
The Integration of Research and Practice in the Prevention of Youth Problem Behaviors

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The prevention of youth problem behaviors is increasingly guided by science. Sound epidemiological research is coming to guide preventive efforts. Valid methods of monitoring the incidence and prevalence of youth problems increasingly shape preventive practice. The identification of empirically supported prevention interventions is becoming more sophisticated, and numerous scientific organizations have begun to engage in dissemination activities. These trends will be accelerated by increased media advocacy for the use of scientific methods and findings, the development of a registry of preventive trials, achievement of consensus about the standards for identifying disseminable interventions, and increased research on the factors that influence the effective implementation of science-based practices.

In this article, we describe recent developments in the integration of research-based practices into the prevention of youth problem behaviors. Effective use of science in practice settings has long been a goal of the behavioral sciences (Albee, 1987; Wandersman et al., 1998). However, only recently has progress begun to be made. This progress has been made possible by significant advances in prevention science that are documented in the articles in this special issue. However, society will fully realize the benefits of science only when scientific methods and findings are integrated into society's child-rearing efforts in the same way that economics has come to guide economic policymaking (Moynihan, 1996) and engineering sets the standards for every building, airplane, automobile, bridge, and highway that is built. Such integration is moving forward, but its pace and success will depend on the actions that scientific and funding organizations take to facilitate the process.

We describe the developing integration of science and prevention practice in terms of four trends: (a) increasing use of epidemiological evidence about youth problem behaviors to guide selection of the targets for prevention, (b) an emerging system for monitoring the incidence and prevalence of youth problems and their context, (c) increasing sophistication in the identification of preventive interventions that are worthy of dissemination, and (d) increased advocacy for the use of empirically evaluated interventions and scientific methods. We identify research priorities to

foster the integration of science and practice and conclude with a call to action emphasizing the need for science-based organizations to actively promote the integration of science and practice.

Epidemiological Evidence Guiding Prevention

Epidemiological evidence about the incidence and prevalence of child and adolescent behaviors and disorders, their sequelae, and factors that influence their development is increasingly guiding the allocation of prevention and treatment resources. For example, evidence about the long-term risks of addiction to tobacco and the fact that most addiction begins in adolescence (U.S. Department of Health and Human Services, 1994) has contributed to increased effort to prevent adolescent tobacco use.

The importance of preventing a given child problem, such as conduct disorder, can be assessed in terms of the incidence and prevalence of the disorder in the population; its relative risk for contributing to deleterious behavioral, psychological, and social outcomes; and the severity of each of those outcomes (Jeffery, 1989). Sufficient epidemiological evidence is available to begin to systematically prioritize child and adolescent problems in terms of their costs and the likely benefits of preventing each of them (e.g., Biglan et al., in press). Such an analysis would be an important guide to the allocation of prevention resources. It would not preclude communities from making the ultimate decisions about which problems to target (e.g., Kelly, 1988).

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Evidence about the interrelationships among problem behaviors and their common influences is also relevant to organizing prevention. Diverse child and adolescent problems are interrelated at any given time (e.g., Jessor & Jessor, 1977), and their developmental trajectories are interrelated (Duncan, Duncan, Biglan, & Ary, 1998). Interrelated problems include aggressive social behavior; delinquency; high-risk sexual behavior; tobacco, alcohol, and other substance use; academic failure; and depression (Biglan et al., in press; Mrazek & Haggerty, 1994). Moreover, a common set of social and biological influences contributes to the development of the entire range of problems (Fishbein, 1998; Flay & Petraitis, 1994). A small number of parenting practices plus associations with deviant peers predict diverse adolescent problem behaviors such as delinquency (Patterson, Reid, & Dishion, 1992), substance use (Dishion & Loeber, 1985), high-risk sexual behavior (Metzler, Noell, Biglan, Ary, & Smolkowski, 1994), and a general problem behavior construct (Duncan et al., 1998). Similarly, school practices influence the formation of deviant peer groups and the development of diverse youth problem behaviors (Biglan, 1995).

Although there is still much to learn about influences on the development of child and adolescent problem behaviors, the implications of this evidence for effective preventive practices are reasonably clear. Widespread reductions in the incidence and prevalence of the adolescent problem behaviors that most vex American society could be achieved by increasing the prevalence of effective parenting (Biglan & Metzler, 1998) and schooling practices and by reducing the incidence of deviant peer group formation. Increasingly, prevention scientists will be working with schools and communities to assist them in affecting these targets.

