Socio-ecological Approaches for Preventing Childhood Obesity:
A Literature Review to Inform Efforts in Durham, North Carolina

by

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Abstract

Childhood obesity has reached almost epidemic proportions; in 2007, it was estimated that 16.4% of U.S. children were obese and 15.2% were overweight. Numerous government and academic-based attempts to put a halt to this trend have centered on the socio-ecological model for health behavior, which posits that effective health promotion interventions must target both individual and social factors, including interpersonal relationships, organizational policies, community environments, and public policy, all of which can contribute to the perpetuation of (un)healthy behaviors. In this paper, approaches to reducing the prevalence of childhood obesity are examined. Specifically, recent programs based on the socio-ecological theory of health behavior are parsed for key lessons to inform interventions tackling this problem in a multidimensional, community-based fashion. The knowledge gained from these earlier efforts are then applied to the case of Achieving Health for a Lifetime, a Durham, North Carolina-based program facing a challenging set of circumstances in its struggle to rein in weight gain among the city’s school children.
**Background**

In 2010, the Partnership for Children in Durham, North Carolina, released a report titled “Healthy and Ready: Assessing Children’s Health Status upon Public School Entry” (Durham’s Partnership for Children, 2010). Using data collected on the standardized Kindergarten Health Assessment Form—which must be completed by a healthcare professional prior to a child’s entry into the North Carolina public school system—the Partnership was able to identify the major health and wellness issues confronting the city’s youngest school children. Notably, the study revealed that approximately 18% of Durham’s rising kindergarteners could be classified as either overweight or obese based on body mass index (BMI). This finding, while disturbing, sets the stage for the troubling trend observed among older children (ages 10–17 years) across the state of North Carolina, 18.6% of whom are obese and 14.9% of whom are overweight (Singh, Kogan, & van Dyck, 2010). Nationally speaking, childhood obesity has reached almost epidemic proportions; in 2007, it was estimated that 16.4% of U.S. children were obese and 15.2% were overweight (Singh GK, 2010). By comparison, only 5% of U.S. children and adolescents were considered obese and 4% were considered overweight in the period between 1971 and 1974 (Ogden & Carroll, 2010; National Center for Health Statistics, 2010).

These numbers effectively highlight the ever-increasing prevalence of childhood overweight and obesity, but they do not speak to the short- and long-term consequences of unchecked weight gain for individuals and the society in which we live. The health effects of excess weight in childhood and adolescence are well documented and include early maturation, insulin resistance and type 2 diabetes, high blood lipids, hypertension, asthma, sleep apnea, hepatic steatosis, and orthopedic problems, as well as psychosocial issues stemming from
stigmatization and discrimination (Centers for Disease Control and Prevention [CDC], 2009a; Dietz, 1998). Unfortunately, overweight and obese children and adolescents are more likely to become overweight and obese adults (Serdula et al., 1993), who, in turn, suffer from a host of other diseases due to their excess weight: coronary heart disease, cancer, dyslipidemia, stroke, liver and gallbladder disease, respiratory problems, infertility, and osteoarthritis, among others (CDC, 2009b).

The U.S. healthcare system must mobilize to treat obesity-related disease in children and adults—a massive undertaking that results in escalating costs for an already over-burdened healthcare infrastructure. Estimates put the annual direct expense of treating obesity-related disease in U.S. adults at approximately $147 billion in 2008 (Finkelstein, Trogdon, Cohen, & Dietz, 2009). Obesity alone is thought to account for as much as 10% of all medical spending; broken down by payer status, that’s 8.5% of Medicare spending, 11.8% of Medicaid spending, and 12.9% of individual payer spending (Finkelstein et al., 2009). Across all categories of healthcare payers, it is estimated that an obese person generates $1,429 in per-capita medical spending per year, which is 42% higher than the costs incurred by a person of normal weight (Finkelstein et al., 2009). The economic burden posed by the obesity epidemic is not limited to these direct medical costs, however. Indirect costs, such as the value of wages lost by people unable to work because of illness, disability, or premature death, must also be considered when tallying up the bill for America’s weight gain (Office of the Surgeon General, 2001). In addition to their negative impact on job earnings, obesity-related health problems also affect the nation’s employers, with work absenteeism costing $4.3 billion annually and reduced job productivity equaling approximately $506 per obese worker per year (Cawley, 2010).
Given these dire consequences for the nation’s physical and fiscal wellbeing, the U.S. government and the healthcare community have become increasingly concerned about the issue of obesity. In 2001, faced with incontrovertible evidence that America was getting heavier (Figure 1), the U.S. Surgeon General issued a “Call to Action to Prevent and Decrease Overweight and Obesity” (Office of the Surgeon General, 2001), in which he proposed the CARE strategy for developing an action plan to curb the epidemic: Communication, Action, Research, Evaluation. This framework, he posited, should be deployed in a range of settings—from homes to schools to worksites—because the problem of obesity requires a multifaceted approach: one that combines individual behavior change with changes to the communities in which people live and the public policies that govern their lives (Office of the Surgeon General, 2001).

**Figure 1.** Increasing prevalence of obesity among Americans, 1991–2000

Recognizing that obesity frequently has its roots in childhood, Congress, in 2002, instructed the Institute of Medicine (IOM) to develop a plan of action for decreasing obesity among the nation’s children and adolescents, resulting in the IOM report “Preventing Childhood Obesity: Health in the Balance” (IOM, 2005). The IOM Committee on Prevention of Obesity in Children and Youth, echoing the sentiments of the Surgeon General, proposed a number of recommendations for the promotion of healthy weight among children across various segments of society, including federal, state, and local governments, industry and the media, healthcare providers, community and nonprofit groups, schools, and families.\(^1\) The 2007 follow-up to this report—“Progress in Preventing Childhood Obesity: How Do We Measure Up”—expanded upon the notion that a multidimensional approach to combating childhood obesity is required, noting that “there will be greater likelihood of success when public, private, and voluntary organizations purposefully combine their respective resources, strengths, and comparative advantages to ensure a coordinated and sustained long-term effort” (IOM, 2007, p. 8).

What these government calls to action have in common is an espousal of the socio-ecological model (SEM) for health behavior. The SEM posits that effective health promotion interventions must target both individual and social factors, including interpersonal relationships, organizational policies, community environments, and public policy, all of which can contribute to the perpetuation of (un)healthy behaviors (McLeroy, Bibeau, Steckler, & Glanz, 1988). By recognizing the interconnectedness of individuals and the various social circles they inhabit, the model proposes that changes made to both the public and interpersonal environments will

\(^1\) The 2005 IOM recommendations subsequently were discussed at regional symposia, where practice and evaluation plans were developed. The 2007 follow-up report mentioned above provides details about these plans, as well as information on progress made on the earlier recommendations: http://books.nap.edu/openbook.php?record_id=11722.
produce changes in individual behavior. Applying this model to the issue of childhood obesity, Davison and Birch (2001) identify the following spheres of influence as contributing to a child’s propensity for weight gain: genetic environment (i.e., family history of obesity), family environment (i.e., behaviors modeled by parents and other household members), and community/social influences (e.g., government and school policies, built environment, sociodemographics) (Figure 2).

**Figure 2.** Socio-ecological landscape of childhood obesity

With this theoretical backdrop, one can pinpoint a number of factors as possible targets for intervention in the childhood obesity epidemic. In addition to genetic susceptibility, many

elements and behaviors contribute to the imbalance between caloric intake and energy output resulting in weight gain. Frequent consumption of sweetened beverages, processed foods, and oversized meal portions; the increased use of high-fructose corn syrup in food manufacturing; elimination of physical activity from the school day; increased time spent in front of the television; lack of healthy role models; and failure of the built environment to provide viable means for physical activity participation—these are just a few of the factors that have received attention as obesity researchers and policymakers debate the best formula for reducing overweight and obesity among the nation’s children (CDC, 2009c).

