Prevalence of Overweight & Obesity in African American Adolescents in Baltimore, Maryland

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EXECUTIVE SUMMARY

Obesity is a rising issue in the United States with nearly 60% of the total population being obese. Obesity places a person at risk for heart disease, and 61% of obese children have at least one additional risk factor. Adolescents battling obesity are at a high risk for co-morbidities such as hypertension, polycystic ovarian syndrome, non-alcoholic fatty liver disease, orthopedic complications, and sleep apnea. In Baltimore city, with 63% of the demographic being African American/Black, 34% of these adolescents are greatly affected making this an emerging public health problem. Key factors contributing to this issue include biological factors (e.g., birth weight, sex, and ethnicity); behavioral factors (dietary intake, physical activity and screen time); as well as other individual, family, community and political determinants. There are currently evidence-based prevention strategies in place within Baltimore, however improvement is necessary. These modified interventions require tailoring to the specific needs of this population as well as collaborations with stakeholders including the Baltimore City Health Department and public schools. In precise monitoring and evaluation of our multi-faceted program implementation, this intervention will deliver exceptional deliverables in reducing the percentage of overweight in a time frame of 3-5 years.

PROBLEM DEFINITION

Based on data from the last decade, the prevalence of obesity and overweight in adolescents remains high, specifically among African-American/Black adolescents living in Baltimore City, MD, mirroring that of national trends in OW/OB.

The problem definition is focused on adolescents rather than the entire population of overweight and/or obese population in Baltimore, Maryland since targeting obesity in adolescence will reduce obesogenic associated diseases in adulthood such as diabetes and hypertension. We chose this time, 2007-2017 mainly due to the availability and quality of data from agencies such as the Baltimore City Health Department and Centers of Disease and Control Prevention (CDC).
MAGNITUDE

The rate of obesity has peaked globally. Of the worldwide population, a third of the US population is obese\(^3\). In 2007, the number of overweight and obese adults in the country totaled 60% with a prevalence of obesity affecting 12.7 million children and adolescents today\(^4\). The prevalence of obesity in the US among 12-19-year-old African Americans is 20.5% in comparison to 8.9% of 2-5-year-old children. According to the U.S. Census, 63.3 percent of Baltimore's population in 2013 was black\(^5\). In Maryland, 38.1% of the African American/Black population is obese and 33.6% are 10-17-year-old adolescents ranking Maryland as the 13th obese state in the country. In 2007, Baltimore City’s obesity rate of 35 percent is higher than their counterparts in Maryland and of the U.S. making this problem a high-rise priority\(^6\).

Being obese or overweight can be determined through Body Mass Index (BMI), which is calculated using the child’s weight and height, and is a reliable measure of body fat. BMI is compared through percentiles, which represent the normal size and growth patterns of children according to their gender and age. Overweight children are between the 85th and 95th BMI percentiles of their age, and obese children are above the 95th\(^7\). If adolescent obesity propels into adulthood, adolescents with a higher BMI will have 30% higher rates of mortality as young and middle-aged adults, with an increased risk of multiple comorbidities in adulthood such as diabetes and hypertension\(8\). The Bogalusa Heart Study tracked 2,400 5- to 14-year-old children for a mean of 17 years and found that obese black children were even more likely to remain obese as adults (83%) than obese white children (68%)\(^9\).

<table>
<thead>
<tr>
<th>YRBSS 2014</th>
<th>Middle Schoolers</th>
<th>High Schoolers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Black (%)</td>
<td>White (%)</td>
</tr>
<tr>
<td>Described themselves as overweight</td>
<td>21.9</td>
<td>23.4</td>
</tr>
<tr>
<td>Trying to lose weight</td>
<td>42.5</td>
<td>38.3</td>
</tr>
<tr>
<td>Obese based on BMI</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Overweight based on BMI</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Sugary sweetened beverage intake</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