Monitoring the Incidence and Prevalence of Youth Problem Behaviors

Systems for monitoring the incidence and prevalence of youth problem behaviors have the potential to shape the selection of increasingly effective prevention practices. As the surveillance of important youth problem behaviors becomes more commonplace, states, communities, and even individual schools can precisely measure how well they are preventing youth problems and can alter their practices in light of the evidence.

We envision the development of a system for monitoring child and adolescent well-being that is like society's system for monitoring economic indicators. That system consists of the collection and aggregation of well-validated economic measures at the community, county, state, and national levels. Changes in these measures trigger changes in economic policy that are designed to prevent inflation or recession. Moynihan (1996) documented how the development of this system was associated with a dramatic reduction in the frequency of recessions.

The evolution of a similar system for children and adolescents is well under way. Initial developments were at

the national level with projects such as *Monitoring the Future* (Johnston, O'Malley, & Bachman, 1999), which has been annually assessing adolescent substance use since 1975. The impact of these assessments on preventive practices at the national level is illustrated by the increased effort to prevent adolescent tobacco use that was initiated when annual assessments indicated that the prevalence of adolescent tobacco use was increasing (Jason, Biglan, & Katz, 1998). Similarly, an upward trend in adolescent marijuana use led to the Office of National Drug Control Policy's current media campaign (Kelder, Maibach, Worden, Biglan, & Levitt, 2000).

State-level surveys have become more common as the technology for conducting such surveys has become more available and their value more widely recognized. The Centers for Disease Control and Prevention's Youth Risk Behavior Surveillance System provides biennial samples of health risk behaviors for youth in Grades 9 through 12. The survey is taken in 39 states and 16 large cities (Centers for Disease Control and Prevention, 2003). In addition, some states are conducting their own surveys of the prevalence of substance use (e.g., Goff, 1999). Similarly, researchers are seeing increased monitoring of academic achievement in an effort to increase achievement (e.g., *Just for the Kids*, 2001).

As the risk and protective factors associated with problematic development have become clearer, the annual monitoring of these factors has also been increasing. Harachi, Ayers, Hawkins, Catalano, and Cushing (1996) have developed measures of the level of risk and protective factors affecting children's development in every community in each of six states. The data provide a profile that communities can use to choose which risk and protective factors to target and to assess changes in these factors as a result of preventive programs or policies. Similarly, under the Synar amendment (Jason et al., 1998), each state is required to obtain a systematic assessment of illegal sales of tobacco to young people to guide state and local efforts to reduce this risk factor for tobacco addiction.

A Focus on Prevalence

Only when the prevalence of a problem becomes important does population-based surveillance become important. When the prevalence of a problem in a population is targeted, schools, community organizations, and whole communities are prompted to look beyond the treatment of the individual case and become accountable for preventing the development of additional cases. This is not to say that treatment becomes unimportant. Indeed, treatment needs to be considered part of the system for affecting the prevalence of problems, because effective treatment reduces the prevalence of existing problems and prevents the incidence of related problems (Mrazek & Haggerty, 1994). Focusing on the prevalence of problems also fosters a transdisciplinary approach to addressing all of the risk and protective factors that contribute to the development of problems, including policies and regulations (Biglan, 1995; Holder, 1998).

Monitoring Systems Enable Evaluation of Effectiveness

The development of monitoring systems represents an important step in the integration of science into society's child-rearing practices. These systems make it possible for individual communities and even neighborhoods to monitor and precisely evaluate the effectiveness of their prevention efforts. The need to assess effectiveness (Flay, 1986) has long been recognized by researchers, because they typically cannot say whether researcher-developed preventive interventions will be effective when implemented with minimal training and oversight from researchers, under the cost constraints typical of practice settings, and with modifications that are thought necessary for a particular population or practice setting (e.g., Price & Lorion, 1989; Weissberg, 1990). The feasibility and support for evaluating preventive practices in communities and states will grow as the cost of measurement procedures drops, the demand for accountability increases (Wandersman et al., 1998), and the value of experimental evaluations is made clear to decision makers. Indeed, much of the improvement in society's child-rearing practices may result from the "continuous quality improvement" (Peters, 1988) that comes from adjusting what professionals do in light of changes in the incidence and prevalence of targeted youth problems.