Data from the 2007 North Carolina Youth Risk Behavior Survey (YRBS) demonstrate the impact that these factors can have. In a state where more than 30% of youth aged 10–17 years are either overweight or obese, only two out of five young people in grades 9 through 12 meet current physical activity recommendation levels set forth by the U.S. Department of Health and Human Services,\(^2\) 35% watch 3+ hours of television per day, only 15% eat fruits or vegetables five or more times a day, and 37% drink at least one sweetened beverage every day (CDC, 2009d). Youth in Durham, North Carolina, fare even worse. According to the 2009 Durham YRBS, 52% of Durham middle-schoolers and 41% of high schoolers watch 3+ hours of television per day, only 39% of middle schoolers eat breakfast every day, and 89% of high schoolers drink one or more sweetened beverages per day (Durham County Partnership for a Healthy Durham, 2011a, 2011b).

Numerous efforts to change these statistics and reduce the prevalence of childhood

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\(^2\)The U.S. Department of Health and Human Services physical activity guidelines for children and adolescents recommend 60 minutes or more of physical activity daily (available at: http://www.health.gov/paguidelines/guidelines/chapter3.aspx).
obesity have focused primarily on the school environment because it represents a well-controlled location in which most children spend a substantial portion of their time. Certainly, obesity researchers and policymakers can affect the nutritional choices and physical activity opportunities made available during the school day; however, given the statistics presented above regarding sedentary behavior and dietary choices made outside of the school day, as well as the socio-ecological framework espoused by the Surgeon General and the IOM, it seems that one should explore a broader array of potential sites for intervention to reduce childhood obesity (Nestle, 2010). In Durham, for example, many factors may be contributing to the weight gain among its youth, including a dearth of urban grocery stores, unsafe neighborhoods, few well-maintained public parks, and an overabundance of convenience stores and fast food outlets (Achieving Health for a Lifetime team, 2009). Unfortunately, there is no magic formula for solving the problem of childhood obesity, forcing researchers and community members to rely on trial and error in determining what will work in a range of environments. The following section will review the design and outcomes of several programs targeting childhood obesity to tease out key themes for successful implementation and sustainability of socio-ecological approaches in this context.

**Literature review**

A literature search was conducted using the PubMed, Embase, and CINAHL databases. Search terms included MeSH terms such as obesity and overweight, in combination with other keywords: community, health, childhood, children, intervention, socio-ecological, social-ecological, and model. Preference was given to study reports published within the last five years
and that related findings regarding programs involving multiple levels of the socio-ecological model. The latter search parameter proved the most limiting factor, as most programs targeting childhood obesity to date are school-focused, given the advantages that the school setting can provide of a controlled environment with guaranteed access to children. In light of the multivariable approach advocated by the Surgeon General and the IOM, however, the following literature review will provide an overview of eight programs modeled on the socio-ecological approach to childhood obesity. See Appendix A for a summary of the programs and their various components.

Full-blown deployment of the SEM in this area of public health remains a relatively novel undertaking. The timeframe mentioned above among the search parameters (2006–2011) practically set itself as reports of socio-ecological programs to combat childhood obesity predating this period were scarce. The authors of the articles cited in this review often referred to the same pilot programs and theoretical policy papers as they outlined the context and background for their respective programs. Obviously, interest in applying the SEM to this problem is growing stronger, but the knowledge gap is wide.

The review that follows presents critical lessons learned from SEM-based programs at various stages along the planning–implementation–evaluation continuum. Some reports focus mainly on the program infrastructure and community-building needed to facilitate a halt to the obesity epidemic. These reports are critical for enabling the public health and policy-making communities visualize what is possible and identify potential barriers; they also provide a basic roadmap for recreating program infrastructure elsewhere. Others come “from the trenches,” where obesity researchers are measuring children and tracking their weights to gauge the
potential impact of SEM programming. These studies and the outcomes data they provide are essential for supplying the evidence base needed to refine methodology and promote adoption of SEM approaches broadly through policy decision-making and related budgeting measures. Although the literature on this subject is relatively sparse, the following representation of what has been done and what has worked may help to guide future efforts in Durham, North Carolina.

“Aligning the stars”: taking advantage of political opportunities

Behavior change doesn’t occur in a vacuum but rather is circumscribed by a larger environment determined by politics and economics. The outermost circle of the socio-ecological model concerns policy-level factors affecting the resources available to the remaining SEM circles (individual, family, institutional, community). The first of these reports, “Action Schools! BC: A Socioecological Approach to Modifying Chronic Disease Risk Factors in Elementary School Children” (Naylor, McDonald, Reed, & McKay, 2006), details how researchers were able harness political will at this policy level in British Columbia (BC), Canada, to foster a community and provincial environment conducive to behavior change at the organizational (i.e., school) and individual levels. Naylor et al. describe how a variety of partners were engaged across government (BC Ministry of Health; BC Ministry of Education; BC Ministry of Tourism, Sports, and the Arts; BC Recreation and Parks Association), academia (University of BC), community stakeholder groups, and schools (e.g., teachers, principals, parents, superintendents) to devise, implement, and evaluate a physical activity model among students in grades 4–7 in the public schools (see Appendix A for a listing of the program’s components). Quite notably, this undertaking evolved in an environment in which the provincial government—which was
preparing for the upcoming, high-profile Vancouver-Whistler Games—looked favorably on programs designed to promote and highlight physical activity participation among young people. With this encouraging backdrop, the Action Schools! BC researchers had somewhat of a mandate to organize parties from across the socio-ecological spectrum in the dual mission of making children more active and underscoring British Columbia’s commitment to physical excellence and sports promotion.

The results outlined in the Action Schools! BC report are short on concrete data but long on observations regarding the possible benefits of multi-sector participation in childhood obesity reduction. By means of focus groups, stakeholder meeting reports, media scanning, and government policy reviews, the research team concluded that their efforts had resulted in macro-level changes that would contribute to ongoing and sustainable promotion of physical activity in BC schools and communities. Perhaps the greatest outcome of the effort was the BC government’s subsequent decision to allot $14.5 million for expansion of the Action Schools! program. The authors recognize the obvious influence that the provincial government played in the success of the program (as it dovetailed nicely with the BC agenda to promote the Vancouver-Whistler Games), and they are justifiably reluctant to directly attribute the impacts observed to the model that was implemented. These limitations aside, however, the report provides an example of how political opportunism can work in favor of SEM approaches and should be exploited when appropriate.

**Building the infrastructure for change**

Armed with an understanding of one’s political environment, the next step of critical
importance is assembling and organizing the stakeholders needed to plan, implement, and evaluate the intervention. A notable example of such an undertaking can be found in a report on a multi-level initiative to prevent childhood obesity in Chicago, Illinois. “Taking on Childhood Obesity in a Big City: Consortium to Lower Obesity in Chicago Children (CLOCC)” (Becker, Longjohn, & Chrisoffel, 2008) provides an overview of an attempt to create a broad-based infrastructure, in this case to monitor and prevent childhood obesity through multiple points of intervention while also creating the evidence base to inform and sustain future efforts. Founded in 2002, the CLOCC has enlisted more than 700 Chicago organizations to the fulfillment of its mission to “foster and facilitate connections between childhood obesity prevention researchers, public health advocates and practitioners, and the children, families, and communities of Chicagoland” (Becker et al., 2008, p. 200). The CLOCC employs its own full-time and part-time staff to oversee and facilitate the partnerships comprising the consortium and to maintain a website for dissemination of information and results (http://www.clocc.net/). The staff is overseen by the CLOCC Executive Committee, External Advisory Board, and Corporate Advisory Committee, the individual members of which provide guidance in decision-making and critical connections to stakeholders at the local and national levels. The importance of the organizational and decision-making mechanisms embodied by these committees and the paid staff cannot be understated. Mobilizing hundreds of stakeholders can create tremendous momentum for change but would be nearly impossible without adequate attention to organizational oversight and communication.

