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A Practical Model for Preventing Type 2 Diabetes in Minority Youth

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PURPOSE
This article proposes a model grounded in behavioral theory and empirical evidence for use when developing a program to prevent type 2 diabetes in high-risk minority youth.

METHODS
The model is based on key concepts of 4 behavioral theories: the Health Belief Model, Social Learning Theory, the Theory of Planned Behavior, and the Ecological Model. Determinants of behavior to target for change are selected based on their theoretical link to behavior change, their success in changing behavior in past programs, and through thorough formative research in the target community.

RESULTS
Diabetes prevention in children requires modifying a complex set of behavior patterns. Social norms and the environment are especially important in children in whom cognitive processes have not fully developed. Family and community involvement is essential for developing a health program and providing a supportive environment in which to change behavior and ongoing reinforcement to maintain behavior changes.

CONCLUSIONS
Behavioral theory informs the selection of factors to target in a behavioral intervention. Special considerations apply when working with children. A program to target risk must be based in behavioral theory, supported by practical data, and tailored to the needs and beliefs of the target community.
Obesity and type 2 diabetes are rapidly increasing in youth, especially among minorities. Recent findings from the Diabetes Prevention Program with adults\(^1\) show that decreasing obesity through dietary modification and exercise can significantly lower the risk of diabetes. However, decreasing obesity in minority youth populations presents significant challenges. Attempts to date have employed disparate strategies, often without explicit theoretical grounding, and have met with varying but mainly limited success. This paper outlines the problem through a brief review of epidemiologic data on obesity and diabetes and identifies the challenges of working with minority youth. Theories of behavior change are used to develop a practical model for selecting factors to target when developing a treatment approach. These factors should be amenable to intervention and likely to have an effect on behavior change. Selection of these factors should be targeted to specific community needs, based in firm theoretical grounding, and supported by applied data.

**Epidemiologic Background**

Between the completion of the second National Health Examination Survey (NHANES II)\(^2\) in 1980 and the NHANES III in 1994,\(^4\) the prevalence of overweight (defined as greater than or equal to the 95th percentile of body mass index [BMI] for age and sex) nearly doubled from 7% to 11% in children and from 5% to 11% in adolescents. These surveys document significant racial disparities in prevalence, with African American and Mexican American children and adolescents at consistently higher risk for overweight and obesity than white children and adolescents.\(^5\)

The recent rise in type 2 diabetes in minority children and adolescents\(^5-10\) parallels the increase in childhood obesity. The prevalence of type 2 diabetes, which ranges from 4.1 per 1000 12 to 19 year olds in the United States to 50.9 per 1000 15- to 19-year-old Pima Indians of Arizona,\(^6\) may be underestimated due to undiagnosed cases,\(^7\) cases misdiagnosed as type 1 diabetes, and cases that go unreported.\(^8\)

Minority populations are disproportionately affected by diabetes.\(^12-13\) Emerging data reveal that the proportion of pediatric diabetes patients with type 2 diabetes varies widely by ethnicity. Population-based data in Chicago have shown that the proportion of pediatric diabetes cases registered through 1999 that have been classified as likely type 2 diabetes is 9% in whites/others, 22% among Hispanics, and 28% among African Americans.\(^14\) Furthermore, African Americans and Hispanics experience higher rates of diabetes-related complications and greater subsequent disability than their white counterparts.\(^12,13\)

Insulin resistance has been found to strongly predict the development of type 2 diabetes.\(^15\) Controlling for family history and BMI, African American children have significantly lower insulin sensitivity than white children.\(^16,17\) Moreover, recent studies show that overweight and obesity are clearly associated with early signs of insulin resistance syndrome in African American children 5 to 10 years old.\(^18\) This reduced insulin sensitivity may increase the risk of developing type 2 diabetes.\(^19\) The increased risk may be exacerbated by lifestyle habits that characterize contemporary American society, specifically increased sedentary behavior, decreased physical activity, and increased consumption of foods high in fat and sugar.\(^20\)

Minorities represent a growing proportion of the US population; that segment is expected to increase from 28% to 47% of the total US population by 2050.\(^21\) With obesity and diabetes disproportionately represented among minorities, it becomes imperative to develop culturally accessible and effective methods of primary prevention to decrease the risk of type 2 diabetes in minorities.

**Barriers to Behavior Change**

High-fat, low-fiber diets and a sedentary lifestyle contribute to the development obesity and the risk of developing diabetes. Preventive efforts require modifying a complex set of behaviors that are established in childhood and are therefore resistant to change. These lifestyle behaviors are constantly reinforced by social norms and constrained by social, economic, and environmental factors as well as systemic barriers that impede access to health care. The barriers can be particularly challenging when working with minority youth. Moreover, youth typically feel invulnerable to the threat of serious illness.