One type of evaluation involves examining the effects of the introduction of a policy or program on the slope or level of a repeated measure of the targeted outcome. This type of evaluation has contributed to the identification of policies related to alcohol use and its consequences (Holder, 1998; Wagenaar, 1983) and is beginning to be used in evaluation of preventive interventions in communities (Biglan et al., 1996; Fawcett et al., 1994). Developments in statistical analysis and experimental design make the use of such interrupted time-series designs a valuable tool for shaping the effectiveness of prevention over time (Biglan, Ary, & Wagenaar, 2000). Systems for monitoring the incidence and prevalence of youth problems also facilitate randomized trials of preventive interventions in communities (e.g., Biglan, Ary, Smolkowski, Duncan, & Black, 2000) and schools (e.g., Tobler & Stratton, 1997).

Thus, we foresee the development of systems of continuous evaluation of prevention programs and policies as monitoring systems and experimental and statistical methods become more available. This development will be facilitated by the scientific community advocating for it, because the value and the availability of monitoring and evaluation methods are not currently well understood outside the scientific community.

Identifying Preventive Interventions That Are Worthy of Dissemination

Recognition of the value of research-based preventive practices has resulted in a growing number of efforts to identify empirically supported preventive interventions. The articles in this special issue are an example of this phenomenon, as are monographs published by the American Psy-

chological Association (Price, Cowen, Lorion, & Ramos-McKay, 1988), the Institute of Medicine (Lynch & Bonnie, 1994; Mrazek & Haggerty, 1994), the Center for Substance Abuse Prevention (1997), the Surgeon General (e.g., U.S. Department of Health and Human Services, 1994), and individual teams of scientists (Mrazek & Brown, 1999). Increasingly, government and private organizations are convening task forces to summarize relevant evidence. Examples include the National Center for Injury Prevention and Control's (2000) projects on the prevention of violence; the U.S. Department of Education Expert Panel on Safe, Disciplined, and Drug-Free Schools (2002); and the American Psychological Association Commission on Violence and Youth (1993).

Perhaps the most important facets of these efforts are meta-analyses of the evaluations of interventions. Lipsey and Wilson (1993) reviewed 290 meta-analyses and found that their effect sizes indicated stronger intervention effects than non-meta-analytic reviews of the same evidence. Durlak and Wells (1997), Tobler and Stratton (1997), and Derzon, Wilson, and Cunningham (1999) conducted meta-analyses of preventive interventions relevant to children and adolescents.

Creating a Registry of Prevention Trials

Identifying evaluated preventive interventions is complicated by the difficulty in obtaining all the evidence. Hundreds of trials of preventive interventions are scattered across many different journals and are virtually inaccessible to most practitioners and policymakers. If prevention scientists are to articulate what preventive interventions can achieve, the scientific community needs a readily accessible repository of the evidence. In medicine, the Cochrane Collaboration provides such a repository with an online database of randomized trials. In behavioral science, the Campbell Collaboration is attempting something similar. In prevention science, Brown, Mrazek, and Hosman (1998) collaborated with a group of prevention scientists to develop a similar system for classifying trials and creating a registry of them. Such a registry could facilitate meta-analyses of prevention trials and enable sophisticated analyses of the factors influencing the development of prevention science knowledge.

Developing Consensus Standards

Standards for identifying programs that are worthy of adoption vary widely among the organizations engaged in dissemination. Most give prominence to experimentally evaluated programs and evaluate the rigor of the research and the degree of its replication. Many include programs that have simply been shown to produce pre-post changes for a single sample (despite the fact that such evaluations have been shown to overestimate the effects of interventions; Lipsey & Wilson, 1993).

The absence of consensus standards makes it harder to promote the adoption of the best supported interventions. Panels convened to identify research-based practices typically include both researchers and program providers. This inclusion is completely appropriate, given the ultimate aim

of getting providers to adopt empirically supported programs. However, when scientists arrive at the table without agreed-on standards, it is common for the give-and-take of the group process to result in inadequately evaluated programs being included in the list. The result is a document that lists both experimentally validated and less well evaluated programs. If, as is likely, the unevaluated programs are also ones that are already widely used, the document may end up simply justifying common practice. If scientists involved in these deliberations could point to a set of standards that are generally accepted within the scientific community, the result might be summaries and reports that more effectively highlight the programs and policies most likely to affect targeted problems.