3 Of note, the CLOCC was initially funded by a three-year grant ($550,000) from a local foundation. As of 2008, 90% of its annual budget came from local and national philanthropies; 5% came from research subcontracts with academic institutions; less than 1% was contributed by the state of Illinois; additional monies and in-kind services were provided by CLOCC members (Becker et al., 2008).
CLOCC efforts detailed in the report relate to data surveillance (e.g., creating a surveillance system using school health forms), policy development (e.g., generating a legislative agenda and a strategy for passage at the state and city levels), clinical care (e.g., providing clinicians with education and resources for the prevention of childhood obesity), public education (e.g., promoting a media campaign that encourages healthy eating and active lifestyles among elementary school-aged children), and community-based initiatives (e.g., establishing “vanguard communities” as models for local mobilization, capacity development, outreach, and evaluation) (Appendix A). As with the BC study, the CLOCC report is unable at this juncture to deliver outcomes data demonstrating the effectiveness of its SEM strategy. It does, however, describe a multi-layered evaluation plan designed to connect the changes made through its actions to individual behavior change and reduced obesity rates among Chicago’s children. A look at the coalition’s website reveals that recent work has centered on developing and advancing a policy agenda at the city and state levels, with an emphasis on facilitating data-based surveillance collaboration, health education, insurance coverage for obesity prevention activities, and access to healthy foods and physical activity resources. Given its ambitious agenda and complex organizational structure, the CLOCC supplies a critical lesson for similar efforts—that is, the need for strong leadership and staff support to shape goals and structure the effort.

**Engaging multiple stakeholders**

Keeping in mind the importance of leadership and program infrastructure in the CLOCC example, one must also consider the types and numbers of stakeholders that will be asked to

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engage with the project of preventing childhood obesity. The literature search uncovered two very different models for this undertaking—one that espouses vast community involvement and another that opts for a more streamlined, single-focus approach. The first model is exemplified by the report titled “The California Endowment’s Healthy Eating, Active Communities (HEAC) Program: A Midpoint Review” (Samuels et al., 2010). The HEAC enlists government, organizational, and community stakeholders in the development and roll-out of unique models promoting healthy eating and physical activity tailored to youth in six low-income California communities. The HEAC program targets five sectors that influence children’s health decision-making: schools, after-school programs, neighborhoods, health care, and marketing and advertising. Stakeholders in each of the six selected communities were provided with a general logic model for obesity-related behavior change and instructed to tailor it to the unique needs of their communities. In turn, the changes espoused by the stakeholder models will be presented to important community players, such as industry, transportation, and policy decision-makers, and their support for those changes will be solicited. The HEAC researchers present preliminary results from these efforts, mainly in the form of numbers of persons exposed to various interventions (e.g., 769,000 students exposed to enhanced P.E. interventions; 300 healthcare providers supplied with training on childhood obesity prevention) (Appendix A). Future evaluation plans include measurement of changes in food and physical activity environments, individual-level outcomes (behavior/attitude changes, BMI), and stakeholder awareness about the issue and support for change (to be determined from surveys, focus groups, etc.).

Given the HEAC’s embrace of multiple stakeholders, the authors of the report underscore the importance of identifying and recruiting community organizations and advocates who have
the ability to mobilize their networks to support the cause of obesity prevention in children. They call these advocates “catalysts or facilitators of change” (Samuels et al., 2010, p. 2116), and their contributions to the success of the undertaking are reportedly quite valuable. In each of the six communities targeted, HEAC has enlisted lead partner organizations to provide a focal point for activity; these organizations range from departments of public health and school districts to groups such as East Bay Asian Youth Center, Latino Health Access, and the Anderson Partnership for Healthy Children. The authors explain that these “catalysts” are essential for providing technical assistance, funding, data, advocacy, and community engagement—all critical elements for a socio-ecologically based approach to stimulating behavior change. Of course, challenges remain: reduced community and school resources due to the economic downturn being the most formidable obstacle. For change to be sustainable over the long term, time and resources must be committed to the project. The HEAC authors remain optimistic, however, observing that “as momentum builds and more partners join the effort, change will happen more quickly at a lower cost” (Samuels et al., 2010, p. 2121).

An example of a program that has enlisted multiple partners with resources to devote to creating low-cost change is Healthy Living Cambridge Kids, which has built upon ongoing efforts of the Cambridge, Massachusetts, public schools to monitor student BMI and fitness via annual collection of height, weight, and fitness test scores in a computerized data system (Chomitz et al., 2010). The already-existing Healthy Children Task Force in Cambridge was tapped to guide the design of the intervention with community input; see Appendix A for a listing of the program’s key components. BMI z-scores were calculated from the collected measurements, with the goal being to determine the mean BMI z-score and mean number of
fitness tests passed between baseline and the follow-up time point three years into the intervention. (Fitness tests gauged cardiovascular endurance, abdominal strength, flexibility, upper-body strength, and agility.) Results showed a significant decrease in mean unadjusted BMI z-score (–0.04, P≤0.001) and significant improvement in fitness test scores, with the percent of students passing all five tests increasing by 14.6% between baseline and follow-up. Notably, the researchers also observed an increase of 2.4% in the prevalence of healthy weight in the study population; the prevalence of obesity decreased significantly by 2.2% (P<0.05). The availability of regularly collected data from the Cambridge public schools enabled these useful comparisons among a broad swath of the city’s school-aged population, underscoring the importance of buy-in from critical partners like local government and existing coalitions with resources to commit.

Another benefit of the multiple-stakeholder model is the fostering of community ownership, as is seen in an example from Australia. The Be Active Eat Well (BAEW) program (Sanigorski, Bell, Kremer, Cuttler, & Swinbern, 2008) bolstered the capacity of a rural community in Victoria, Australia, to create behavior change among its youngest residents through coalition-building among government agencies, local stakeholders, and community members. Program activities are outlined in Appendix A and are similar to those reported for the studies mentioned above. BAEW used as its primary outcome differences over time in the weight, waist, and BMI z-score of study participants. Children (n=833) were measured at baseline and again two years later. Results showed that children in the intervention group gained less weight (–0.92 kg; standard error [SE] 0.41) and had significantly smaller increases in waist size (–3.14 cm; SE 0.96) and BMI z-score (–0.11; SE 0.05) than those in a control group. While noting that these results are encouraging, the authors acknowledge that the changes observed in
BAEW were not of sufficient magnitude to have an impact on the incidence of overweight and obesity. “The challenges ahead,” they observe, “are to determine the level of intervention required to achieve a reduction in childhood overweight and obesity prevalence, how to ensure sustainability of the successful intervention strategies within the community, and to assess the longitudinal effects of the reductions in unhealthy weight gain as children become adolescents and then adults” (Sanigorski et al., 2008, p. 1066). While still puzzling over how best to make an impact in this area, the BAEW researchers do supply an example of how program sustainability may be achieved through cultivation of community ownership of child wellness efforts by local leaders, organizations, and community members, who merge resources, reorient priorities, and generate widespread support to achieve the desired outcome of halting weight gain among children.

**Taking a stream-lined approach**

In contrast to the three reports described above, which place an emphasis on solutions derived from multiple stakeholders, the program described in the report titled “A Statewide Strategy to Battle Child Obesity in Delaware” (Chang, Gertel-Rosenberg, Drayton, Schmidt, & Angalet, 2010) attempts to reduce childhood obesity by delivering a ready-made strategy to community partners in selected settings representing varying levels of the socio-ecological model. Spearheaded by a children’s health system—Nemours (www.nemours.org)—this program promotes changes in policy and practice in specific environments (schools, child care facilities, and primary care practices) to slow and eventually reduce the prevalence of childhood obesity in the entire state of Delaware. This approach bears a resemblance to that taken in the
Action Schools! BC program insofar as it is somewhat circumscribed by the agenda of an organizational body (the BC government in Action Schools! and Nemours Health System in the Delaware initiative). In other words, the interventions presented serve the interests of a particular stakeholder as opposed to the collective will of an assembled body of stakeholders (as is the case in the CLOCC, HEAC, Healthy Living Cambridge Kids, and BAEW examples).

