immediate postintervention measurement in grade 5. This difference declined to 1.0% by grade 8 but remained statistically significant. At the end of grade 8, statistically significant differences in energy from total fat by treatment group persisted. Students exposed to the CATCH intervention had a mean intake of 30.6% of energy from fat, and students in the control group averaged 31.6% of energy from fat. Energy from saturated fat approached but did not reach the national and study goals of 10% of energy. The significant differences in energy intake from saturated fat by treatment group were also maintained from grade 5 through grade 8, with the mean energy intake from saturated fat in the grade 8 in intervention and control students being 11.3% and 11.8%, respectively. Carbohydrate consumption also remained significantly higher among the intervention group (56.6% vs 55.4% of energy, *P*=.02). The differences noted in diet are both statistically and clinically significant; a reduction in fat and saturated fat consumption of the magnitude seen in the intervention group, along with the increase in carbohydrate consumption, would translate to an improved dietary intake in an individual student—a reduction of a dish of ice cream once a day, or switching from regular milk to skim milk.

Figure 1.

Comparison of dietary fat (% of energy) between intervention and control students, Child and Adolescent Trial for Cardiovascular Health (CATCH) cohort, grades 3 through 8.

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Comparison of dietary fat (% of energy) between intervention and control students, Child and Adolescent Trial for Cardiovascular Health (CATCH) cohort, grades 3 through 8.

The FC, including 40 foods or food groups accounting for substantial amounts of daily fat and sodium intake, was administered on a group basis in grades 7 and 8. The students from intervention schools scored significantly lower than those from control schools, indicating healthier diets, on total fat (*P*=.003), saturated fat (*P*=.02), and sodium (*P*=.006) intake, and the differences remained constant between grades 7 and 8 for all 3 nutrients (*P*≥.41) (Figure 2).

Figure 2.

Food Checklist scores for dietary fat, saturated fat, and sodium at grades 7 and 8, Child and Adolescent Trial for Cardiovascular Health II cohort.

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Food Checklist scores for dietary fat, saturated fat, and sodium at grades 7 and 8, Child and Adolescent Trial for Cardiovascular Health II cohort.

Physical activity

Table 3 and Figure 3 display differences between intervention and control students in minutes of self-reported daily vigorous activity, characterized by hard breathing most of the time while exercising. Experimental students reported more minutes than did control students, but the differences narrowed over time. The intervention effect was maintained at grade 8, with experimental students reporting a mean of 30.2 minutes of daily vigorous activity compared with control students' 22.1 minutes. Total activity minutes demonstrated an overall decrease from grades 5 to 8, with intervention students reporting more total activity in grades 5 and 6 than control students (*P*=.02 and *P*=.04, respectively). No differences between intervention and control students for total activity were present in grades 7 and 8.

Figure 3.

Daily minutes of vigorous physical activity, Child and Adolescent Trial for Cardiovascular Health (CATCH) cohort, grades 5 through 8.

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Daily minutes of vigorous physical activity, Child and Adolescent Trial for Cardiovascular Health (CATCH) cohort, grades 5 through 8.

Physiological risk factors

Table 4 presents physiological measures at grades 3, 5, and 8. No changes attributable to the CATCH intervention were demonstrated. The slight but nonsignificant decrease in serum cholesterol level noted in the intervention

Table 5 displays the results of the HBS for dietary knowledge and intention. Scores for healthy food choices (food intentions) and knowledge (food knowledge) were significantly higher among intervention group students compared with control group students. During grades 6 and 7, average scores progressively declined for both measures and in both conditions. However, scores remained significantly higher for intervention group children than for control group children in grades 6 and 7. Positive social support for physical activity did not differ significantly between the treatment groups in grade 8. As with food intentions and food knowledge, mean scores for positive support for physical activity decreased during grades 6 and 7 (data not shown).