Direct indicators such as the percentage age of students that are obese and overweight in Baltimore/percentage of age nationally and the percentage of adolescent obese and overweight /percentage of
age nationally. Indirect indicators selected are perception of one’s own body weight and consuming sugar sweetened beverages (SSBs). During the 2017-2018 school year, there were 16,964 students enrolled in grades 6 to 8 and 20,764 students enrolled in grades 9 to 12 (Baltimore City Public Schools, 2017). Of these numbers, 80.1 percent are African American (Baltimore City Public Schools, 2017). If the prevalence of obesity and overweight remained constant among Black high school students in Baltimore from 2015 to 2017, the number of obese Black high school students would be 2,827, and the number of overweight Black high school students would be 2,960. Similarly, if the percent of Black students who perceived themselves as overweight remained constant from 2014 to 2017, the number of students would be 2,595. The number of Black high school students estimated to drink at least one serving of soda per day is 4,840. Some limitations to these indicators include not measuring weight and height, differing methodologies based on age of student, self-identification and only capturing students in the public-school system.

**KEY DETERMINANTS**

The key determinants are divided into six categories: Biological, Behavioral, Individual, Family, Community and Political.

- **BIOLOGICAL:**
  There are several biological factors contributing to the rise of obesity in adolescents that is supported by extensive research. The following list of factors play a significant role in obesity in adolescents: breastfeeding, birth weight, exposure to gestational diabetes mellitus (GDM), sex and ethnicity\(^8,10,11\).

- **BEHAVIORAL:**
  Dietary intake, physical activity, screen time and sleeping hours were all significant factors that contributed to being overweight and/or obese in adolescents. Lack of physical activity was a main contributor as well as increased screen time (> 2 hrs./day) through watching television, playing video or computer games\(^12\). Dietary intake such as selection of a larger portion size and skipping a meal, particularly breakfast, is also linked with obesity\(^11\).
- **INDIVIDUAL**

  This includes factors like: food preferences (sweet or salty), food knowledge (caloric/nutritional content), psychological factors such as emotional eating and addictive behavior are other factors contributing to obesity in adolescents\(^{13,14}\). Emotional eating caused by hormonal imbalance during this phase, addictive behavior (alcohol, tobacco, marijuana use). Alcohol and tobacco did not have significant associations in this age group, however, consistent or increased use of marijuana from aged 12 to 18 years was associated with an increased risk of obesity in young adulthood\(^{13}\).

- **FAMILY**

  These factors include eating practices (preparing meals and designated dinner time), family income (lower SES) and caregiver obesity (10-12 more at risk if both parents are obese)\(^{11,15-17}\).

- **COMMUNITY**

  These factors include the built environment (higher crime area where disadvantaged and minority children live in more, low-safety environments, and deteriorating neighborhoods not promoting physical environment to exercise)\(^{18}\), food availability (food deserts, less accessibility to grocery stores that carry fresh produce, increased obesogenic areas that have fast foods)\(^{19,20}\) and SSB tax (preventing purchase of SSBs particularly in adolescents)\(^{21}\).

- **POLITICAL**

  These are all school based and community based interventions that are currently in place or have been implemented\(^{2,22-24}\).

**CONCEPTUAL FRAMEWORK**

The conceptual framework for this presentation is included below (Figure 1). It is similar to a socio-ecological model which helps us to creatively visualize different levels to intervene at. It is also comprehensive in details of determinants in each category. All the factors included in the framework are also evidence-based. The goal was to maintain visual clarity and comprehension. The limitation of the framework is that it is specific to adolescents and does not display obesity through a life course perspective. In addition, causal and non-causal factors are not illustrated.
**KEY STAKEHOLDERS**

A stakeholder is an individual or group that has an interest in an issue. The following is a list of some stakeholders with interest and possible concerns about obesity in African American adolescents in Baltimore city:

- Local agencies: local partnerships, department of education, Baltimore City Health Department, Baltimore City public schools in Maryland
- School staff: included in curriculum, teachers, sports facilitators,
- Local food distributors: source of fruits and vegetables
- Media team: campaign organizers, newsletter/brochures production
- Dietician: in charge of nutritious recipes
- Parents: to help encourage students to participate in the event

Those affected are in school adolescents and their parents. Those interested in the evaluation results can be the following: planning committee, local agencies, researchers, Baltimore community, health insurance companies, professional societies.
Although these are active participants in providing resources for preventing obesity, some stakeholders may be hesitant in investments over a longer time periods due to costs necessary for sustainability.