The Nemours researchers base their program on the 5-2-1-Almost None prescription for healthy living—five servings of fruits/vegetables per day, only two hours in front of the television or game console, at least one hour of physical activity, and almost no sugar-sweetened beverages. To ensure maximum exposure for this behavior model, the research team is seeking to facilitate policy and practice changes in three settings in which children spend time outside of the home—schools, child care facilities, and primary care practices. Partnerships have been formed with organizations and agencies with a shared focus on child-related issues and an ability to influence policy decision-making. Learning collaboratives and training toolkits have been developed to educate school staff, childcare providers, and healthcare providers about obesity prevention and treatment, and a 5-2-1-Almost None social marketing campaign targets both children and their families to inspire behavior change and to create a groundswell of support for policy change (Appendix A). Findings to date reveal that more schools have adopted wellness policies, the Delaware state legislature has passed laws to boost physical education/activity in the schools and in child care settings, and the prevalence of overweight and obesity among Delaware children has not increased significantly since 2006. Although direct causation cannot be established between the Nemours intervention and these accomplishments, the authors credit their focus on a limited set of priority issues and settings as critical for creating an environment
conducive to producing the changes in policy and behavior observed. Certainly, each approach has its advantages: the Delaware program focuses attention and resources on the accomplishment of an immediate goal, and the multiple-stakeholder approach builds a network of collaborators that can contribute to the long-term sustainability of shared objectives. There is a place for each model in the battle against childhood obesity, although the optimal approach likely resides somewhere along this continuum between single- vs. multi-focus effort.

**Building the evidence base for credibility and sustainability**

Efforts that focus mainly on creating the momentum, securing the funding, and building the organizational infrastructure needed to facilitate behavior change are critical to producing an environment in which children and their families have the resources and motivation to make healthier choices about diet and exercise. Ensuring that such infrastructure continues to receive priority status in policy-making and funding discussions depends in large part on the ability of program leaders to produce tangible evidence showing that the efforts are successful in decreasing weight gain among a targeted population of children. It is only within the past decade or so that the concept of evidence-based public health (EBPH) has received attention (Brownson, Fielding, & Maylahn, 2009). Borrowing from the lexicon of evidence-based medicine, EBPH represents a logical extension of the ongoing effort to professionalize public health practice via higher education and accreditation (Council on Linkages between Academia and Public Health Practice, 2010; Tilson, 2008). Like its medical cousin, EBPH strives to link high-quality evidence from the peer-reviewed literature with real-world practice settings, thereby ensuring greater credibility and success in practice, as well as more efficient use of limited public health
resources. Unlike evidence-based medicine, however, public health research lacks a “gold standard” for its evidence base; randomized controlled trials often are not feasible given the complex and unpredictable nature of public health settings (Brownson, 2009). Consequently, EBPH places results from quasi-experimental studies against a backdrop of population demographics, available resources, and organizational/environmental contexts to arrive at what might be deemed “best practice.” Although there are no guarantees that results stemming from sound statistical analyses of public health data will persuade a policy-maker or funder to throw support behind a program, rigorous evaluation of public health interventions will contribute to a growing evidence base that may bolster future efforts to influence health policy (Brownson, 2009).

**Demonstrating efficacy**

Among the vanguard of projects providing the evidence base for this area of public health is a study described in the report titled “A Community Intervention Reduces BMI z-score in Children: Shape Up Somerville First Year Results.” Published in 2007, this report presents the findings from a non-randomized trial of environmental intervention for obesity prevention in three Boston-area cities (Economos et al., 2007). The researchers used a community-based participatory research approach in designing and implementing a program to enhance the availability of healthy food and physical activity in the before-, during-, and after-school environments of early elementary school-aged children (grades 1–3). Through focus groups, community meetings, interviews, and advisory council sessions, the research team solicited input

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5 The ISI Web of Knowledge shows that this specific report has been cited 58 times overall; http://apps.isiknowledge.com.
from a range of community members in the design of the intervention. Strategies selected resemble many of those seen in the previously described reports (Appendix A). Unlike many other studies, however, this project incorporated a plan of statistical analysis to quantify the credibility of its hypothesis that a community-wide approach to the problem of childhood obesity is effective. The primary outcome of interest was change in BMI z-score from the pre- to the post-study periods; multiple height and weight measurements were made for each student at each time point to enable the necessary calculations.

Results from Shape Up Somerville (SUS) revealed a modest but significant effect size in BMI z-score change ($\beta = -0.1005, P = 0.001$), which is best represented by the example of a child at the 75th percentile for BMI z-score and 50th percentile for height. With the stated effect size of the SUS intervention, this child would be expected to avoid gaining approximately 1 pound (0.8 lb for a male, and 0.9 lb for a female) over the eight-month period of the intervention. The authors acknowledge that controversy exists regarding appropriate analytic approaches to data gathered via community-based participatory research efforts of this nature, but they describe in detail the variety of methods used to validate their findings in view of their hypothesis. Clearly, however, additional scholarly attention should be paid to the analytical methodology to undergird the evidence base for public health practice so that effective arguments (above and beyond those based solely on face validity) may be made to policy-makers and funding bodies for the continued support of these types of programs.

In contemplating the SUS results, one should take into account the carefully selected circumstances under which the study was performed. The median household income ranged from $39,507–$46,315 (by comparison, the median U.S. household income in 2008 was roughly
$52,000); the percentage of families living below the poverty level varied from 12.5–14.5% (the U.S. average in 2008 was 13.2%). Most parents had at least a high school diploma, with education levels generally being higher in the intervention community. More than 60% of families included parents who were married (Economos et al., 2007). Obviously, the researchers chose a study population of middle class people with some resources to devote to child wellness. The results, then, should be viewed as reflecting the efficacy of this intervention strategy under “ideal” circumstances but not necessarily its effectiveness in “real world” settings, where circumstances cannot be so carefully controlled and positive outcomes are not often likely. Challenges in building the evidence base for SEM-based approaches to preventing childhood obesity will involve thinking creatively about what constitutes legitimate evidence and in translating tested models into public health practice.

**Using multiple outcomes measures to expand the definition of “evidence”**

Against a backdrop of the SUS results, another program, the Travis County CATCH trial, sought to measure the impact that community involvement may have on the success of an existing child health intervention program (in this case, the Coordinated Approach to Child Health BasicPlus [CATCH BP]) (Hoelscher et al., 2010). The research team devised a community component to complement the original program, creating what they termed CATCH BPC (CATCH BP and Community involvement). Community-based features of the program are listed in Appendix A; these included family fun nights, school-based social marketing (e.g., morning announcement messages, CATCH signage, school menu messages), community membership on the CATCH BPC oversight committee, obesity prevention workshops involving
community members, and development/distribution of a community health promotion activity guide. Supplementing the BMI z-score measure, the research team employed a range of measurement tools to examine the primary outcome of reduction in prevalence of overweight and obesity. A self-administered, 62-question survey was completed annually by a cross-section of student participants (in grade 4), assessing their physical activity level, dietary patterns, physical activity knowledge, self-efficacy, and outcome expectations. Process measures included the System for Observing Fitness Instruction Time (which gauges the level of moderate-to-intense physical activity during P.E. class time), structured interviews with program leaders, and self-administered questionnaires to teachers regarding their perceptions of the program. Interestingly, results indicated that schools receiving the CATCH BPC programming attained greater gains in the desired outcomes than their CATCH BP counterparts. Prevalence of overweight and obesity decreased by 8.2% among students in the BPC schools as compared with 3.1% in the BP schools. Student dietary intake behaviors and physical activity levels were also more favorable in BPC students. The process measures revealed greater uptake of intervention activities at schools receiving community support, with more activities and teacher interest being reported. The usefulness of these additional measures above and beyond the standard BMI comparisons should be acknowledged as critical to providing much-needed context and support for the SEM evidence base in childhood obesity prevention.