Smoking

Current smoking was assessed by agreement with the item, "I have started to smoke a little," in grade 5, and then, "I have smoked on 2 or more of the last 30 days," in grades 6 through 8. Overall smoking prevalences for the control and intervention conditions, respectively, were 6.3% and 6.2% in grade 5, 5.9% and 4.5% in grade 6, 10.2% and 11.2% in grade 7, and 15.6% and 16.2% in grade 8. None of these differences reached statistical significance.

Comment

The CATCH project is the largest school-based randomized trial ever conducted. It was conducted in 4 geographically different sites, involved multiethnic and multiracial groups, and included longer follow-up (3 years) than similar school interventions. Since no additional intervention occurred after grade 5, the study results suggest that the behavior changes resulting from a multicomponent intervention, including classroom curricula, food service modifications, physical education changes, and family reinforcement, were sufficient to produce an intervention effect that could still be detected after 3 years. The program has been carefully evaluated and found to be feasible to implement.[25] These findings combine to suggest that CATCH or similar multicomponent approaches may qualify as suitable models for school-based primary prevention programs.

It has been assumed that reduction of adult cardiovascular risk of morbidity and mortality will occur only if behavioral change continues through adolescence and adulthood. Much of the evidence for intermediate and long-term effectiveness of behavioral intervention programs has targeted single risk factors, such as obesity and smoking prevention. Some long-term positive effects were seen with the Know Your Body program,[40,41] a school- and family-based cardiovascular risk reduction program; the San Diego Family Health Project,[42] a family-based intensive diet and activity intervention; and the Class of 1989 Study,[43] a school- and community-based cardiovascular health promotion study. In addition, the Life Skills Training Program[44] showed long-term effects on smoking behavior, alcohol use, and marijuana use after it was initiated in grade 7. However, all of these studies occurred in single sites and did not involve school environmental changes as intervention elements.

The differences between experimental and control students noted in this follow-up, while statistically significant, are narrowing in magnitude over time. If the trends continue, soon no differences will be detectable. This calls for additional research to investigate the best modalities for maintaining intervention effects beyond the elementary school level, especially as youth continue through adolescence. It also suggests that programs to alter the environments of middle, junior, and senior high schools are warranted.

In CATCH, although detectable behavioral differences persisted for 3 years after the intervention, there were no may be unrealistic to expect dramatic physiological changes in a young population, given the level of intensity of a primary prevention program and the relatively healthy general population at which it is targeted.

A potential limitation of this study is the reliance on self-reported data. To overcome this, validation studies were conducted on the major behavioral measures, eg, the SAPAC and the 24-hour dietary recall interview.[29,32] These proved to be valid and reliable measures. In the field, several procedures were employed to reduce bias,[48] including national and local training with standardized measurement protocols, on-site quality-control observations, and an adequate ratio of field staff per student. The 24-hour recall interview included probes to complement standardized questions on the HBS. Furthermore, it is difficult to provide socially desirable or "correct" answers on a 24-hour dietary recall interview. Previous analyses of the HBS correlating student responses on knowledge and attitudes have suggested that response bias was not responsible for the positive results seen in grades 5 and 8.[28] Furthermore, not all results obtained were in the positive or desired direction (eg, smoking, or social support for physical activity). In future studies, use of direct observation methods (diet) or motion sensors (activity) on randomly selected subsamples might add to the validity of self-reported data.

These results, if valid, have important implications for public health policy. Schools could be an important setting for programs to influence the development of healthful behaviors at an early age. In addition to interventions that provide education for children, the study suggests that for behavior change to occur and persist, interventions must create and maintain school environments that support healthful behavior. To sustain the benefits of elementary school programs, health promotion should probably continue through junior and senior high school. Additional research is required to assess the valid impact of such programs as well as how programs can be more widely implemented.

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Editor's Note: I'm almost as impressed with the 73% follow-up population as I am with the findings. CATCH-ing them early seems to stick.—*Catherine D. DeAngelis, MD*

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