**Knowledge and Beliefs**

The ability and willingness to change behavior is influenced by one’s knowledge and beliefs.\(^22,23\) For example, Maillet et al\(^24\) reported that the perceived difficulty of changing cooking style to lower fat methods was a common barrier to dietary adherence for urban adults with diabetes. This problem may be magnified for children, who generally have little control over how food is prepared at
home. Prior lack of success at weight loss may reduce an individual's belief in his or her ability to change behavior. For lower socioeconomic groups, competing necessities may outweigh the impetus for working to decrease weight.

**Attitudes**
Eating is pleasurable, and immediate gratification may outweigh the promise of benefits in the future, especially in children. El-Kebbi et al. reported that the taste of low-fat and low-sugar items was perceived as a major barrier to dietary adherence by adult patients with diabetes in an urban hospital setting. A sense of fatalism may dissuade those affected by multiple stressors; for example, Jain et al. found in a group of low-income mothers that children's body size was thought to be predestined and, therefore, difficult or impossible to alter.

**Social Norms**
A significant barrier to weight loss among minorities is social norms. Several studies have documented that larger body size is more acceptable among African Americans than whites. Thompson et al. and Collins showed this acceptance extends to African American children as well. Being thin may be seen as a sign of disease in some cultural groups. Weight-control interventions that target African Americans may be more successful if they focus on improving physical fitness and overall feeling of well-being, on disease prevention and healthier lives, or on spiritual or psychological benefits as outcomes instead of on thinness. Feeding may represent a form of caring and nurturance. Anderson et al. described the importance of food and eating in the personal and cultural life of urban African American adults with diabetes. The ability to eat meals outside of the home may be perceived as a measure of status in some groups. The desire to conform to peers is especially strong for adolescents.

**Environment**
An important factor that may be overlooked in behavior change programs that focus primarily on individual characteristics is the environment. For example, environment may be a limiting factor for lower income families who may not have access to safe recreational resources in their neighborhoods. Fast-food chains have built outlets disproportionately in low-income areas in the last 2 decades, and healthy, affordable alternatives are often lacking. Low-income workers may find it difficult to arrange

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**Practical Application**
Type 2 diabetes occurs in children and adolescents, especially in specific ethnic groups including Hispanics, Asians, Pacific Islanders, and African Americans. Burnet and colleagues describe a program to effect change within this population based on behavioral and social learning theories. The prevention and management of type 2 diabetes in youth must recognize the unique cognitive and environmental factors associated with this age group, as well as social, cultural, and geographic issues associated with various populations. The authors describe how obesity in youth plays a major role in the early development of diabetes. The morbidity and mortality seen in this age group suggest a dire future for the thousands of youth already developing type 2 diabetes. Burnet and colleagues suggest that there is an urgent need for long-term, randomized controlled studies of various interventions for type 2 diabetes in youth.

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time off from work to attend preventive healthcare activities. Underfunded schools receive extra income from vending machines, providing an incentive to market soda and other snack food to students. Ludwig et al showed that the risk of obesity in youth increases 60% for each extra serving of sugared soft drink consumed per day.

media, especially television, exerts a tremendous influence on youth behavior. The NHANES III survey found that children's energy intake tended to increase with increased TV viewing. Foods are the most frequently advertised products on children's television, and TV viewing time is associated with snacking between meals. Television programming aimed at African American audiences consistently features heavier actors and actresses than other television programming. This potent source of environmental influence may present a significant barrier to preventive efforts with youth if not addressed as an integral part of the program.

Access to Preventive Health Care
The risk of being uninsured increases as family income decreases and is greater for minorities. In 1999, although 11% of non-Hispanic whites lacked health insurance coverage, 21.2% of African Americans and 33.4% of Hispanics lacked health insurance. Despite the Medicaid program, 32.4% of poor Americans (10.4 million people) had no health insurance during 1999. Moreover, racial and ethnic disparities in insurance status have been shown to persist when ethnicity and socioeconomic status are controlled.

Paucity of Culturally Specific Programs
Most large weight-loss studies have been done with white participants. However, programs developed based on the needs and values of the dominant culture do not necessarily address the cultural values that underlie motivations, preferences, and behavior of other groups. African Americans appear to value family and peer networks more highly than individualism and self-reliance, and therefore may be less successful with traditional weight-loss programs that focus on self-management. Many existing research instruments have not been validated for minority populations, and most have not been validated for youth. Furthermore, providers may not be skillful at working with patients from cultural backgrounds that differ from their own.

Recruiting and Retaining Minority Participants for Research
Low participation of minority groups in research studies is strongly related to distrust of the medical and scientific community. This distrust is based in a legacy of historical abuses and suspicion of the medical establishment. In studies of African American participation in clinical trials and public health research, lack of knowledge and cultural barriers and lack of understanding and trust of informed consent procedures posed barriers to recruitment. Once recruited, retaining minority youth participants is challenging, even when they seem to enjoy the program.

Implications for Treatment
Numerous factors contribute to the development of obesity, and significant barriers to change exist when working with minority youth. When developing weight-control programs, it is important to intentionally select those factors that are open to intervention and will most likely have an effect on behavior. Because minority groups are heterogeneous, formative research in the local community is necessary to gain an understanding of the preferences, behavioral beliefs, current practices, sources of support, social norms, and perceived barriers to action in the target population because they serve as determinants of behavior. A sound practical framework developed from a critical review of behavior change theories allows researchers to target those factors most likely to affect behavior change in a specific population.

