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# Targeting obesity to reduce the risk for type 2 diabetes and other co-morbidities in African American youth: a review of the literature and recommendations for prevention

CHINYELU O NWOBUR, CAROLYN C JOHNSON

## Abstract

**O**ver the last decade, the prevalence of obesity has continued to rise within the adolescent population of the US. Data show that African American youth are disproportionately affected by the obesity epidemic due to their higher risk for obesity-related co-morbidities, such as type 2 diabetes. Interventions that target risk factors for obesity at the individual, family and community levels are needed in order to prevent the onset of type 2 diabetes and related complications. This article provides an overview of the prevalence of obesity and type 2 diabetes in African American youth, the pathophysiology of the disease, and the behavioural risk factors that have contributed to its high prevalence within the African American adolescent population. Successful intervention strategies that target modifiable risk factors, such as diet and physical activity, will be identified. Finally, recommendations for programmes to prevent the onset of type 2 diabetes within the African American adolescent population are presented.

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**Key words:** African American youth, obesity, prevention, recommendations, type 2 diabetes.

## Introduction

The increased prevalence of obesity in the US is not only an adult concern since its prevalence has risen among children

and adolescents.<sup>1</sup> Consequently, youths under the age of 18 years are suffering from adult-related diseases and complications. The Centers for Disease Control and Prevention (CDC) define youth with a Body Mass Index (BMI) above the 85th percentile as being at risk for overweight, and those with a BMI above the 95th percentile as being overweight.<sup>2</sup> Children who present with a weight 20% above ideal weight are designated as obese according to CDC guidelines.<sup>3</sup> Because this excess weight is associated with severe physiological and psychological outcomes, adolescents with a BMI above the 85th percentile are usually classified as overweight and those above the 95th percentile as obese.<sup>4</sup>

In 2004, the National Health and Nutrition Examination Survey (NHANES) reported that 37.2% of children aged 6–11 years and 34.3% of adolescents aged 12–19 years were overweight. More than 17% of persons within these two age groups were classified as obese.<sup>1</sup> Minority youth were significantly affected by this problem inasmuch as 20% of African Americans and 19.2% of Mexican Americans were classified as obese compared with 16.3% of their Caucasian counterparts.<sup>1</sup> Among the African American population, 23.8% of girls between the ages of two and 19 years were considered obese, exceeding the national average and prevalence among other ethnic subgroups.<sup>1</sup> The onset of these racial differences typically occurs during puberty, when weight increases more in African Americans compared with their Caucasian peers.<sup>5</sup>

Studies have shown that as many as 80% of overweight or obese adolescents will become obese adults, predisposing this population to complications such as hypertension, dyslipidaemia, gallbladder disease, and nephrotic and vascular diseases at earlier stages of adulthood.<sup>6,7</sup> Obesity and increased weight gain have also been linked as major risk factors for type 2 diabetes during childhood and adolescence. Children as young as four years of age have been diagnosed with type 2 diabetes, with the average age of onset being 13 years.<sup>8</sup> According to the National Institute of Diabetes and Digestive and Kidney Diseases, minority youth with type 2 diabetes are at higher risk of developing diabetes-related complications than their Caucasian counterparts.<sup>9</sup> Because the life expectancy of a child who develops type 2 diabetes before the age of 15 is reduced by 27 years,

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children within this subpopulation may not live as long as their parents.<sup>10</sup>

Evidence-based prevention programmes have shown that childhood and early adolescence are optimal time periods to prevent the onset of obesity, mainly because it is a critical period prior to the establishment of adult patterns of behaviour.<sup>11</sup> By targeting modifiable risk factors for obesity, such as diet, physical activity and the child's built environment (i.e. community infrastructure), the onset of type 2 diabetes and its related complications can be prevented or at least delayed. While the prevention of obesity would also have positive influences on other health problems such as hypertension and vascular disease, we will focus on its impact on type 2 diabetes. In this article, we will review the link between adolescent obesity and type 2 diabetes, the pathophysiology of diabetes, and lifestyle factors that have contributed to its onset within the African American adolescent population. We will also review interventions that were effective in targeting modifiable risk factors associated with obesity, and present recommendations for programmes to prevent or delay the onset of type 2 diabetes within African American youth.