As this literature review reveals, the obesity research community is zeroing in on best practices for reduction of obesity and overweight among children. Embracement of the socio-ecological model for health behavior change shows promise and is advocated by government
leaders and public health professionals alike; however, its application in this context is easier visualized than accomplished, with a multitude of factors to be considered, stakeholders to be enlisted, resources to be marshaled, and strategies to be explored. No study summarized above is perfect. Each lists limitations in scope (e.g., population size and sociodemographics), implementation (collaboration challenges, funding limitations, etc.), and evaluation (namely, statistical/analytical shortcomings). Each also adds another brick to the growing evidence base for public health approaches to childhood overweight and obesity, either by creating a roadmap for execution or by providing concrete results validating the efforts made to date. Overall, the findings point toward a promising path for future research into SEM-based programs, one of which—Achieving Health for a Lifetime—is currently unfolding in Durham, North Carolina.

**Achieving Health for a Lifetime: a Durham, North Carolina, case study**

In 2008, Durham Health Innovations (DHI, [www.dtmi.duke.edu/dccr/dhi](http://www.dtmi.duke.edu/dccr/dhi)) issued a request for proposals for projects combining resources from Duke University and community stakeholders to reduce death or disability from specific diseases prevalent in Durham, North Carolina. The purpose of this grant program was to underwrite planning of activities that would enable healthcare providers and community members in Durham to take charge of their health in a sustainable way (the caveat being that funding did not extend beyond the planning stage). Applicant teams were instructed to emphasize community ownership and low-cost sustainability of their proposed activities; focus on securing grant-based funding for long-term implementation was discouraged. One of the ten projects chosen for planning grant funding is titled Achieving

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6 Of note, the leading causes of death in Durham are cancer and heart disease (Durham County Partnership for a Health Durham, 2011c).
Health for a Lifetime (AHL), which mobilizes community resources to reduce the incidence and prevalence of childhood obesity in Durham through capacity-building efforts and intervention development. Specifically, the program team is targeting northeast central Durham—an economically depressed area with a 95% minority population that has been the focus of recent government efforts in crime reduction and historical preservation. Hoping to “piggyback” on the momentum generated by these efforts and to make an impact in an area of Durham with the most need, the team has chosen northeast central Durham’s elementary school, Y.E. Smith Elementary, as the locus for the pilot project. The program’s long-term goal is to create a “web of wellness” that will eventually encompass the area’s middle school and high school, as well as churches, community groups, local organizations, and eventually other parts of the city in a comprehensive approach to reducing obesity among Durham’s youth. This “web” constitutes a version of the socio-ecological model insofar as it addresses the issue of childhood obesity from a number of angles; however, AHL has been forced to re-envision the SEM somewhat to account for the meager resources of its initial target population, many of whom have little attention to give to matters of nutrition and exercise when concerns about personal safety, employment, and transportation are more pressing. Far from the likes of Somerville, MA, northeast central Durham does not represent the median of anything but rather the outer edge of survival. As such, AHL has come to place greater emphasis on the organizational and community levels of the SEM to compensate for resources lacking at the interpersonal and individual levels.

As is true of other SEM-based programs, AHL has drawn on a large constituency of academic, institutional, and community stakeholders to design and drive its planning efforts. Organizational participants at the outset ranged from the Duke Department of Community and
Family Medicine, the Durham County Health Department, and Durham Public Schools to local groups like Durham Congregations in Action, El Centro Hispano, and the YMCA of the Triangle. Interventions are designed to spiral out from the school setting, with initial emphasis placed on activities occurring during the school day (e.g., nutrition classes, cafeteria learning displays, increased opportunities for physical activity before, during, and after school) and later attention paid to incorporating families and communities (faith-based and otherwise) into the effort to improve diet and physical fitness in the overall population (Achieving Health for a Lifetime team, 2009). Of note, during the planning process underwritten by the DHI grant, the AHL team struggled with issues pertaining to the program’s long-term sustainability, as well as its intent—that is, testing efficacy (as was done in Shape Up Somerville) versus achieving effectiveness in a community with the greatest need and the fewest resources. The fiscal realities of delivering nutrition and exercise programming to an economically disadvantaged community quickly became apparent, as did competing agendas among the funding body and team members (discussed below).

In terms of evaluation, the original proposal for AHL lists a number of possible sources of data and information (Achieving Health for a Lifetime team, 2009). The major clinical end point is child BMI (the collection of which is recommended, but not mandated by the state). Other quantifiable health measures include headcounts at AHL events and response rates to children’s obesity risk assessments sent home to parents. Survey-based and/or qualitative measures, including self-reports of behavior change among children, parents, and staff, are mentioned as other possible gauges for program success.

To date, much has been accomplished at different levels of the socio-ecological model
(Appendix B). Individual children are expanding their palates to include more healthy foods thanks to the USDA Fruit and Vegetable Grant, which brings samples into the classroom for tasting. They are also being encouraged to be more physically active outside of the school day through a student walking program, which offers incentives for distances walked. Families are being educated about nutritious eating via mailings sent to the home. Likewise, parents are being alerted to their children’s overweight or obesity (determined via annual BMI measurement at the school) and referred to local health/weight loss resources. Teachers are being supplied with resources for introducing health topics and exercise into the classroom; they are also taking advantage of a teachers’ walking club to model healthy behaviors for their students, families, and friends. At the community level, various programs are being developed in conjunction with local religious congregations and the Durham County Health Department that will enable weight loss and regular physical activity among neighborhood residents.

As AHL enters its second full year of implementation, some early lessons have been learned and unforeseen challenges encountered, according to Jennifer McDuffie, PhD, AHL program manager (J. McDuffie, personal communication, February 8, 2011). Looming large for the AHL team is the recent turnover in the state legislature from a Democratic to a Republican majority. The North Carolina Republican Party platform espouses public school reform based on standardized testing, cutting of administrative waste, and teacher retention and promotion based on test scores (NC Republican Party, 2010). Y.E. Smith Elementary School, the early focal point of the AHL program, has already felt the repercussions of this political stance as embodied by

7 Of note, 170 letters reporting high BMI measurements were sent home in early 2011. Of those 170, 60 responses have been received, indicating an interest in referral to weight loss services. Follow-up phone calls are being made to the remaining letter recipients.
the No Child Left Behind Act of 2001: after its students garnered low scores in 2009 end-of-grade testing, the school’s principal was unexpectedly dismissed and several teachers have been let go. Becky Posada, the Durham County Health Department nutritionist assigned to Y.E. Smith, reports that this upheaval has taken a toll on the school’s staff, increasing stress levels and spawning concerns about job security (B. Posada, personal communication, February 28, 2011).

Understandably, school commitment to the AHL program is waning as other more dire concerns come to the foreground. Resources and attention are being devoted elsewhere—namely, to student preparation for end-of-grade testing. Unfortunately, this redistribution of classroom time and effort will do little to address the fact that almost 40% of Y.E. Smith students are overweight or obese. As studies have shown an association between overweight and poor academic performance (Taras & Potts-Datema, 2005), AHL’s promotion of nutrition education and physical activity in the classroom could do as much to ensure better academic outcomes as more time spent on test preparation. Attention will need to be drawn to this connection in the months ahead to reengage school faculty and staff with the AHL mission and potentially to ward off future cuts to physical education/nutrition education budgets.

Furthermore, the AHL infrastructure has not held together seamlessly, partially due to conflicting agendas among the program’s major player, Duke Medicine (the driving force behind the DHI initiative), and its community stakeholders. Although, at the outset, DHI professed an interest in community-based strategies for long-term, sustainable activities to prevent chronic disease, its interests evolved over the funding period to focus more on collaborative ways to reduce death or disability from disease using information technology and coordinated care. In contrast, many community stakeholders committed to AHL wish to intervene more “upstream,”
believing that prevention is the best means for reducing the prevalence of childhood obesity.