PRACTICAL MODEL
Conceptual Framework
Past research on nutritional education and weight control often suffered from a failure to base programs on theoretical models. Recent research is more likely to include either implicit or explicit reference to theoretical frameworks. Many programs, especially earlier ones, were designed on the assumption that providing knowledge would change attitudes and, in turn, improve behavior and outcomes in the areas of nutrition and weight. This approach, referred to as the knowledge-attitude-behavior (KAB) model, was found to be largely ineffective in changing behavior despite demonstrable increases in knowledge. Behaviorally based programs developed over the past 2 decades have proven more effective in terms of outcomes. Drawing on strategies from the social and behavioral sciences, these programs involve learners in experiential rather than strictly knowledge-based learning in an effort to develop behavioral skills in desired areas.
THEORETICAL FRAMEWORK FOR BEHAVIOR CHANGE

Beliefs and Knowledge (TPB)
- Perceived susceptibility (HBM)
- Perceived benefits (HBM)
- Outcome expectancies (SLT)

Attitudes (TPB)

Cognitive factors
- Intrapersonal (EM)

Community and environmental factors

Behavioral Intention (TPB)

Normative Beliefs (TPB)
- Interpersonal factors (EM)
- Peers/family/community

Behavior (Reinforcement)

Self-Efficacy (SLT)

Environmental Factors (EM)
- Neighborhood surroundings
- Institutions/corporate interests/media
- Public policy

TPB=Theory of Planned Behavior; HBM=Health Belief Model; SLT=Social Learning Theory; and EM=Ecological Model.

The proposed model synthesizes elements from several theories of behavior change, building on the strengths of each theory as demonstrated in empirical studies in real-life settings. Specifically, the model attempts to address environmental influences on behavior as well as intrapersonal determinants.

Cognitive Arm of the Model
The theoretical framework of the proposed model is shown in the Figure and highlights contributions from relevant theories. The upper left portion of the diagram represents constructs that are generally targeted by cognitive theories such as Social Learning Theory (SLT) and the Health Belief Model (HBM) of behavior change.

Many recent behavioral interventions have drawn heavily upon Social Learning Theory and Social Cognitive Theory. SLT hypothesizes that for a person to attempt to change a behavior for health reasons, the person must (1) believe that current behavior leads to poor outcomes and that the behavior change will lead to a valued health benefit (outcome expectation), (2) feel capable of making the behavior change (self-efficacy or efficacy expectation), and (3) value the perceived consequences of the behavior change (incentive).

Similarly, the HBM posits that health behavior depends on perceived susceptibility to and perceived severity of a health problem, and the belief that changing
one's behaviors would reduce one's susceptibility to the health problem at a subjectively acceptable cost. The concept of self-efficacy, emphasized in SLT, adds predictive value to the HBM when it is included as an explicit variable targeted by the intervention.66

The cognitive arm of the model includes constructs related to knowledge, attitudes, and beliefs. The KAB approach was necessary but not sufficient; it did not adequately address the importance of external, community, and environmental factors in changing behaviors. Accordingly, environmental factors are represented in the lower left portion of the Figure.

Environmental Arm of the Model
This arm of the model represents the significant contributions of community and environmental factors, as highlighted in the Theory of Planned Behavior (TPB)57 and the Ecological Model (EM)66-71 of behavior change. Social influences such as family and peers are especially important for children, whose knowledge, beliefs, and eating habits are strongly influenced by environment.72 Social norms take on increased importance for children compared with cognitive processes, which have not yet developed fully in preadolescents.

The EM posits that behavior is determined by multiple influences: intrapersonal factors, interpersonal factors, institutional factors, community factors, and public policy.48 A broader environmental perspective is important in accounting for external influences on health behavior, including social networks and support systems, social institutions, community structures, and the relationships among them. Most behavioral interventions are designed to address changes at the individual level of decision making. However, parallel work at the levels of community and institutions, including creative use of mass media, may help to reinforce individual decision making about nutrition, weight, and related health issues.

Central Framework of the Model
Contributions from an individual's health beliefs, knowledge, and attitudes, and the wider influences of normative beliefs and institutional factors, converge to determine behavioral intention. The TPB57 posits that intention to perform a behavior is an immediate determinant of the attempt to perform a behavior and of the strength of that attempt. A person will attempt to perform a behavior if the person believes that the advantages outweigh the disadvantages, and if the person believes that important others (peers/family/community) value the behavior. Because of the importance of family and other normative influences on youth, the overall structure of the model draws largely on the TPB, while constructs from the HBM and SLT serve to characterize the individual (cognitive arm) factors more fully than would the TPB alone.