### Adolescent obesity and type 2 diabetes

The prevalence of type 2 diabetes among African American youth has paralleled the increasing rates of obesity within this population. Since 2003, type 1 diabetes is no longer the major form of diabetes diagnosed among African American youth.<sup>12</sup> Among adolescents aged 10–19 years diagnosed with diabetes, 57.8% of African Americans were diagnosed with type 2 versus type 1 diabetes, compared with 46.1% of Hispanic and 14.9% of Caucasian youth.<sup>12</sup> These rates correspond with the increased incidence of metabolic syndrome or insulin resistance syndrome that has been found among obese African American youth.<sup>13</sup> Metabolic syndrome is a combination of risk factors that includes abdominal obesity, dyslipidaemia, hyperinsulinaemia and hypertension.<sup>14</sup> Obesity is linked as a primary cause of this syndrome due to its trigger of excess insulin production.<sup>14</sup> The elevated insulin response is a manifestation of up-regulated pancreatic beta cell function, which could possibly lead to its progressive decline and onset of type 2 diabetes.<sup>15</sup>

### Pathophysiology of type 2 diabetes among African American youth

Type 2 diabetes, the most common form of diabetes, manifests either when the body does not produce enough insulin to compensate for an increased glucose load and/or when the peripheral tissues in the body become resistant to insulin.<sup>16</sup> The disease is clinically diagnosed when an individual has an elevated fasting blood glucose level > 125 mg/dL (6.9 mmol/L), an elevated random blood glucose level > 200 mg/dL (11.0 mmol/L) with diabetic symptoms (e.g. polydipsia, polyuria and blurred vision), or a high serum glucose level two hours after a 75 g oral glucose tolerance test > 200 mg/dL (11.0 mmol/L).<sup>16</sup>

The greatest risk of type 2 diabetes among youth has been shown to occur during mid-puberty, when insulin resistance is at its highest.<sup>17</sup> Adolescents who are unable to recov-

er from this period of insulin resistance may have an increased risk of sustaining this pathophysiology, leading to beta cell failure and onset of type 2 diabetes.<sup>16,17</sup> The most at-risk adolescents are overweight, have a positive family history of diabetes, are members of an at-risk race or ethnicity (African American, Hispanic, Native American, Asian or Pacific Islander), and have signs or symptoms indicative of insulin resistance.<sup>11</sup>

On average, obese African American children have higher levels of insulin secretion due to their increased sensitivity to high energy-content foods and higher rates of insulin resistance.<sup>7</sup> In addition, it has been noted that having a parent with type 2 diabetes contributes to insulin resistance in African American children as early as the age of 10 years.<sup>18</sup> Increased insulin resistance in childhood can lead to impaired glucose tolerance, predisposing these children to overt diabetes.<sup>15</sup>

### Factors contributing to increased diabetes prevalence in African American youth

As discussed above, obesity is a major risk factor for type 2 diabetes in African American children and adults. Factors observed in the literature that contribute to obesity in African American youth, and thus to the onset of type 2 diabetes, are described below.

#### *Cultural beliefs*

Cultural influences and social norms within the African American population have helped to perpetuate the increasing prevalence of obesity and type 2 diabetes. Many African American teenagers describe overweight in terms of overeating or consuming foods high in sugar rather than as a sign of poor health or increased body weight.<sup>19</sup> In addition, being 'big boned' (a term used to indicate increased size) is typically acceptable and even desirable to the African American culture.<sup>20</sup> Many African American girls see themselves as healthy despite their increased size or weight and control their diet primarily to increase their level of attractiveness rather than to improve their health status.<sup>19</sup>