Here we see a possible shortcoming in the single-focus approach embodied by the Nemours/Delaware study described earlier. Because of these differing views (and the fact that DHI/Duke Medicine held the purse-strings for the planning grant funding and so needed to be placated), several early AHL participants withdrew from the program, expressing concerns regarding independence in planning activities that they felt would be most effective, such as community health education and weight loss counseling efforts to keep people from developing chronic, obesity-related disease. Among the AHL partners who have remained involved, other disagreements have emerged as to what types of interventions are feasible and practical for a low-income, low-budget environment like Y.E. Smith Elementary and its surrounding community (B. Posada, personal communication, February 28, 2011). At the heart of this issue is the efficacy vs. effectiveness problem: Is AHL’s time best spent showing how childhood obesity can be curbed under ideal sociodemographic circumstances, or should it devote its efforts to finding out what can actually work in an underserved community?

Further stymieing efforts is the fact that a few of the “community catalysts” who comprised an important bloc of the core team were forced to turn their attention to other commitments for personal/professional reasons. Another blow to the AHL infrastructure came as representatives of Durham’s Latino community (e.g., El Centro Hispano) were unable to sustain their commitment to the project due to other obligations, leaving the core team without any input from a segment constituting 12% of Durham’s population (and almost 25% of the Y.E. Smith student body). Thus, as the DHI planning grant period ends (and Duke Medicine’s financial commitment to the program diminishes in size), AHL’s leadership is struggling to fill in the gaps
of its network of supporters to carry on and underwrite its work. To this end, it is considering alliances with local organizations committed to obesity prevention rather than coordinated care and, in the process, is redefining its goals to better match the perspectives of its core team rather than the agenda of its former primary funding body (i.e., DHI/Duke Medicine).

Part of this network-building process hinges on the team’s ability to foster community buy-in and ownership of the AHL objectives. Efforts on this front have proven challenging as Dr. McDuffie is the only paid staff person on the project and is allotted only 10 hours/week to devote to overseeing its many facets, including neighborhood outreach (J. McDuffie, personal communication, February 8, 2011). As a result of this understaffing, aside from select community members and the staff and parents at Y.E. Smith, few people know about AHL in northeast central Durham. McDuffie notes that what is needed is more manpower, mainly in the form of hired staff and volunteers who are motivated to spread the word and create the groundswell of support necessary for AHL to have a lasting impact.

An additional challenge is inspiring people with more pressing concerns—such as finding work, paying the rent, and keeping themselves safe—to care about nutrition and exercise. In northeast central Durham, unemployment is approximately 15%, and some 36% of individuals live below the poverty level. The median household income is only 41% of the citywide median (Environmental Protection Agency, 2006). Transportation poses an additional hurdle for many families who might otherwise have an interest in eating healthfully and/or exercising; without a car or ready access to public transportation, a person might be more inclined to sit on the couch eating junk food than to walk miles through unsafe neighborhoods to the nearest grocery store or city park. To address some of these obstacles, the AHL team may lobby the city for additional
bus routes or encourage the conversion of abandoned, city-owned homes into low-cost gyms for area residents. The team also foresees enlisting the local faith community, whose roots in the community may encourage greater volunteer participation to help families in the target population access the resources needed to make behavior change as easy as possible. Whether it’s providing a weekly shuttle to a grocery store, hosting free exercise classes on church grounds, opening a healthy foods pantry, or supplying volunteers in Y.E. Smith classrooms to oversee nutritional and/or exercise activities, the religious institutions of northeast central Durham could bolster the AHL effort tremendously by virtue of their service-oriented missions and their connections to the community. Because money does not currently exist to fund staff support, volunteer labor is critical to the success of the AHL program; the recruitment of a committed body of ready volunteers will do much to enhance existing efforts and extend the program’s overall reach. Becky Posada of the Durham County Health Department observed that this is, perhaps, the greatest challenge facing the program—fostering local ownership of AHL so that volunteers are long-term and stable in their commitment. Finding a church to “adopt” Y.E. Smith and get involved with the larger AHL project, she posits, would be a step in the right direction for accomplishing this goal (B. Posada, personal communication, February 28, 2011).

The question of funding also looms large; the DHI grant only underwrote the planning stage, and so implementation monies must be secured independently by the project team, unfortunately during a period of economic downturn. As mentioned above, the disconnect between DHI priorities and the AHL team’s views on how best to reduce obesity prevalence among Durham’s children resulted in an uncomfortable partnership with uncertain goals. Now less beholden to DHI expectations and requirements, the project team is looking for funding
bodies that will embrace its upstream approach and be willing to subsidize actual implementation. In particular, the team is looking for organizations and/or businesses in the Durham area with concrete ties to the community and a genuine interest in improving the lives of the city’s children by innovative means (J. McDuffie, personal communication, February 8, 2011).

A possible obstacle to securing financial backing concerns the fact that AHL is trying to make change happen in a less-than-ideal laboratory. Unlike the study population in Shape Up Somerville, the average household income in northeast central Durham is only $16,680/year (City-Data.com, 2011). The population tends to be mobile, as households move or are reconfigured due to economic and/or personal need. The student body at Y.E. Smith changes from year to year; Dr. McDuffie estimates that, of the 370 students whose BMIs were measured in 2010, approximately 60% had been among the 290 students measured the preceding year. Consequently, the popular BMI z-score outcome measure is not an ideal gauge of program impact. Alternative measures may need to be explored, such as attendance counts at AHL events and self-reports of time spent in physical activity. Efficacy of AHL interventions, in any case, will be difficult to prove using the metrics of studies like Shape Up Somerville. McDuffie explains, however, that although weight may not change, fitness can be improved, and that would be an acceptable outcome according to the AHL team, whose focus is more on establishing intervention effectiveness in this challenging environment. Convincing funding bodies of the acceptability of such metrics may be a challenge, which is why efforts will be focused on gaining support from local government, businesses, and organizations with an interest in creating change locally.


**Recommendations**

Northeast central Durham obviously faces many challenges in addressing the health needs of its children. The prospect of mounting a multi-dimensional, socio-ecological campaign to reduce and prevent childhood obesity seems daunting as there are many other pressing issues demanding priority. However, lessons learned from the studies included in the literature review inform what steps may be taken to ensure eventual success for AHL. Based on these lessons, the following recommendations should be considered:

1. **Make the stars align**—As demonstrated in the Action Schools! BC example, political opportunities should be exploited to draw attention to and gain allies for the AHL program. Of note, Durham is a “Let’s Move” City—part of Michelle Obama’s campaign against childhood obesity (http://www.letsmove.gov/officials-step-1.php), which just celebrated its one-year anniversary in February 2011.⁸ Combine this fact with the Democratic National Committee’s choice of Charlotte, NC, as the host for its 2012 nominating convention, and the scene is set for Durham’s government officials to make a showcase of the city and its efforts to align itself with the presidential agenda for childhood wellness. A potential ally in this effort would be the superintendent of Durham Public Schools, Dr. Eric Becoats, who was appointed in 2010. Dr. Becoats unveiled a new strategic plan for the school system in January 2011 (http://www.dpsnc.net/stratplan/pdf/dpsstrategicplan.pdf), a portion of which concerns student wellness and safety. Capitalizing on this change in leadership and the possibility for national attention in conjunction with the 2012 presidential election, interest in the AHL objectives could

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⁸ Per Appendix B, the Let’s Move Campaign has been active in Durham, with community-based weight-loss programs being established via local churches and the Durham County Health Department, as well as through the national TOPS (Taking Off Pounds Sensibly) organization.
be ignited among local government leaders with resources and policy-making clout to commit. Hopefully, armed with some baseline data (e.g., BMI measurements of Y.E. Smith students pre- and post-AHL, end-of-grade test scores across successive years both before and after AHL), these leaders may be convinced of the integral role of health and fitness in achieving academic success. Ideally, as Becky Posada observed, AHL could become part of the “culture of the school”—not an extracurricular undertaking but rather an essential component of the curriculum (B. Posada, personal communication, February 28, 2011). This can only be accomplished through widespread buy-in at the legislative level, and so every possible avenue to influence should be explored and exploited as appropriate.