Self-efficacy, a construct from SLT, is shown in the model as a factor that serves to move a person from a behavioral intention (TPB) to actually performing the behavior. Self-efficacy can be understood as the confidence one has in one's ability to perform a specific behavior. Research suggests that increasing one's sense of self-efficacy will help to increase the likelihood that one will attempt to perform a behavior.73 Bandura identified 4 ways in which to enhance self-efficacy: (1) performance accomplishments, (2) vicarious experience, (3) verbal exhortation, and (4) addressing the physiological state (diminishing negative affect such as anxiety).65-74

Using the Model
Table 1 illustrates how constructs identified as targets in the model have been strategically addressed in preventive studies. Specific examples of selected program components are listed in Table 2. For individuals to be motivated to make behavior changes needed to decrease obesity, they must believe there are adverse consequences to obesity (perceived susceptibility), that decreasing obesity can lower the likelihood of these consequences (perceived benefits), that important others value the behavior (social norms), and that they are capable of effectively performing the specific behaviors needed (self-efficacy). Therefore, for a diabetes prevention program to be most effective, it should address the prevalence and serious consequences of obesity and diabetes as well as the efficacy of preventive measures, as shown in the adult Diabetes Prevention Program (DPP).

Self-efficacy has been shown to be an important determinant of behavior.65-74 Setting realistic goals and reviewing progress can increase participants' sense of self-efficacy through performance accomplishments. Lay health educators from the community may serve as a source of vicarious experience as well as offer verbal exhortation. Including exercises directed at developing coping skills can help to reduce anxiety and improve self-efficacy through addressing participants' physiological state.
### Table 1.

**Targets for Interventions in Behavioral Change**

<table>
<thead>
<tr>
<th>Source</th>
<th>Study Population/Design</th>
<th>Targets</th>
<th>Outcomes</th>
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</table>
| Brownell et al., 1983<sup>a</sup>  
Treatment of obese children with and without their mothers: changes in weight and blood pressure. | Obese 12-16 y olds, White lower middle class (n=42); 3 groups: child alone, mother/child (M/C) together, mother/child separate | Knowledge X  
Risk awareness* X  
Self-efficacy X  
Role models X  
Parental involvement X  
Community partnership X  
Reward/reinforcement X | All groups lost weight; M/C separate group lost the most during 16-week program, continued to decrease in % overweight at 1 y follow-up; other 2 groups maintained weight loss but did not decrease further |
| Israel et al., 1985<sup>a</sup>  
The effect of training parents in general child management skills on a behavioral weight loss program for children. | 8-12 y old children (n=33), ≥20% overweight; 3 groups: control, weight reduction only (WRO), weight reduction + parent training (PT) | Knowledge X  
Risk awareness* X  
Self-efficacy X  
Role models X  
Parental involvement X  
Community partnership X  
Reward/reinforcement X | During 8-week program, 2 treatment groups lost weight, control gained; at 1-year follow-up, maintenance of weight loss superior in PT group; positive correlation between child management skills and weight maintenance |
| Epstein et al., 1986<sup>a</sup>  
Effect of parent weight on weight loss in obese children. | Overweight 8-12 y olds and their families (n=41); obese and nonobese parents; 2 treatment groups: parent control vs child self-control | Knowledge X  
Risk awareness* X  
Self-efficacy X  
Role models X  
Parental involvement X  
Community partnership X  
Reward/reinforcement X | Children with nonobese parents more compliant with diet and exercise, lost more weight, and maintained better weight loss; child self-control had similar results to parental control |
| Perry et al., 1988<sup>a</sup>  
Parent involvement with children's health promotion: The Minnesota Home Team.  
Crockett et al., 1989<sup>b</sup>  
Parent education in youth-directed nutrition interventions. | 3rd graders, mostly middle-class white; 4 groups: home intervention alone (Hearty Heart Home Team), school intervention alone (Hearty Heart and Friends), home + school, control | Knowledge X  
Risk awareness* X  
Self-efficacy X  
Role models X  
Parental involvement X  
Community partnership X  
Reward/reinforcement X | Greater changes in knowledge for school-alone group, only parent-taught home group changed dietary intake; both home alone and home + school were effective in changing eating behavior, increasing parent knowledge, parent self-efficacy, and parent-child communication vs school alone or control |
| Walter and Wynder, 1989<sup>a</sup>  
The development, implementation, evaluation, and future directions of a chronic disease prevention program for children: the Know Your Body studies. | Series of pilot studies to assess feasibility of Know Your Body (KYB) program components | Knowledge N/A  
Risk awareness* N/A  
Self-efficacy N/A  
Role models N/A  
Parental involvement N/A  
Community partnership N/A  
Reward/reinforcement N/A | Acceptable school-based examination for chronic disease risk factors; intervention effectively modified risk factor levels on a short-term basis |
### Table 1.