The beliefs of minority youth tend to reflect those of their parents. African American adults who decide not to have their overweight child participate in weight management or diabetes screening programmes feel that their child's size is not of medical concern and believe they will eventually grow into their weight.<sup>21</sup> Their children's weight only becomes a matter of concern if their level of activity decreases or they experience sustained teasing by their peers.<sup>20</sup> According to a study performed by Jain *et al.*, many African American mothers did not consult or rely on growth charts to define their child's weight status, felt that 'obesity' did not apply to children or adolescents, and described obesity as a condition that impairs one's level of mobility.<sup>20</sup>

#### *Physical activity and dietary behaviours*

Despite African American adolescents' increased susceptibility to type 2 diabetes, they are generally not engaging in healthy behaviours to prevent its occurrence. In a study of Chicago inner-city youth, only 26% of African American

**Table 1. Characteristics of included childhood/adolescent obesity prevention programs**

Study	Sample	Design	Intervention	Outcome variables	Result*
<i>Sports, Play and Active Recreation for Kids (SPARK)</i> San Diego, CA <sup>35,36</sup>	955 students 4th–5th grade 7 elementary schools Male/female AA, Asian/Pacific Islander, Caucasian, Latino Mean age: 9.49–9.62 years	Quasi-experimental 1.5 years 3 study conditions: PE specialist-led; teacher-led; control Aim: increase physical activity within/outside school environment	PE classes Newsletters Homework	PA: self-report & accelerometry Fitness: muscle strength & CV endurance Anthropometric: BMI & skinfold thickness	Increased levels of PA in school and fitness among girls No change in PA outside of school No reported change in BMI
<i>Stolley &amp; Fitzgibbon</i> Chicago, IL <sup>37</sup>	65 AA girls & mothers Group sessions of mother-daughter dyads Age: 7–12 years	RCT 12 weeks Aim: low-calorie, low-fat diet	Culturally-sensitive curriculum Parent participation	BMI Dietary intake	Decreased fat intake & fat calories in mothers & daughters Decreased dietary cholesterol in mothers Increased parental support No change in BMI
<i>Project Heart</i> Baltimore, MD <sup>38</sup>	88 girls 8th–9th grade girls in top tertile for BP Female public high school AA & Caucasian	RCT 18 weeks Aim: to lower BP and increase cardiorespiratory fitness	Daily 50-minute aerobic exercise classes with didactic instruction throughout 18-week semester	BP Cardiorespiratory fitness BMI	Decreased mean exercise HR Decreased mean resting systolic BP No change in BMI
<i>Planet Health</i> Boston, MA <sup>39</sup>	1,295 students 6th–7th grade 10 schools Male/female Caucasian, AA, Latino, Asian/Pacific Islander, American Indian	RCT 18 months Aim: increase PA & F/V intake; decrease fat intake & TV-watching time	PE classes Interdisciplinary curriculum	BMI Triceps skinfold thickness Self-reported TV/video watching Dietary intake MVPA levels	Increased daily intake of F/V Decreased daily hrs of TV viewing by boys & girls Decreased BMI and triceps skinfold thickness in girls
<i>Child &amp; Adolescent Trial for Cardiovascular Health (CATCH)</i> CA, LA, MN, TX <sup>40</sup>	5,106 students 3rd–5th grade 96 schools Male/female Caucasian, AA, Latino	RCT – Multisite study 3 years 3 conditions: school intervention; school + family intervention; control Aim: decrease consumption of total fat, saturated fat & salt; Increase PA levels in PE class & overall	PE classes Health education curriculum School food service Parent programme	Physical activity levels Analysis of macronutrients of food service meals Dietary intake BMI, skinfold thickness BP, dietary & serum cholesterol Self-report of knowledge, self-efficacy & social support	Increased levels of MVPA during & after school Decreased fat content in school meals Decreased individual fat intake Increased salt consumption No changes in BMI, BP or serum cholesterol Increased knowledge, self-efficacy & social support No additional effects for family participation
<i>Child &amp; Adolescent Trial for Cardiovascular Health (CATCH)</i> CA, LA, MN, TX <sup>41</sup>	3,714 students 6th–8th grade	Tracking & measurement follow-up study Aim: determine sustainability of behavioural intervention effects	No intervention – tracking & measurement only	Individual measurements of dietary intake, PA and health habits survey BP & serum cholesterol	Sustained lower levels of fat intake and higher levels of PA Positive social for PA declined