Consensus standards can be achieved only through a coordinated discussion among all of the organizations working on the problem. To further that discussion, we propose tentative standards. Our proposal is based on the hierarchy of evidence in the Institute of Medicine's report on prevention (Mrazek & Haggerty, 1994) and is influenced by discussions that have been taking place in clinical psychology (Chambless & Hollon, 1998). Table 1 lists seven levels of evidence against which any given preventive intervention might be evaluated.

Table 1
Quality of Evidence for Evaluating Preventive Interventions

Grade	Evidence
1	Grade 2 is met plus evidence of effectiveness when the preventive intervention is implemented in its intended setting with adequate training of personnel and monitoring of implementation and outcomes.
2	Evidence from multiple well-designed, randomized, controlled trials or multiple well-designed, interrupted time-series experiments that were conducted by two or more independent research teams.
3	Evidence from multiple well-designed, randomized, controlled trials or multiple well-designed, interrupted time-series experiments that were conducted by a single research team.
4	Evidence from at least one well-designed, randomized, controlled trial or an interrupted time-series design that was replicated across three cases.
5	Evidence from comparisons between groups that were not effectively randomized to conditions.
6	Evidence only from pre-post evaluation with no comparison group or repeated assessment on a single case for which an intervention was introduced at some point in the time series.
7	Endorsement based on clinical experience by respected authorities, descriptions of programs, and case reports.

For the purpose of the present discussion, a well-designed randomized trial is one for which, at a minimum, (a) an adequate sample size has been assigned to each condition so that pretest group equivalence is likely and (b) through appropriate analysis, attrition has been shown to not be a threat to internal validity. Like Chambless and Hollon (1998), we would include evidence from interrupted time-series experiments. An interrupted time-series experiment would be considered well-designed if the effects of the intervention were replicated across at least three cases. The validity of such designs has been discussed by Biglan, Ary, and Wagenaar (2000).

Standards for Disseminability

How good does the empirical evidence need to be for scientific organizations to actively promote the adoption of a program or policy? We suggest Grade 2, as described in Table 1, as a standard. This standard would mean that scientific organizations would promote programs or policies only if they had been shown to have a significant impact on their target in two or more well-designed, randomized, controlled trials or in three or more interrupted time-series experiments that had been conducted by two or more independent investigators. If adopted, such a standard would mean that scientific organizations would put their resources into disseminating the programs and policies that have a reasonably high likelihood of affecting their targets. The standard would not preclude individual scientists from disseminating less fully evaluated programs, but it would concentrate the limited resources of scientific, government, and nonprofit organizations on the policies and programs that are most likely to have an impact.

Informed Consent for Adopters

Just as the standards for providing psychological services to individuals require that the client be informed of the risks associated with treatment, organizations that are advocating the adoption of empirically supported policies or programs should inform would-be adopters of the risks associated with adoption. It must be recognized that even when a program or policy meets Grade 2 evidence, it may have no beneficial effect or even a harmful effect when it is applied in a new setting, provided to a different population, or provided by a new type of provider. The information provided to would-be adopters should include a description of the populations with whom the intervention has been tested, the characteristics of providers, and the types of settings in which the intervention has been offered. This standard is especially important for addressing concerns that preventive interventions developed with nonminority populations may not be appropriate for minority populations (e.g., Kelly, 1988).

Implementation Conditions

Discussions of dissemination and effectiveness sometimes imply that programs should continue to be effective when they are implemented with minimal staff training and no monitoring of their effects. This process is analogous to a manufacturer setting up a system of production that does

not continuously monitor the quality of the product. If the child-rearing and educational systems are going to come close to the effectiveness of the best manufacturing systems, continuous training and implementation monitoring must become standard practice. This training and monitoring will require the development of practitioners who are trained in many of the skills that are currently found only among researchers. Traditional distinctions between researchers and practitioners will diminish as a result.