**Targets for Interventions in Behavioral Change (Continued)**

<table>
<thead>
<tr>
<th>Source</th>
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<th>Outcomes</th>
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<tbody>
<tr>
<td>Walter and Wynder, 1989&lt;sup&gt;1&lt;/sup&gt;</td>
<td>Longitudinal 5-y efficacy study of KYB program in 4105 4th graders in NYC areas differing in racial composition and SES; 2 groups: KYB curriculum, parent involvement, and risk factor examination</td>
<td>Knowledge</td>
<td>X X X X X X</td>
</tr>
<tr>
<td>The development, implementation, evaluation, and future directions of a chronic disease prevention program for children: the Know Your Body studies.</td>
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<td>Risk awareness</td>
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<td>Self-efficacy</td>
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<td>Parental involvement</td>
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<td>Community partnership</td>
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<td></td>
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<td>Reward/ reinforcement</td>
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<tr>
<td>Bush et al, 1989&lt;sup&gt;2&lt;/sup&gt;</td>
<td>1041 African American 4th-6th graders, stratified by SES; 3 groups: KYB (school-based, teacher-delivered), KYB + parent involvement (mailings, newsletter, PTA presentations); control</td>
<td>X X X X X X</td>
<td>After 3 y, favorable changes in BP, HDL, cholesterol/HDL ratio, fitness, and health knowledge for intervention groups; no significant effect on obesity or total cholesterol; small but significant increase in smoking in intervention group</td>
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<tr>
<td>Cardiovascular risk factor prevention in black schoolchildren: two-year results of the Know Your Body program.</td>
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<tr>
<td>Wadden et al, 1990&lt;sup&gt;3&lt;/sup&gt;</td>
<td>Overweight urban African American female adolescents (n=36); 3 groups: child alone, mother/child together, mother/child separate</td>
<td>X X X</td>
<td>Child, M/C separate, M/C together lost 1.6, 3.1, 3.7 kg, respectively; significant weight loss but no significant difference across groups; better attendance correlated with more weight loss, subjects whose mothers had better attendance lost more weight; follow-up: rapid weight-regain subjects same BMI at 6-mo follow-up as when they began program</td>
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<tr>
<td>Obesity in black adolescent girls: a controlled clinical trial of treatment by diet, behavior modification, and parental support.</td>
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<tr>
<td>Epstein et al, 1994&lt;sup&gt;4&lt;/sup&gt;</td>
<td>Overweight 6-12 y old children and their families (n=185), 1-y study with follow-up after 5 and 10 y</td>
<td>X X</td>
<td>Results support importance of family-based treatment for childhood obesity; including a parent with a child in treatment enhances effects (must be explored in single-parent and disadvantaged families); exercise enhances long-term effects of diet interventions</td>
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<tr>
<td>Ten-year outcomes of behavioral family-based treatment for childhood obesity.</td>
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### Table 1.