*continued*

**Table 1. Characteristics of included childhood/adolescent obesity prevention programs (continued)**

Study	Sample	Design	Intervention	Outcome variables	Result*
<i>El Paso Coordinated Approach to Child Health (CATCH) TX, NM</i> <sup>42</sup>	896 students 3rd grade 8 schools Male/female 93% Latino Age: 8–9 years	RCT Dissemination study of the original CATCH Programme 6 months Conditions: 4 intervention schools, 4 control schools Aim: to assess impact of CATCH programme on low-income Hispanic students	The national CATCH programme: health education, PE, school food service modification, PA	BMI, waist/hip ratio, waist circumference, triceps skinfolds, aerobic fitness	Increased MVPA Decreased levels of fat intake Decreased percentage of girls at risk for overweight (BMI $\geq$ 85th percentile)
<i>Eat Well &amp; Keep Moving Baltimore, MD</i> <sup>43</sup>	336 students 4th grade 6 schools Male/female > 90% AA	Quasi-experimental 2 years Aim: improve dietary intake; decrease TV viewing; increase MVPA	Integrative multi-disciplinary curriculum Eat Well cards Health-related campaigns Coalition for parental involvement	Dietary intake PA levels Hours spent watching TV Knowledge of healthy food/activity choices	Increased dietary knowledge Decreased % total energy from fat Increased F/V intake No change in TV viewing
<i>Cardiovascular Health in Children Study (CHIC) North Carolina</i> <sup>44</sup>	2,109 students 3rd–4th grade 18 schools Age: 7–12 years Male/female AA, Caucasian, Asian, Latino, Native American Age: 7–12 years	RCT 8 weeks 3 conditions: public health approach, risk-based approach, control Aim: to reduce risk factors for cardiovascular disease	Know Your Body program Risk-based: assigned to smoking/nutrition classes based on elevated risk factors Public health: health education/PA 3x/week	BP, total serum cholesterol, aerobic power, BMI	Increased knowledge & decreased blood cholesterol in public health group Increased PA in risk group Decreased body fat & systolic BP in both intervention groups
<i>San Jose Study San Jose, CA</i> <sup>45</sup>	192 students 3rd–4th grade 2 schools Male/female 80% Caucasian Mean age: 8.9 yrs	RCT 6 months Aim: to reduce TV, video game and video viewing	Classroom curriculum TV turn-off campaign Parent newsletters Electronic TV time manager	BMI, triceps skinfolds, waist circumference, waist/hip ratio, hours of TV etc. viewing, PA, dietary intake, cardiorespiratory fitness	Decreased BMI, waist circumference, skinfolds & waist/hip ratio. Decreased TV viewing & video game playing
<i>Promoting Lifestyle Activity for Youth (PLAY) Arizona</i> <sup>46</sup>	606 students 4th grade Stratified sample of 35 schools Male/female Ethnicity not specified Mean age: 9.8 years	RCT 12 weeks 4 conditions: PLAY/PE, PE only, PLAY only, control Aim: increase MVPA	Promotion of student-directed/teacher-led activities 15 teacher-led activities (15 minutes daily) PLAY protocol Student activity log	BMI Level of PA	Increased PA for girls, not boys No BMI differences
<i>Physical Activity and Teenage Health (PATH) Queens County, NY</i> <sup>47</sup>	442 girls 3 high schools Caucasian, AA, Latino, Asian American Age: 14–19 years	RCT 12 weeks Aim: promote behaviour change in CVD risk factors, heart health knowledge & fitness levels	Personal wellness course Nutrition education MVPA behavioural modification	BMI, % body fat, resting BP, maximum O <sub>2</sub> uptake, total serum cholesterol, heart health knowledge	Decreased % body fat, systolic & diastolic BP Increased breakfast consumption & self-perception of health No changes in total serum cholesterol, oxygen uptake or BMI

