EDITORIAL

Changes in Cigarette Smoking and Dietary Behavior of Children After Six Years of School-Based Intervention

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Lung cancer will be a worldwide threat for at least another 100 years. In countries like ours with easy access to tobacco products, most smokers acquire the habit during childhood or adolescence. The same is likely to be true of third world countries because social and economic development makes them targets for cigarette marketing. Successful prevention at the school level could be one practical public health solution to the projected 21st century global epidemic of lung cancer. If the people in the United States can learn how to bring about permanent reductions in prevalence rates of adult smoking through intervention in public schools, virtually every country in the world stands to benefit from our knowledge. Although the worldwide philosophical goal of teaching good nutrition principles to school-age children would be to promote health and avoid disease in the future, the specific dietary changes promoted are likely to differ from country to country. Unless we have new evidence of added benefit by changing two or more health behaviors at a time, an integrated cigarette smoking and dietary intervention program is likely to have much less potential for worldwide sharing than smoking prevention alone.

In this issue, Dr. Walter and her colleagues (1) report results of a long-term intervention program (6 yr) in four New York elementary school districts. They are reporting measured differences in smoking onset rates that were not present at the time the program began. These differences were large enough to win approval and support for repeated long-term measurements. If these differences are maintained, they could provide some of the first evidence that long-term changes can be made in smoking onset behavior. To date, several investigators (2,3) have reported up to 3 years of follow-up after as many as 3 years of active intervention; not one has been able to document consistent and persistent differences in adolescent smoking rates. The New York investigators are also reporting differences in diet composition at the end of the intervention program. These differences were not present at the beginning and were paralleled to some extent by differences in measurements of plasma total cholesterol in all the volunteer cohorts. If prevalence rates of smoking and high fat consumption can be lowered, how much can they be lowered and how easily and how cheaply can they be achieved? Will school smoking prevention programs work in countries whose rates of smoking are steadily increasing? Will nonsmoking behavior learned in schools with supportive environments persist through adolescence in countries where most graduates move into work environments in which the use of tobacco is encouraged? Answers to yet other questions are needed to accelerate and cut the costs of ongoing research. For example, results of current projects (2,4,5) in groups of schools that have programs or that serve as controls show that differences between rates of smoking begin to decrease once the intervention is complete. What level of difference in rates has to be measured at the end of intervention (short-term) to make it possible for investigators to achieve a minimum acceptable persistent difference in smoking rates among individuals at 18 or 20 years of age?

The worldwide need for lung cancer prevention programs demands the use of rigorous research design and methods to test the effectiveness of programs delivering interventions that have proved efficacious at the individual level. These interventions must be (a) easy to deliver, (b) low cost, (c) completely harmless, and (d) readily and fully incorporable in the ongoing teacher-delivered school curricula. Because their most important outcomes are measured 2 or more years after the students leave high school, long-term follow-up requirements add to the complexity of this research.

The choice of study units is influenced by the nature of the intervention programs and the structure of the public school system. Although many investigators have chosen to randomize groups and organizations, they have all used schools as channels to bring intervention to the pupils. None has intervened in the schools per se. In fact, only one has made changes in the participants' environment. Walter et al. (1) and other investigators (6) have chosen school districts rather than schools as randomization units, because children change schools but rarely change districts. The number of districts randomized largely determines the robustness and power of the research design. The choice of randomization units dictates the units of statistical analysis, and at the very least, all analyses must accommodate measures of their intraclass correlations. The analyses included in this issue do not always meet the requirements of the randomization decisions.

Initial response rates really have to be 95% or higher, and responsiveness has to be maintained at that high level if one is to ensure statistically powerful, unbiased results. This statement is based on the need for several years of follow-up because it is well-known that individuals with poor health behaviors are overrepresented in nonvolunteer groups and among children lost to follow-up. There were

Received June 5, 1989; accepted June 6, 1989.
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15 schools in the four New York districts, and the authors' (1) report on the postintervention results of cohorts which represent 63% and 40% of students in the eight intervention and seven control schools, respectively. They have expressed their concern about the small sample size, low participation, and high drop-out rates.

Interpretation of the reported differences in biochemical measurements is difficult without additional information. The most important differences are the self-reported smoking rates and the degree to which children in both sets of schools were not forewarned as to the day and time at which saliva samples would be collected.

Although a completely objective measurement of smoking may be ideal in adults, in studies of adolescent smoking, a trade-off occurs between sensitivity and objectivity of available assessments. The most widely accepted compromise is self-reported smoking behavior with biochemical validation. Variables known to influence smoking rates, such as socioeconomic class, ethnic groups, and nonsmoking policies, should at least be identified and measured. The outcome measure that best reflects the effectiveness of the impact of the intervention program on the entire population of the intervention school(s) must be deliberately chosen.

As many, if not more, difficulties can be encountered in the measurement of dietary behavior as in those of smoking. Reported differences in dietary intakes are presented by the authors (1) as grams of nutrient per 1,000 kilocalories in baseline and postintervention subsamples of the volunteer cohorts. An earlier report (7) noted that the postintervention subsample sizes were larger than the very small baseline subsamples. It also described a lower average kilocalorie intake among the intervention sample at baseline (350 kilocalories) and an average increase of 729 among the intervention and control samples. It also described a lower average kilocalorie intake among the intervention sample at baseline (350 kilocalories) and an average increase of 729 among the intervention and control samples between baseline and follow-up. This increase in mean kilocalorie consumption with a reduction in fat content is a most unusual finding, simply because it is difficult for one to consume enough calories from nonfat solid food to replace and exceed those from fat. This excess increase in calorie consumption accounts for some of the differences in nutrient:calorie ratios. It also raises a question about intensity of both preparedness and probing associated with the dietary interview. Were the children in the samples forewarned about the dates of the interviews? Were the nutritionists, who recorded the histories and asked the probing questions, completely blind to the intervention status of the schools and the subjects? Furthermore, the Westchester School Districts were part of a larger study including a number of schools in the Bronx (7).

The caloric intakes of the intervention and control groups in the Bronx schools did not differ, and only minimal differences were noted in their intakes of fat. When both school districts (Westchester and Bronx) are considered, a concern is raised that chance differences cannot be ruled out in the Westchester results.

The use of an integrated smoking and dietary intervention program at the time of anticipated smoking onset should provide these investigators (1) with a unique opportunity to explore the costs and benefits of their approach. The intervention has also been administered often enough for them to document its general acceptability and the viability of a year-long, time-consuming course as an integral component of 6 years of a modern-day school curriculum. One would hope they will collect enough data to allow them to say whether these two health behaviors change independently or interact in a positive or negative way. It will be disappointing if they do not accumulate enough information to be able to estimate the impact of the program on the nonvolunteer and drop-out groups and calculate the cost-effectiveness of the entire intervention program.

This report is presented in an optimistic vein, which I hope will prove to be justified by future long-term measurements. The study itself highlights the scientific difficulty and demands of rigorous research in cancer prevention for which definitive results are urgently needed.

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