IDENTIFICATION OF INTERVENTION AND PREVENTION STRATEGIES

- **B’MORE HEALTHY COMMUNITIES FOR KIDS (BHCK)**

BHCK was spearheaded in Baltimore in 2014 and was initiated as a multi-level initiative to work directly with low-income neighborhoods where there is limited accessibility to fresh produce and other nutritious staples. Some strategies included: working with carry outs to increase access, creating cost-effective collaborations between smaller stores and wholesalers and promoting cooking healthier meals and sharing food knowledge.

- **RETHINK YOUR DRINK**

The Baltimore City Health Department launched a public health education campaign called Rethink Your Drink that required warning labels on all SSB advertisements, restaurant menus, and in any store selling SSB’s.

- **WHAT MAKES A LUNCH**

A free meal program (breakfast and lunch) for all students seeks to address food insecurity and remove cost as a barrier to healthy food access. The meal consists of choosing a fruit and vegetable and milk for lunch.

- **PLANET HEALTH**

Planet Health an interdisciplinary curriculum in Boston, was integrated with physical activity (PA), nutrition lessons and a two-week Power Down campaign to decrease screen time. In addition, newsletters with PA and nutrition information to involve parents, school administrators, and staff in reducing adolescent obesity. The cost of the program was $33,677 or $14 US dollars per student per year, with the program preventing an estimated 1.9% of the female students (5.8 of 310) from becoming overweight adults. These findings translated to a cost of $4305 USD per QALY saved and a net saving of $7313 USD to society. Considering the success of the program, our interdisciplinary curriculum would have a similar approach and work towards a similar goal.
**ALTERNATIVE INTERVENTIONS**

The primary decision criteria used for selecting these interventions were effectiveness, political will, and sustainability (see Figure 2. Decision matrix). Other interventions considered included a policy intervention through a local SSB tax (1% per fluid oz.). The strength of this is, it is a passive intervention that would provide primary and secondary prevention and economic disincentive and enforcement. It would also an evidence-based association with reduction in obesity; the tax would provide financial support to more obesity prevention/treatment programs. Some weaknesses would be low social and political will and low-cost feasibility. It also ignores biologic and individual determinants.

Another alternative intervention is a community based (programmatic) intervention to increase healthy food options in corner stores and take-out food services. It is an active intervention with primary and secondary benefits including education, engineering and economic incentives (for store owners). Strengths of this intervention include high social will, increased knowledge and addressing many key determinants. Weaknesses include difficulty in determining cost feasibility and sustainability which is dependent on many players.

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**Figure 2: Policy Decision Matrix**

Problem: Overweight and Obesity in African-American Adolescents

<table>
<thead>
<tr>
<th>Criteria to decide priorities</th>
<th>Proposed Strategy ---</th>
<th>Strategy 1 * SSB tax</th>
<th>Strategy 2 * Community-based Intervention</th>
<th>Strategy 3 School-based Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention Effectiveness</td>
<td>high</td>
<td>medium</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>Intervention Feasibility</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td></td>
</tr>
<tr>
<td>Affordability (Cost Feasibility)</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td></td>
</tr>
<tr>
<td>Intervention Sustainability</td>
<td>high</td>
<td>low</td>
<td>medium</td>
<td></td>
</tr>
<tr>
<td>Ethical Acceptability**</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>Political Will</td>
<td>medium</td>
<td>medium</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>Social Will</td>
<td>medium</td>
<td>medium</td>
<td>medium</td>
<td></td>
</tr>
<tr>
<td>Potential for Unintended Benefits</td>
<td>high</td>
<td>high</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td>Potential for Unintended Risks (LOW risk = HIGH priority)</td>
<td>low</td>
<td>medium</td>
<td>medium</td>
<td></td>
</tr>
<tr>
<td>Equitability</td>
<td>medium</td>
<td>high</td>
<td>high</td>
<td></td>
</tr>
<tr>
<td><strong>FINAL PRIORITY RATING</strong></td>
<td>medium</td>
<td>medium</td>
<td>medium-high</td>
<td></td>
</tr>
</tbody>
</table>

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PROPOSED INTERVENTION & IMPLEMENTATION

The proposed intervention will be a multi-level and multi-component intervention consisting of an interdisciplinary curriculum, food environment and physical activity to lower the prevalence rates of overweight and obese African American adolescents in Baltimore City over a 3-5-year period. It will be an active program intervention involving education and engineering. Implementation will include media campaigns where students can be connected, engaged and informed through media portals like Facebook, Twitter and Instagram. Parents and teachers will be informed through communication strategies like newsletters, brochures, PTA meetings and the Baltimore community through television and radio to raise awareness.