*continued*

**Table 1. Characteristics of included childhood/adolescent obesity prevention programs (continued)**

Study	Sample	Design	Intervention	Outcome variables	Result*
<i>Family Fitness Program</i> Humbolt County, CA <sup>48</sup>	283 students 3rd grade 6 schools 15 classrooms Caucasian, Native American, Asian, Hispanic, AA Male/female Mean age: 8.6 years	RCT 20 weeks 9 programme classrooms 6 control classrooms Aim: modify behaviours that are CV risk factors	Family fitness score cards 3–30 minute PE classes 2–30 minute nutrition education classes Home activities with parents	BMI, skinfolds, total serum cholesterol, PA & nutrition knowledge, dietary intake	Increased PA & nutrition knowledge Decreased total fat intake No changes in BMI, fitness or skinfolds
<i>Medical College of Georgia FitKid Project</i> Georgia <sup>49</sup>	601 elementary students 3rd grade 18 schools Average age: 8.7 years Male/female AA, Caucasian, Asian, Latino, Other	RCT 12 months Aim: reduce body fat	After-school programme with academic activities Healthy snacks 80 minutes age-appropriate PA	BMI, % body fat, waist circumference, BP, bone mineral density	Decreased % body fat Increased bone density Increased CV fitness Lower BMI, more PA
<i>Wellness, Academics &amp; You</i> DE, FL, KS, NC <sup>50</sup>	1,013 students 4th–5th grade 69 classes	RCT 1 year Aim: decrease overweight & related co-morbidities & improve academic functioning	Daily journaling & class discussions Health education, self-assessment and PA modules	BMI, dietary intake, PA	Decreased BMI Increased daily consumption of F/V Increased PA levels
<i>Bright Bodies Weight Management Program</i> New Haven, CT <sup>51</sup>	209 children with BMI $\geq$ 95th percentile Male/female AA, Caucasian, Latino Age: 8–16 years	RCT 12 months Aim: increase healthy food choices & decrease BMI	Provide 50 minutes of PA twice a week 40 minutes of behavioural modification once a week Coping skills training High-intensity PA 3x/week at home	BMI, % body fat, BP, blood lipid & glucose	Decreased % body fat & total body fat Decreased total serum cholesterol Decreased fasting insulin at 6 & 8 months Decrease in BMI and body weight No weight gain over 12 months No change in BP

**Key:** BMI = Body Mass Index; RCT = randomised controlled trial; AA = African American; BP = blood pressure; PA = physical activity; F/V = fruit/vegetable; PE = physical education; CV = cardiovascular; HR = heart rate; MPVA = moderate-to-vigorous physical activity; \*Significant change in outcome in intervention groups compared to control

adolescents engaged in more than 20 minutes of moderate-to-vigorous physical activity (MVPA) each day, while 71% spent four or more hours each day watching TV, using the computer or playing video games.<sup>22</sup> Other studies have shown that minority youth engage in lower levels of physical activity when compared with other ethnic populations.<sup>23</sup>

In addition, up to 70% of African American adolescents drank soda more than twice a day and 55% consumed fried foods, such as chicken and pork chops, at the same frequency.<sup>22,24</sup>

Compared with their Caucasian counterparts, data have shown that African American mothers more typically moni-

tored their children's diets by restricting food intake for higher weight children and pressuring lower weight children to eat more.<sup>25</sup> Research has shown, however, that these activities only increased unhealthy eating among children and adolescents. Restriction of specific foods for children and adolescents seemed to increase the foods' likeability and led to their over-consumption.<sup>26</sup>

#### *Environmental factors*

In the home environment, children are exposed to numerous television commercials encouraging the consumption of foods high in fat, soft drinks, and snacks with large amounts

of excess calories.<sup>26</sup> Within the African American culture, traditional foods such as ribs, pork chops and fried chicken contain large amounts of fat and cholesterol.<sup>27</sup> In addition, due to price and transportation, parents may select foods that are high in fat due to their low cost and close proximity to the home. Limited time for those parents who work outside the home needs to be considered, as this factor may prevent consistent preparation of nutritious meals for their children and adolescents.<sup>28</sup>