**Targets for Interventions in Behavioral Change (Continued)**

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<th>Source</th>
<th>Study Population/Design</th>
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<tbody>
<tr>
<td>Johnson et al., 1995&lt;sup&gt;51&lt;/sup&gt; Health Ahead—the heart smart family approach to prevention of cardiovascular disease.</td>
<td>3rd and 4th graders (n=19; 12 black, 7 white) and their parents; weekly 90-min sessions for 12-15 wk</td>
<td>Knowledge, Risk, Self-efficacy, Role models, Parental involvement, Community, Partnership, Reward, Reinforcement</td>
<td>22% decrease in high-sodium foods, 14% decrease in high-fat/cholesterol foods; 6% increase in healthier alternatives but changes not significant (small sample size); significant decreases in adult BP; stabilized weight in obese children</td>
</tr>
<tr>
<td>Kelder et al., 1995&lt;sup&gt;88&lt;/sup&gt; Community-wide youth nutrition education: long-term outcomes of the Minnesota Health Program (Class of ’89).</td>
<td>6th graders (n=2376; predominantly white, middle class) in public schools, followed for 7 y</td>
<td>Knowledge, Risk, Self-efficacy, Role models, Parental involvement, Community, Partnership, Reward, Reinforcement</td>
<td>Knowledge, healthy food choices, and restraint in food salting higher in intervention females; intervention males also have greater knowledge and less salt, results less conclusive for food choice in males; food choice only weakly explained by knowledge, current food choice much stronger predictor (than knowledge) of future food choice</td>
</tr>
<tr>
<td>Luepker et al., 1996&lt;sup&gt;31&lt;/sup&gt; Outcomes of a field trial to improve children’s dietary patterns and physical activity: the Child and Adolescent Trial for Cardiovascular Health (CATCH).</td>
<td>5106 ethnically and SES diverse 3rd-5th grade public school students (Austin, Minneapolis, New Orleans, San Diego); 3 groups: school-based, school-based w/family component, control</td>
<td>Knowledge, Risk, Self-efficacy, Role models, Parental involvement, Community, Partnership, Reward, Reinforcement</td>
<td>At 3 y follow-up, intervention lunches decreased significantly in % fat; intensity of activity in PE classes increased significantly in intervention schools; intervention students reported significantly more physical activity; no significant change in BP, body size, cholesterol</td>
</tr>
<tr>
<td>Stolley and Fitzgibbon, 1997&lt;sup&gt;26&lt;/sup&gt; Effects of an obesity prevention program on the eating behavior of African American mothers and daughters.</td>
<td>Inner-city, African American, 7-12 y old girls (n=65) and their mothers; study over 12 weeks, follow-up 18 mo using KYB curriculum</td>
<td>Knowledge, Risk, Self-efficacy, Role models, Parental involvement, Community, Partnership, Reward, Reinforcement</td>
<td>Treatment mothers significantly decreased intake in saturated fat and dietary fat, increased parental support; daughters' behavior changed minimally but authors speculate possible future positive influence of continued maternal modeling; long-term follow-up measures gathered but not published</td>
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<th>Self-efficacy</th>
<th>Role models</th>
<th>Parental involvement</th>
<th>Community partnership</th>
<th>Reward/ reinforcement</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Holcomb et al, 1998&lt;sup&gt;18&lt;/sup&gt; Evaluation of Jump Into Action: a program to reduce the risk of non-insulin dependent diabetes mellitus in school children on the Texas-Mexico border.</td>
<td>NIDDM prevention for 5th-grade Mexican American children (n=1114); 2-mo intervention with 4-wk follow-up; 2 groups: Jump Into Action (JIA) + teacher training, JIA w/o teacher training (no control group)</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>Significant effects for knowledge, self-efficacy, diet, and exercise behavior changes that were sustained at 4-wk follow-up; behavior improvements smaller than increases in knowledge and self-efficacy; teachers with training report higher personal efficacy</td>
<td></td>
</tr>
<tr>
<td>Trevino et al, 1998&lt;sup&gt;15&lt;/sup&gt; Bienestar: a diabetes risk-factor prevention program.</td>
<td>Pilot program with 4th-grade Mexican American children (n=102); 8-mo study</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>Significant decrease in dietary fat intake, significant increase in intake of fruits and vegetables and in health knowledge; no decrease in % body fat or level of activity; self-efficacy not measured, modest (insignificant) improvement in self-esteem; after-school group high-attenders had higher health knowledge score than low-attenders</td>
<td></td>
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<tr>
<td>McKenzie et al, 1998&lt;sup&gt;*&lt;/sup&gt; A primary intervention program (pilot study) for Mexican American children at risk for type 2 diabetes.</td>
<td>Pilot program with Mexican American children ages 7-12 y (n=37); 8 weekly sessions</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>Improved knowledge test score in 70% of children, 50% improved dietary habit test score; program well received, especially by parents (94% of whom read food labels, 83% used fat-modified recipes)</td>
<td></td>
</tr>
<tr>
<td>Gorstmaster et al, 1999&lt;sup&gt;37&lt;/sup&gt; Reducing obesity via a school-based interdisciplinary intervention among youth: Planet Health.</td>
<td>Ethnically diverse 6th and 7th graders from public schools in MA (n=1295); 2 groups: intervention and control</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>Obesity reduced among girls in intervention schools, TV viewing reduced in both boys and girls; intake of fruits and vegetables increased in girls; reduction in TV viewing predicted decrease in obesity in girls</td>
<td></td>
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<tr>
<td>Resnicow et al, 2000&lt;sup&gt;27&lt;/sup&gt; GO GIRLS!: results from a nutrition and physical activity program for low-income, overweight African American adolescent females.</td>
<td>Inner-city, overweight African American adolescent girls (n=57) and parents; study conducted over 2 y; no control group</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>Substantial interest among participants but high attrition rates; high-attenders report more social support and lower intake of total kilocalories, fat, cholesterol, and sodium; subjects preferred experiential learning to didactic; low parent attendance was obstacle to behavior change</td>
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</tbody>
</table>
## Table 1.

Targets for Interventions in Behavioral Change (Continued)

<table>
<thead>
<tr>
<th>Source/Location</th>
<th>Study Population/Design</th>
<th>Targets</th>
<th>Outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epstein et al, 2000&lt;sup&gt;78&lt;/sup&gt; Decreasing sedentary behaviors in treating pediatric obesity.</td>
<td>Obese 8-12 y olds (n=90) and parents; 16 weekly sessions, followed for 2 years; 4 groups: increase physical activity, decrease sedentary activity x low dose, high dose</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>

SES=Socioeconomic status, BP=blood pressure, HDL=high-density lipoprotein, BMI=basal metabolic index, NIDDM=non-insulin-dependent diabetes or type 2 diabetes, PE=physical education.

*Corresponds to the constructs of perceived susceptibility, perceived severity, and perceived benefits from the Health Belief Model, and outcome expectations from Social Learning Theory.