Advocating the Integration of Science and Practice

Science-based practices will not become commonplace in prevention unless scientific organizations promote their use. An infrastructure of organizations that can do this promotion is developing. It includes the Center for the Study and Prevention of Violence at the University of Colorado; the Collaborative for Academic, Social, and Emotional Learning; the Center for Substance Abuse Prevention; the Community Tool Box at the University of Kansas; the National Center for Improving the Tools of Educators (NCITE) at the University of Oregon; the Social Development Research Group at the University of Washington; the Society for Prevention Research; and many other organizations.

The approaches of these organizations to advancing science-based prevention are diverse. For example, the Blueprints project at the Center for the Study and Prevention of Violence began by identifying 10 empirically supported prevention programs and making information about them available on a Web site (<http://www.colorado.edu/cspv/blueprints/>) and through publications by the center. Under funding from the Office of Juvenile Justice and Delinquency Prevention, the center is providing training and technical assistance for a total of 50 implementations of 8 of the programs. The Community Tool Box (<http://ctb.lsi.ukans.edu/>) is a project of the University of Kansas Work Group on Health Promotion and Community Development, which is directed by Stephen Fawcett. It provides more than 3,000 pages of information about community development and health promotion as well as consultation and opportunities to communicate with others working in communities. It had more than 500,000 visits in 1998. The Social Development Research Group created Communities That Care (Hawkins & Catalano, 1992), a model in which communities assess the incidence and prevalence of youth problem behaviors and risk and protective factors and are then guided to select research-based programs that address the highest priority risk and protective factors.

NCITE helps mobilize and support coalitions of powerful organizations at the local, state, and national levels to influence education to adopt empirically based practices. It has been involved in a number of important efforts. At the national level, it has provided consultation to congressional staff on the Reading Excellence Act, Comprehensive School Reform Development (CSRD), and Reading First legislation. Reading First defined scientific research and set a precedent for funding only state applications that used

empirically supported approaches to reading instruction. The CSRD act specified that only research-based models for at-risk students were eligible for funding. NCITE worked with four major education organizations (American Federation of Teachers, National Educational Association, American Association of School Administrators, and National Association of Elementary School Principals) to develop a rigorous methodology for evaluating the models to be eligible for CSRD funding. The current increased emphasis on accountability and what works at the national level has spawned too many new evidence-based initiatives to describe. For example, the new Institutes of Education Sciences have funded a What Works Clearinghouse to standardize rigorous methodology for reviewing education research studies to inform educators, policymakers, and parents. At the state level, NCITE has played a significant role in reforming reading instruction in California and Texas and is providing scientific expertise relevant to educational reform to business groups and educators in five other states.

This description of the work of NCITE would be incomplete without acknowledging the many difficulties encountered in implementing evidence-based practices in an environment that does not routinely use robust data in decision making. For example, Slavin (2002) found that of the 2,665 CSRD grant awards made between 1988 and 2002, only about 20% were applications tied to programs with strong evidence, whereas 16% were tied to programs that were deemed promising. Slavin (2002) commented,

The recent ESEA [Elementary and Secondary Education Act] reauthorization tightens up the definition of *proven* and *comprehensive*, and places more emphasis on programs with scientifically based evidence of effectiveness (U.S. Department of Education, 2002c), but state officials who review CSR [comprehensive school reform] proposals still have broad discretion and could continue to minimize or ignore the research base behind the programs they fund. (p. 16)

Clearly, moving research to policy does not mean that research moves into practice.

Persuasive communication campaigns are needed to promote science-based practices. The behavioral sciences are not lacking in expertise about persuasion (e.g., Flay & Burton, 1990; Wallack, Dorfman, Jernigan, & Themba, 1993), but few resources have been used to advocate the adoption of empirically based practices. Science-based organizations must become effective in injecting into public discussion information about the benefits to children, families, schools, and communities of reducing the most prevalent and costly child and adolescent problems. They need to collaborate with professional organizations and policy groups to make sure that every major decision about prevention is informed by descriptions of programs and policies that have been experimentally evaluated. They need to advocate ongoing monitoring of the prevalence of targeted child and adolescent problems and to educate the public about the value of experimental evaluations of all implemented preventive programs.

Mass media activities should include a steady flow of fact sheets, press releases, op-ed pieces, and articles in opinion-leading magazines and journals. Major news organizations will need to be influenced to report on the role of empiricism in prevention. Conferences, workshops, and individual briefings can inform journalists about empirically supported programs and policies and about the need for empiricism in the selection and evaluation of programs and policies.