High crime rates and deficient street lighting in low-income neighbourhoods discourage African American parents from allowing their children to play outdoors.<sup>29</sup> Within these communities, there are limited avenues for physical activity, such as minimal or no walking paths, bike paths, parks or recreational facilities that promote MVPA.<sup>29</sup> Obesity within the United States' minority population has been described as 'the creation of an environment where highly palatable foods are easily accessible to all at low cost and physical activity is not required.'<sup>30</sup> Within this environment, unhealthy activities (high-fat diets and insufficient physical activity) are promoted to a population that is susceptible to chronic disease.

Nonetheless, the Diabetes Prevention Program of the CDC has shown that at-risk individuals can reduce the threat of type 2 diabetes by 58% by consuming a diet low in total and saturated fat and engaging in MVPA for at least 30 minutes every day.<sup>31</sup> Additional studies have demonstrated that these healthy behaviours can improve insulin sensitivity, decrease insulin and fasting glucose, and reduce intra-abdominal fat among adolescents, thus preventing the onset and manifestation of type 2 diabetes.<sup>32-34</sup> Encouraging the adoption of these behaviours by children and young adolescents can yield healthy lifestyle changes that can last into adulthood.

### Evidence-based interventions to prevent obesity

Table 1 summarises evidence-based research intervention studies over the last 10 years that have successfully targeted modifiable risk factors for obesity in children and adolescents. The following inclusionary criteria were used: peer-reviewed studies conducted within the US, a study sample consisting of children between the ages of 6–18 years, a primary objective of the prevention of overweight or obesity through lifestyle modification (diet and/or physical activity), and the use of a control group for quantitative evaluation. In addition, at least one relevant parameter was to be used as an outcome measure: BMI, waist circumference, percent body fat, and skinfold thickness (triceps/biceps). Programmes targeting cardiovascular health were also included. Pilot studies, studies used to treat children with critical illnesses, and studies that targeted college students or teens above the age of 18 years were excluded. The studies listed in the table include effective interventions that made a significant impact on health-related knowledge, dietary intake, physical activity, weight loss or maintenance.

Table 1 shows that selected studies targeted various populations on the basis of sex, age, race and obesity status. The majority of studies targeted children and adolescents within the school environment.<sup>35-50</sup> Generally, these programmes

emphasised modification of the nutritional content of school meals,<sup>40,42</sup> provided classroom education about physical activity, diet, obesity and related co-morbidities,<sup>35,36,38-40,42-45,47-50</sup> and created a school environment that supported healthy lifestyle changes.<sup>35,36,38-40,42-50</sup> Health education was shown to be effective in improving children's knowledge about obesity and its related co-morbidities, healthy dietary habits, and various forms of physical activity. Through daily journaling, peer-based activities and educational modules that emphasised label reading, students were provided with a curriculum that emphasised the importance of diet and exercise and how these factors can help to decrease their risk of obesity, type 2 diabetes and cardiovascular disease.<sup>35,36,38-40,42-51</sup> Many of these modules were integrated into physical education classes<sup>35,36,38-40,42,44,47-51</sup> and the cafeteria environment<sup>40,42</sup> for environmental support and reinforcement.

Dietary modifications included changes in food service preparation, delivery and promotion by limiting the amount of total and saturated fat and cholesterol within the meals served.<sup>40,42</sup> Foods high in fat and cholesterol were designated as 'whoa!' foods while fruits and vegetables were designated as 'go!' foods.<sup>40,42</sup> Students demonstrated knowledge acquisition and real-life application by properly selecting foods according to the information learned within the classroom environment.<sup>40,42,43,48,50</sup> Even though these dietary changes did not have a major influence on BMI, they did result in decreased intake of total and saturated fat and in increased intake of fruits and vegetables.<sup>37,39,40,42,43,48,50</sup>

Most of the studies included methodology for physical educational (PE) classes in which students were provided with up to 30 minutes of MVPA three to five days a week.<sup>35-51</sup> Free play and reduction of sedentary activity was more effective in preventing weight gain than forced exercise and aerobics.<sup>39,42,45,51</sup> Allowing children to direct their self-play improved their level of self-efficacy, resulting in increased physical activity in both males and females.<sup>46</sup> Although most studies resulted in significant changes during PE classes, no changes were observed outside the school environment.