2. **Grow the AHL infrastructure**—The core team overseeing the AHL program should be expanded to include more local government leaders (see point 1 above) and the local business community. Presently, members of the team abound in good intentions and have some resources to devote to the effort, but an influx of policy-making power and financial support would increase the program’s visibility and credibility among the target population as well as among untapped allies in the community. Additional data collection sources might be accessed (via various government agencies), policies could be changed (e.g., zoning, parks/recreation), and money could be applied toward a social marketing campaign and incentive program to educate and motivate the target population. A recent alliance with the like-minded East Durham Children’s Initiative ([www.eastdurhamchildrensinitiative.org](http://www.eastdurhamchildrensinitiative.org)) should be strengthened as a means to further boost the program’s profile, potentially increasing its appeal to locally based funders.

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9 A 2009 effort to generate neighborhood plans for six areas comprising northeast central Durham enlisted more than 50 local government agencies and businesses. These stakeholders may be viewed at [http://www.ci.durham.nc.us/departments/nis/necd/pdf/necd_gen_plan.pdf](http://www.ci.durham.nc.us/departments/nis/necd/pdf/necd_gen_plan.pdf) (UNC Dept. of City and Regional Planning, 2009).
who can align themselves with AHL’s approach to childhood obesity prevention and fund much-needed AHL staff positions.

Committees should also be formed, along the lines of those seen in the CLOCC effort: an executive committee (comprising key leadership), an external advisory board (with broad community representation), and a corporate advisory committee (to oversee efforts to enlist local business and raise funds to sustain the program). Each of these bodies should include at least one prominent community member from northeast central Durham and at least one Y. E. Smith staff member; inclusion of these individuals will ensure that discussions and plans are based in reality, dictated more by on-the-ground circumstances instead of theoretical possibilities. Smaller, task-oriented working groups might also be considered to facilitate more collaboration among various AHL volunteers who may find it difficult to attend larger, AHL-wide meetings scheduled during the work day. This will open up volunteer opportunities to a broader swath of the community and perhaps will nurture more community ownership of the program. Finally, money needs to be found to fund a full-time staff position to oversee communication among the various stakeholders and to augment community outreach efforts.

3. **Expand the evidence base**—As mentioned above, northeast central Durham presents numerous challenges in measuring outcomes over time. Accordingly, the AHL team should think creatively about potential means for quantifying success, including use of some of the survey tools mentioned in the CATCH BPC intervention outlined in the literature review. Additionally, they might enlist assistance from faculty and students in health outcomes research at local universities such as Duke and the University of North Carolina at Chapel Hill to develop and validate new measures (as part of their ongoing research and training efforts) to undergird
evidence-based public health practice. Furthermore, potential funders will need to be educated both about the difficulties inherent to measuring behavior change in this challenging context and the legitimacy of such alternate measures of health and behavior change. Such conversations will likely stress the need for proven effectiveness versus efficacy when dealing with an unstable and impoverished environment like northeast central Durham. Additionally, more traditional measures (such as BMI z-score) may be used if the population is over-sampled to account for its transience and instability.

4. **Foster community ownership**—Critical to long-term sustainability of this effort is the nurturing of program ownership among the people living in northeast central Durham. The addition of a full-time staff person will aid in getting the word out about AHL objectives and events. Even more support might be gained, however, by tapping community organizing networks both locally and nationally. Because the target area has a mostly African-American population, assistance from local African-American service organizations should be solicited to support AHL programming. For example, the Durham chapter of The Links, Inc. ([www.links.org](http://www.links.org)) has signed on as a community partner, although the partnership has not yielded tangible results to date; avenues for future collaboration with this organization are being explored.\(^{10}\) Other options include SpiritHouse NC, a Durham-based cultural organizing collective that engages people of color, women, and teens in leadership roles for community-

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\(^{10}\) With a membership of over 12,000 professional women of color in 42 states, the Links is a volunteer service organization with a mission to “enrich, sustain, and ensure the culture and economic survival of African Americans and other persons of African ancestry.” The Southern Area of The Links secured a grant in 2010 to establish the Commission on Childhood Obesity Prevention, a panel comprising national health experts who meet to determine long-term solutions for addressing childhood obesity. North Carolina is one of the states of interest for this commission, and so the AHL team might propose that northeast central Durham serve as a “laboratory” for the commission’s work.
driven strategies to improve quality of life (www.spirithouse-nc.org), and the Durham Striders Youth Association, a Durham-based volunteer organization that provides track-and-field training for children between the ages of 6 and 18 years (www.durhamstriders.com). Furthermore, as Becky Posada suggested, local churches could be asked to ―adopt‖ a school in northeast central Durham, providing a steady stream of volunteers to assist with various activities, as well as spreading the word in the community.11

Because childhood obesity may be framed as a social justice issue (in terms of its socio-economic roots), national volunteer organizations could be contacted about the possibility of recruiting community organizers to help mobilize neighborhoods and families to make the changes needed—at the policy, community, organizational, and individual levels—to prevent obesity among their children. Such organizations might include Americorps and Volunteers in Service to America (VISTA).12 Opportunities for semester-long, credit-earning internships through local institutions such as UNC-Chapel Hill, Duke, and North Carolina Central University should also be explored. The more individuals who can be on the ground, spreading the word, and getting people excited about behavior change for healthier living, the more likely it

11 A number of churches in northeast central Durham have a history of community involvement, most notably Union Baptist on the border of Old Five Points and Cleveland-Holloway. The AHL team should capitalize on the strong relationship that it has already formed with Union Baptist and expand its reach to include other churches in the area, such as: Shabach Ministries in Old Five Points; Full Gospel Holy Church on Ashe Street; Angier Avenue Baptist Church at Angier Avenue and Driver Street; and Antioch Baptist Church on Holloway Street (UNC Dept. of City and Regional Planning, 2009).

12 In fact, Durham Health Innovations is currently in the process of hiring three community health organizers. These positions will be full-time under a six-month contract, with the potential of continued funding. According to the job posting, the organizers “will engage community leaders and residents to address neighborhood health and wellness issues, build community capacity and support within communities, and organize community and civic organizations interested in chronic health conditions and wellness concerns.” Ideally, AHL will be able to claim some of the organizers’ time by virtue of its connection (past and present) to Duke.
is that AHL’s objectives will be met and sustained beyond the duration of the program.

As was seen in the literature review and is represented by the above recommendations, there is no cut-and-dry, one-size-fits-all solution to the problem of childhood obesity. The socio-ecological model shows promise for addressing the many factors that contribute to childhood weight gain, but the application of the model remains an experiment in trial and error based on the setting. One lesson, however, seems to stretch across all of the programs examined in this paper; that is, it takes a village to raise a healthy child, or, more specifically, a village and a government and a school and a family.
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unhealthy weight gain in children through community capacity-building: results of a