It will also be necessary to communicate in person to groups and individuals who have the power to effect change. In NCITE's effort to foster empirically supported reading instruction in California, reading researchers testified to the legislature and the state board; met with the teacher unions, the state school board association, and numerous county education offices; responded to dozens of inquiries from the press; and presented to business leaders and foundations. One presentation to the Packard Foundation led to donations of more than \$22 million to support teacher training in the use of research-based instruction for beginning reading.

Research Needed to Foster the Integration of Science and Practice

Effective integration of prevention science and practice will require changes in the nation's research agenda. Research funded by the National Institutes of Health is currently well organized to develop and evaluate preventive interventions under controlled conditions. However, it is not as well organized to foster the integration of science-based practices into practice settings. The research process has generally been seen as beginning with hypothesis and method development, followed by efficacy, then effectiveness trials of interventions, and culminating in demonstration or implementation projects (Greenwald, Cullen, & McKenna, 1987; Hoagwood & Koretz, 1996). Holder et al. (1999) noted that the traditional phase framework does not encompass the evaluation of policies or programs that are developed in the field rather than by researchers. Yet, development and evaluation of such non-researcher-driven interventions are making a significant contribution to the identification of effective preventive strategies.

By designating "demonstration and implementation" as a phase that comes after effectiveness studies, the framework of the National Institutes of Health implies that implementation itself is not a topic for research (Biglan & Glasgow, 1991; Flay, 1986; Holder et al., 1999). This designation may be one reason why little research on dissemination is going forward. In our view, once a program or policy has been shown to be of value in efficacy or effectiveness trials, the phases of research need to be repeated on a new problem, namely, how to influence provider organizations to implement the empirically supported program. Thus, for every validated preventive intervention, there needs to be a new cycle of research, beginning with the development of hypotheses about what influences provider practice and measures of intervention implementation and followed by efficacy and effectiveness trials testing

dissemination or training strategies (Biglan & Taylor, 2000).

Research is particularly needed on the practices of provider organizations (Biglan & Taylor, 2000). Studies are needed of the current practices of provider organizations and how well they serve the needs of defined populations. In the prevention of child behavior problems, systematic analyses are needed of which agencies provide what services to which populations, because there is a patchwork of state and local agencies providing services to children and families. Methods are needed for measuring the number and types of organizations in defined localities, the populations they reach, and the services they provide in order to estimate the proportion of target populations who are reached by prevention programs.

Analyses are needed of the factors that influence organizations to adopt and maintain empirically based practices. There are useful analyses of the characteristics of innovations that foster or impede their adoption (Rogers, 1983). However, contextual analyses of the practices of organizations are lacking (Biglan, 1995).

Research is particularly needed on the influence of the material consequences to organizations of their practices. In theory, organizations will use empirically supported practices if such practices benefit the organizations. This hypothesis is supported by free-market economic analyses (e.g., Friedman & Friedman, 1980), analyses of the selection of cultural practices (Biglan, 1995; Harris, 1989), and analyses of the effects of reinforcers on the behavior of individuals (e.g., Biglan, 1995). To the extent that public and private funding is contingent on the use of empirically supported practices, organizations will adopt them (Mrazek, 1998).

A Call to Action

The gap between science and practice appears to be narrowing as scientific findings and methods are increasingly being used in prevention practice. The process will be facilitated if scientists advocate for (a) the use of epidemiological evidence to guide prevention programming; (b) ongoing monitoring of the incidence and prevalence of youth problem behaviors and risk and protective factors in every community; (c) increased evaluation of preventive practices in schools, communities, and states; (d) the creation of a registry of evaluations of preventive interventions; (e) agreement on a set of consensus standards for selecting disseminable preventive interventions; (f) further development of an infrastructure of organizations that can assist schools, community organizations, whole communities, and states in implementing research-based assessment, evaluation, and intervention practices; and (g) research that evaluates methods of influencing practice settings to effectively adopt empirically supported practices. If researchers can foster increased use of scientific practices in these ways, it is possible to achieve a society in which the largest possible proportion of children experience healthy, happy, and successful development and arrive at adulthood with the social, emotional, and cognitive skills they need to lead healthy and successful lives.

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