Many interventions were not successful in changing body weight in overweight children or BMI due to short programme duration and the inconsistency of lifestyle changes outside the classroom environment. A number of programmes used measures that were not sensitive enough to identify individual knowledge attained or that did not examine personal barriers to behavioural change. When looking at specific populations, many of the programmes were not successful in targeting African Americans and other minority youth.

### Recommendations for prevention/intervention programmes with African American youth

There are very few culturally sensitive interventions that specifically target African American youth and the risk factors associated with the onset of obesity and type 2 diabetes among this at-risk population.<sup>37</sup> Development of prevention programmes that target lifestyle modification within this population needs to be informed by good formative research that can provide information about salient cultural and social values of the target audience, issues of

importance, availability of resources, and the costs and benefits of the intervention. When the community provides input that is used in developing and establishing programme components, there is a higher probability of community support and reinforcement, which can help to make a change within the young population.

Intervention strategies should also be age-appropriate. Health education and physical activities should be enjoyable and congruent with the adolescent's interests and capabilities. Including parents, grandparents and/or caregivers in addition to the adolescent is desirable because eating habits and lifestyle factors are strongly influenced by parental modelling, encouragement and support. Parents, of course, become primary agents of change within the household environment. Parents also need to be educated about the risk of type 2 diabetes among minority youth, its average age of onset, and complications that may arise if it is not prevented or treated. One study found that lack of programme compliance within the diabetic African American population was due to lack of knowledge about the disease and lack of appreciation of its severity.<sup>52</sup>

Interventions that educate African American children and their parents about type 2 diabetes prevalence, risk factors and pathophysiology should emphasise healthy eating and physical activity. Assuring that the environment supports and reinforces knowledge attained and provides opportunities for lifestyle change is necessary to decrease obesity and type 2 diabetes significantly within this child and adolescent population.

### **Implications for practice – Catch One Catch All**

The Child and Adolescent Trial for Cardiovascular Health (CATCH)<sup>41</sup> was a successful behaviour change programme for elementary schoolchildren. This was a national multisite field trial in which 96 elementary schools at four different field sites participated in a three-year intervention aimed at increasing MVPA in school PE programmes and reducing fat and saturated fat in school meals and children's diets overall.<sup>41</sup> Because CATCH was a large, well-designed study in which three ethnic groups were targeted, Caucasian, African American and Latino, from four different geographic locations, its success in changing behaviour can be more readily generalised and disseminated than that of most other programmes. In addition, reduced consumption of dietary fat and increased levels of physical activity were sustained over time when children were measured three years after completion of the intervention.<sup>40</sup>

Catch One Catch All is a proposed programme that builds on the methodology of the original CATCH programme which was tested with 3rd–5th grade students and later expanded to include K–2nd grades. Components of the CATCH programme would be implemented but specifically tailored to African American youth. Through a multilevel approach, the Catch One Catch All programme would aim to encourage healthy weight loss, increase physical activity and reinforce healthy eating behaviours among adolescents that will be sustained into adulthood. The pilot programme would target 6th–8th grade African American students (aged approximately 10–14) so that healthy eating behaviours and

physical activity are encouraged repeatedly and maintained throughout the adolescent's educational career.

### *Theoretical framework*

The Catch One Catch All programme would address dietary and physical activity behavioural change among adolescents through application of Social Cognitive Theory (SCT).<sup>53</sup> SCT is based on the triadic influence of environmental (social and physical), behavioural and personal factors. The concept of observational learning is an important part of the theory, emphasising vicarious capability and self-efficacy. The four processes governing this modality include attention span, retention, motor reproduction and motivational processes. These processes make the school setting an ideal place for intervention. Within the school environment one can capture and elicit the student's attention in peer-based activities and increase the level of self-confidence through reinforcement.