### APPENDIX A. Socio-ecological components of community-based efforts to combat childhood obesity

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<th>Study</th>
<th>Target population</th>
<th>Factors targeted for intervention</th>
<th>Outcomes</th>
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<tbody>
<tr>
<td>Naylor et al. (2006), ACTION Schools! BC</td>
<td>School-aged children (grades 4–7) in British Columbia (BC), Canada</td>
<td><strong>Intrapersonal</strong> (---) <strong>Interpersonal</strong> (---) School principals and faculty engaged in various advisory committees and evaluation focus groups</td>
<td>BC Recreation and Parks Assoc., Heart and Stroke Foundation of BC, Univ. of BC engaged in model development</td>
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<tr>
<td>Economos et al. (2007), Shape Up Somerville (SUS)</td>
<td>Children (n=1178) in grades 1–3 at public elementary schools in 3 Massachusetts cities</td>
<td><strong>Intrapersonal</strong> (---) Parent outreach and education, family events, children’s Health Report Cards</td>
<td>Training of school staff on nutrition/physical activity, changes to schools menus, nutrition/P.E. curricula for school and after-school, enhanced recess equipment, walk to/from school campaign</td>
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<td>Study</td>
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| Becker et al. (2008), CLOCC  | Children in Chicago, IL, with special focus on obesity prevention in children ages 3–5 years | - Intrapersonal: ---  
- Interpersonal: Public education campaign targeting families  
- Organizational: BMI data collection via school health forms, education efforts in schools (*Chicago Kids Go!*))  
- Community: Training Chicago healthcare providers on obesity screening technology, creation of referral network for obesity mgmt., use of “vanguard communities” to mobilize, develop capacity, intervene, and evaluate  
- Policy: Development of CLOCC legislative agenda, passage of 4 key policies into IL law, current focus on city-level policies | Evaluation plan includes: studies of knowledge, attitudes, behaviors re: childhood obesity, nutrition, and exercise; monitoring of childhood obesity prevalence; mapping of community features; inventory of community-based programs to facilitate healthy living |
| Sanigorski et al. (2008), Be Active Eat Well (BAEW) program | Children aged 4–12 years in Colac, Australia (n=833)  
- Promotional materials (stickers, balloons, etc.) and newsletters targeting children to induce behavior change; Kids Day Out event to encourage outdoor activity participation  
- Parent tip sheets re: program objectives, Happy Healthy Families program (6-week small group intervention)  
- School nutrition policies implemented, training for school staff and faculty on program objectives, cafeteria menu changes and taste tests, walk-to-school days, after-school physical activities expanded, sporting club coach training and  
- Fresh foods tasting and fruit displays at local markets, community garden created, social marketing campaign, obesity prevention training for area healthcare providers | Integration of program strategies into Colac health promotion plan, municipal public health plan, and municipal early years plan | Colac children gained less weight, showed lower increases in waist size and BMI z-scores than children in the control community |
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<td><strong>Intrapersonal</strong> <strong>Interpersonal</strong> <strong>Organizational</strong> <strong>Community</strong> <strong>Policy</strong></td>
<td></td>
</tr>
<tr>
<td>Chang et al. (2010), Nemours program</td>
<td>Delaware’s population of 207,000 children ages 2–17 years</td>
<td>5-2-1-Almost None social marketing to change eating and physical activity behaviors among children</td>
<td>Strngthened school wellness policies, training to staff on wellness policy, implementation of student fitness tests, BMI measurements (optional), increased P.E. time</td>
</tr>
<tr>
<td>Chomitz et al. (2010), Healthy Living Cambridge Kids</td>
<td>Children in grades K–5 in Cambridge, MA, public schools (n=1858)</td>
<td>Health and fitness progress reports distributed annually to all K–8 students via mail</td>
<td>School policies and systems changes (e.g., wellness policy, nutrition guidelines, food purchasing from local farms), P.E. expanded to new</td>
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<td>nutrition counseling offered</td>
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<td>activities, P.E. teacher</td>
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<td>training and development, before-</td>
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<td>expanded, school garden</td>
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<td>established, nutrition education</td>
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<td>introduced, school food service</td>
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<td>improved by new recipes, “taste</td>
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<td>test” events, staff training,</td>
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<td>and farm-to-school activities</td>
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<td>Faculty and staff</td>
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<td>training, CATCH</td>
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<td>program materials, teacher-led</td>
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<td>activity breaks, school-based</td>
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<td>social marketing, CATCH</td>
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<td>committee meetings and facilitator</td>
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<td>and community membership on</td>
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<td>CATCH committee, community health</td>
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<td>promotion activity guide</td>
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<td>Trained staff on P.E. and</td>
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<td>nutrition standards, hired P.E.</td>
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<td>specialists, expanded P.E. class</td>
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<td>time and resources, introduced</td>
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<td><strong>Community</strong></td>
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<td>community orgs. to promote 5-2-1,</td>
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<td>community fitness program</td>
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<td>implemented, physical activity</td>
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<td>directories distributed</td>
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<td>scores improved for all children</td>
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<td>(14.6% increase in percent passing</td>
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<td>all 5 tests)</td>
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<td>Hoelscher et al. (2010), CATCH-BPC program</td>
<td>1107 elementary school students in 30 Travis Co., TX, schools</td>
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<td></td>
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<td>Family Fun Nights</td>
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<td>Samuels et al. (2010), HEAC program</td>
<td>885,000 elementary, middle, and high school children located across</td>
<td>Enlisted youth to assess food marketing in schools and neighborhood stores, promoted</td>
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<td>Parental involvement in school wellness policy committees</td>
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<td>Trained staff on P.E. and nutrition standards, hired P.E. specialists, expanded P.E. class time and resources, introduced physical</td>
<td>Developed county vending policies, included ban on unhealthy food marketing in in district wellness</td>
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<tr>
<td>Study</td>
<td>Target population</td>
<td>Factors targeted for intervention</td>
<td>Outcomes</td>
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<td><strong>Intrapersonal</strong></td>
<td><strong>Interpersonal</strong></td>
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<tr>
<td>6 low-income California communities</td>
<td>child weight management programs</td>
<td>activity into after-school program</td>
<td>in obesity screening and prevention</td>
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</tbody>
</table>
### APPENDIX B. Socio-ecological components of Achieving Health for a Lifetime, Durham, NC—2010 to 2011

<table>
<thead>
<tr>
<th><strong>Intrapersonal</strong></th>
<th><strong>Interpersonal</strong></th>
<th><strong>Organizational</strong></th>
<th><strong>Community</strong></th>
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<tr>
<td>USDA Fruit and Vegetable (F&amp;V) grant provides samples of fresh produce for student sampling during the school day, expanding children’s palates for healthy foods</td>
<td>Nutrition lessons related to the F&amp;V grant are being sent home to parents; these include nutritional information, shopping tips, and recipes involving foods introduced in the classroom</td>
<td>Nutrition lesson notebooks have been made available for teachers participating in the F&amp;V grant program</td>
<td>A teacher walking program has been introduced to motivate teachers to get more physically active outside of the school day and to model healthy behaviors in their communities</td>
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<td>Students are participating in a walking program designed to reward at-home exercise through distance-tracking and incentives</td>
<td>The student walking program may result in children enlisting their families to join them on their walks</td>
<td>Durham Co. Health Department’s (DCHD) optional “Dine for Life” nutrition education program has been expanded to include more lessons and classrooms</td>
<td>Overweight and obese students are being referred to the DCHD and the Duke Healthy Lifestyles program for weight loss counseling</td>
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<tr>
<td>Letters have been sent to notify parents of their children’s BMI measurements in the overweight and obese categories; these include information about available health counseling and services for the family</td>
<td>Classroom physical activity lesson notebooks have been made available to teachers interested in bringing exercise into the classroom</td>
<td>After-school and summer exercise programs were introduced in 2010 and continue in 2011</td>
<td>Cooking classes for overweight and obese students are being provided by Operation Frontline (a program of the locally based Inter-Faith Food Shuttle)</td>
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<td>BMI measurements are being taken from students on an annual basis to inform parents about potential weight problems and to track overall AHL progress and impact</td>
<td>A Student Wellness Ambassador Program (SWAP) is being developed to enlist and train students to advise their peers on health topics</td>
<td>A Student Wellness Ambassador Program (SWAP) is being developed to enlist and train students to advise their peers on health topics</td>
<td>TOPS (Taking Off Pounds Sensibly; <a href="http://www.tops.org">www.tops.org</a>) weight loss support groups are being established in the community as part of the national Let's Move Faith Communities initiative</td>
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<td>A DCHD lay-led exercise program is underway; DCHD teaches church members to organize simple exercise programs based on walking clubs or existing videotaped exercise routines; also part of the Let's Move Faith Communities initiative</td>
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</tbody>
</table>