Targeting normative beliefs takes on tremendous importance when working with youth in whom cognitive processes are still developing.<sup>26,30,72</sup> Choosing the family as the unit for prevention efforts is a primary strategy for addressing normative beliefs. A successful prevention program also requires formative research (eg, focus groups and interviews) with community members and leaders to assess the community’s behavioral beliefs, current practices, sources of support, social norms, and perceived barriers to action. In keeping with the EM, formative research empowers community members by including them in the process of problem definition, establishes relationships within the community, and forms the basis for ongoing interaction at the levels of community institutions.<sup>77,78</sup>

### Empirical Evidence

Empirical studies are linked to different aspects of the theoretical model (Table 1). Many behavioral weight-loss interventions described to date draw mainly from SLT and the HBM, explicitly or implicitly (cognitive arm of the model). Of these, the most effective interventions also incorporate other components within the theoretical model to strengthen and reinforce the cognitive component. For example, Epstein and colleagues<sup>79,80</sup> work with obese children shows the power of delivering a nutrition education component within a family-based setting (social norms, or environmental arm of the model) and strengthening participants’ self-efficacy through use of praise and contracts. The 10-year follow-up of 185 families demonstrated that the short-term and long-term effects of weight-control interventions are significantly improved when a parent is included in treatment.

Normative beliefs (TPB, or environmental arm of the model) strongly influence children’s behaviors. Parents’ values and perceptions clearly influence children’s eating patterns<sup>90,101</sup> and physical activity behavior.<sup>39,32,34</sup> Social norms are addressed in some studies by formative research and other strategies designed to take into account cultural preferences of the target group. For example, GO GIRLS<sup>127</sup> is a nutrition and exercise program for teen girls and their mothers from low-income public housing.
## Table 2.

### Selected Examples of Target Implementation

<table>
<thead>
<tr>
<th>Target Area</th>
<th>Examples from Empirical Evidence</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Knowledge</strong></td>
<td>Traffic light diet (&quot;green&quot; foods good, &quot;yellow&quot; consume in moderation, &quot;red&quot; consume little)</td>
<td>Epstein et al, 2000&lt;sup&gt;79&lt;/sup&gt; and 1994&lt;sup&gt;80&lt;/sup&gt;</td>
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<td><em>Lunch Bag</em> program and <em>Slice of Life</em> program</td>
<td>Kelder et al, 1995&lt;sup&gt;89&lt;/sup&gt; (Class of ’89)</td>
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<td>Food content, distinguishing emotional from physical hunger, reading labels, preparing meals</td>
<td>Resnicow et al, 2000&lt;sup&gt;27&lt;/sup&gt; (GO GIRLS!)</td>
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<td><strong>Risk awareness</strong></td>
<td>Perceived susceptibility and severity</td>
<td>Bush et al, 1989&lt;sup&gt;92&lt;/sup&gt; (<em>Know Your Body</em>)</td>
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<td></td>
<td>Education about morbidity, disease prevalence, consequences</td>
<td>Trevino et al, 1996&lt;sup&gt;65&lt;/sup&gt; (Bienestar)</td>
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<td></td>
<td>Holcomb et al, 1998&lt;sup&gt;60&lt;/sup&gt; (<em>Jump Into Action</em>)</td>
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<td></td>
<td>McKenzie et al, 1998&lt;sup&gt;60&lt;/sup&gt;</td>
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<td></td>
<td>Perceived benefits</td>
<td>Holcomb et al, 1998&lt;sup&gt;60&lt;/sup&gt; (<em>Jump Into Action</em>)</td>
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<td></td>
<td>Education about efficacy of changes</td>
<td>McKenzie et al, 1998&lt;sup&gt;60&lt;/sup&gt;</td>
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<td></td>
<td>Outcome expectancies</td>
<td>Resnicow et al, 2000&lt;sup&gt;27&lt;/sup&gt; (GO GIRLS!)</td>
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<td></td>
<td></td>
<td>Kelder et al, 1995&lt;sup&gt;68&lt;/sup&gt; (Class of ’89)</td>
</tr>
<tr>
<td><strong>Normative beliefs</strong></td>
<td>Formative research</td>
<td>Resnicow et al, 2000&lt;sup&gt;27&lt;/sup&gt; (GO GIRLS!)</td>
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<td></td>
<td>Preintervention focus groups</td>
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<td></td>
<td>Influential community leaders</td>
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<td></td>
<td>Community liaison, CHA residents association members, guidance counselors at local schools</td>
<td>Resnicow et al, 2000&lt;sup&gt;27&lt;/sup&gt; (GO GIRLS!)</td>
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<td></td>
<td>Partner with CHA local tutoring program</td>
<td>Stolley and Fitzgibbon, 1997&lt;sup&gt;66&lt;/sup&gt;</td>
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<td></td>
<td>Student peer leaders</td>
<td>Kelder et al, 1995&lt;sup&gt;68&lt;/sup&gt; (Class of ’89)</td>
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<td>Parental role models/parental involvement</td>
<td>Stolley and Fitzgibbon, 1997&lt;sup&gt;66&lt;/sup&gt;</td>
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<td></td>
<td></td>
<td>Epstein et al, 1994&lt;sup&gt;60&lt;/sup&gt;</td>
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<td>Wadden et al, 1990&lt;sup&gt;65&lt;/sup&gt;</td>
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<td>Bush et al, 1989&lt;sup&gt;92&lt;/sup&gt; (<em>Know Your Body</em>)</td>
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<td>Trevino et al, 1998&lt;sup&gt;60&lt;/sup&gt; (Bienestar)</td>
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<td>Kelder et al, 1995&lt;sup&gt;68&lt;/sup&gt; (Class of ’89)</td>
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<td>Crockett et al, 1989&lt;sup&gt;64&lt;/sup&gt; (Hearty Heart Home Team)</td>
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<td>Community-wide education efforts</td>
<td>Reger et al, 1998&lt;sup&gt;103&lt;/sup&gt; (1% or Less)</td>
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<tr>
<td><strong>Institutional factors</strong></td>
<td>Work with organizations</td>
<td>Resnicow et al, 2000&lt;sup&gt;27&lt;/sup&gt; (GO GIRLS!)</td>
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<td></td>
<td>Public housing developments</td>
<td>Stolley and Fitzgibbon, 1997&lt;sup&gt;66&lt;/sup&gt;</td>
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<td></td>
<td>Schools</td>
<td>Bush et al, 1989&lt;sup&gt;92&lt;/sup&gt; (<em>Know Your Body</em>)</td>
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<td>Gortmaker et al, 1999&lt;sup&gt;97&lt;/sup&gt; (Planet Health)</td>
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<td>Luepker et al, 1996&lt;sup&gt;61&lt;/sup&gt; (CATCH)</td>
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<td>Trevino et al, 1998&lt;sup&gt;60&lt;/sup&gt; (Bienestar)</td>
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<td>Holcomb et al, 1998&lt;sup&gt;60&lt;/sup&gt; (<em>Jump Into Action</em>)</td>
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<td></td>
<td>Kelder et al, 1995&lt;sup&gt;68&lt;/sup&gt; (Class of ’89)</td>
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<td>Partnership/pressure on corporate interests</td>
<td>Kelder et al, 1995&lt;sup&gt;68&lt;/sup&gt; (Class of ’89)</td>
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<td></td>
<td>Grocers, restaurants</td>
<td>Reger et al, 1998&lt;sup&gt;103&lt;/sup&gt; (1% or Less)</td>
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<td></td>
<td>Media campaigns</td>
<td>Kelder et al, 1995&lt;sup&gt;68&lt;/sup&gt; (Class of ’89)</td>
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<td></td>
<td></td>
<td>Reger et al, 1998&lt;sup&gt;103&lt;/sup&gt; (1% or Less)</td>
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<td></td>
<td>Public policy efforts</td>
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</table>
developments. Partnering with public housing also illustrates a constructive approach to interacting with organizations and institutions. In this study, girls whose mothers were more involved with them in the program were able to more effectively lower their fat intake, again underscoring the importance of family as a source of social norms. Other programs that have been effective with African American youth have also relied on involving parents as a way of affecting normative beliefs. Self-efficacy was bolstered in GO GIRLS! through skills practice and mastery; Stolley and Fitzgibbon improved self-efficacy through maternal role modeling and feedback.