Positive parent involvement and behaviour change throughout the programme would be prompted through the use of the Health Belief Model.<sup>54</sup> The key variables of the Health Belief Model are perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action and self-efficacy. According to the Health Belief Model, if perceived threat (perceived susceptibility plus perceived severity) is high and perceived benefits outweigh the costs, self-efficacy and cues to action such as media campaigns and educational materials would prompt behaviour change. With the use of this model, it is anticipated that African American parents would help to change their children's high-risk behaviours, such as physical inactivity and high fat consumption, if they are convinced that their children are susceptible to obesity and type 2 diabetes, understand the detrimental consequences of both obesity and the disease, and believe that behaviour changes such as increased exercise and healthy eating (actions that are available to them) will reduce the threat of disease.<sup>54</sup>

### *Programme description*

The methodology of Catch One Catch All would include a health curriculum with strategies that focus on lifestyle changes and the importance of a supportive environment. At all three grade levels, health education activities would consist of obesity and diabetes education, role modelling and group assignments. Students would be given the opportunity to learn about the risk factors associated with type 2 diabetes, their personal susceptibility to the disease, and how to resist marketing strategies that promote fat consumption and physical inactivity. This information would be reinforced in PE classes as students have the opportunity to participate in recreational sports, fitness activities, hip-hop dance routines and athletics. Breakfast and lunch periods would also provide students with the opportunity to put their nutritional knowledge into practice.

To promote positive behaviour change within the family environment, flyers and brochures would be disseminated to African American households within the community. Educational materials would target type 2 diabetes among African American children, its onset, and prevention; appropriate child-feeding practices and proper nutrition; and

strategies on how parents can become more involved in their child's physical activity efforts. The programme would also host monthly Parent Teacher Association meetings, an annual science fair, and a graduation ceremony at the end of the 8th grade year in order to provide parents with the students' creative ideas in preventing type 2 diabetes and improving their neighbourhood environment.

The health education component of Catch One Catch All would be limited in scope if the environment in which the adolescent lives is not conducive to healthy behaviour. Through government funding and the recruitment of community individuals and licensed professionals, local area parks could be renovated in order to provide places for adolescents and their families to play and exercise. Bicycle and walking paths would be developed along streets and playground areas in order to promote healthy physical activity. In addition, provision of increased lighting in parks and along neighbourhood streets would make playground activity safe and extend the length of playtime.

### Discussion

Future diabetes prevention programmes that target behavioural risk factors among African American youth can effect behaviour change by targeting the individual, family and community levels. It should be noted that each aspect of Catch One Catch All and related programmes would reinforce the importance of healthy eating, increased physical activity and weight loss at each level of this framework. By providing educational materials in the schools and the community, along with community renovations of parks and exercise paths, healthy behaviours can be initiated in childhood and sustained well into adulthood.

Health education alone is not enough to change lifestyle behaviours within African American youth if the availability of resources and access is not addressed. Environmental changes need to be made to perpetuate lessons learned within the classroom. Intervention strategies need to be theoretically sound and culturally sensitive so that children and adolescents can be provided with the tools that are necessary to sustain healthy behaviours both within and outside the school environment.

The selected interventions in this review were able to show the effectiveness of health education, dietary modification, decrease of sedentary behaviour and incorporation of MVPA in schools in reducing unhealthy behaviours among youth. While the progression from obesity to type 2 diabetes is not inevitable within this population, targeting risk factors for obesity can prevent onset of the disease and deleterious outcomes. With the increasing prevalence of type 2 diabetes within African American youth, there is a need for intervention/prevention programmes that incorporate these factors and address the needs of this at-risk population.

Diabetes prevention programmes such as the Catch One Catch All programme will serve to inform students and their families of the risks associated with obesity and type 2 diabetes, educate them in its prevalence within the African American community, and provide the avenues necessary to incorporate changes in their behaviour that will lead to life-long physical activity and proper nutrition.

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### Conflicts of interest statement

None declared.

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