School-based interventions are, by their nature, designed to work through a social institution (environmental arm of the model). Many school-based programs demonstrate increases in knowledge, increased parental involvement in the programs also seems to correlate with more significant changes in behaviors among the school children.

Several long-term community-based projects have targeted cardiovascular risk factors. However, these large studies were difficult to reproduce and had limited effects on obesity. The 1% or Less Program exemplifies a very successful behavioral weight-loss intervention using the environmental approach to target an entire community. Researchers partnered with grocers, restaurants, and food suppliers and ran a public media campaign to promote low-fat milk in a West Virginia community. The market share of low-fat milk consumption increased from 18% preintervention to 41% postintervention; a 35% market share was sustained at the 6-month follow-up. By targeting a very specific behavior (milk choice) in a focused campaign, the 1% or Less Program achieved significant results; the market share of low-fat milk consumption more than doubled and was sustained at the 6-month follow-up. Ideally, environmental and social elements of an intervention should be combined with cognitive components to maximize the impact for participants and their community.

**SUMMARY**

Evidence strongly supports the need to address both cognitive and environmental aspects when working with minority youth to decrease obesity and the risk of diabetes. Self-efficacy can be targeted as an independent variable. When developing weight-control programs in a community, it is important that behavioral targets be relevant to community members and open to intervention. This approach necessitates thorough research in the intervention community, which also strengthens institutional ties to the community and empowers community members in the development of programs. Additionally, selection of behavioral targets should be grounded in theory and practice that identifies constructs that are likely to produce behavioral change.

The most difficult part of the model to address, and the part with the least empirical evidence available, involves institutional factors, corporate interests, and mass media influences on the nutrition and health behaviors of youth. Public policy efforts in these areas can be effectively dovetailed with behavior change research programs; for example, efforts are underway in several states to effect legislation restricting soft drink vending machines in schools. Concurrently, advocacy is needed to promote minority leadership and participation in research, increased access to preventive care, and culturally appropriate health care for the growing minority populations in the United States.
REFERENCES