There will be a pilot intervention with 3 public middle schools and 3 public high schools in Baltimore City to expand to all middle and high schools incrementally. The first step would be to identify potential pilot schools with Baltimore City Health Department (using life expectancy, obesity, income, food access data and BHCD’s knowledge of previous piloted interventions in schools) and hold informational meetings and focus groups with interested school administrators. Workshops on curriculum education will be held and a curriculum specialist will be hired for data collection as an intervention liaison between schools and JHU--using model of community-based participatory research²⁷. The first step will mirror Planet Health and extend to only the middle school due to differing curriculum.

Our second level, improving the food environment, is already currently in place for elementary schools. USDA Fresh Fruit and Vegetable Program (FFVP) has funds designated to provide fresh fruits and vegetables as snacks ($50-75 per student per year) to eligible elementary schools. We will replicate this intervention in middle and high schools with city partnerships and make minor modifications such as inclusion of:

- Fruit and vegetable distribution: twice per week.
- Recipes developed by dietician
- Implementation through partnership with Baltimore organizations working in food access.

Improving the food environment has been successful in several states such as 14 FFVP participating Arkansas elementary schools that demonstrated a 3% decrease in obesity rate as well as a 1.8% reduction in overweight rate. Reductions in BMI and school level obesity rates are attributed to FFVP participation and are large enough to be economically meaningful⁵.
The final part of the intervention is promoting the physical activity environment before school, after lunch and after school. This includes increasing the availability of physical activity equipment and increasing physical activity supervision. An RCT of 48 middle schools in San Diego showed significant intervention effect for physical activity for the total group \((p < 0.009)\) and boys \((p < 0.001)\), but not girls \((p < 0.40)\)\(^28\). In addition to this, a review of disparities in physical activity and sedentary behaviors in US children and adolescents states that because physical activity in schools (vs recreation in the community) represents a greater proportion of physical activity for low-income, communities of color, policies that increase physical activity in schools (and ensure existing policies) and recreation opportunities may help address disparities in physical activity behavior\(^29\). This will include designing physical activity opportunities specific to the selected schools through focus group direction and supervision of school staff to guarantee success. Physical activity levels are monitored at the start and end of each school year for the span of the program using surveys. Physical activity will also be mandatory for 60 min/day with flexibility in timing: before classes, after lunch, and after school hours. Nutrition education will be incorporated into the school curriculum targeted to ensure each student gets 10 to 12 lessons per year. Students will be taught how to make healthy food choices, with an emphasis on healthy fat, that contribute to a well-balanced diet and selecting beverages without added sugars or artificial sweeteners. Financial costs would be like Planet Health ($7,360 for 3 middle schools), FFVP ($40,000 for 3 middle schools $121,000 for 3 high schools) and PA equipment ($500/school) highly feasible costs for the year. Funding sources from Baltimore City Health Department, CDC, Johns Hopkins Global Obesity Prevention Center, Hungry Harvest and Capital Area Food Bank.

A multi-component intervention was selected because these interventions are found to be the most promising. School support used to facilitate about 30% of interventions and may be a support for sustainability of interventions. Parents involved in 90% of interventions studies and are considered key actors in the physical activity and nutrition of children\(^26\). When combined in a school setting, physical activity and nutrition components show higher efficacy when targeting multiple behaviors and environments in those with longer duration\(^22\). Some barriers can include long term sustainability after the high school children graduate, developing better methods for short term progress to yield tangible results, and providing continuous fiscal stability (funds for staff, equipment and materials) necessary for both implementation and sustainability. In addition, training of staff and having ongoing consultation may be an issue if there is a substantial amount of turnover in teachers and school administrators.
**EVALUATION**

Key stakeholders that will be highly interested in the evaluation plan will be those that are providing direct funding sources such as the Baltimore City’s Health Department, CDC’s child and adolescent sector, and JH Obesity and Prevention Center.

Process evaluation can be accomplished by deciphering how many parents (percentage) are aware of the intervention strategies through the number of newsletters distributed to them, surveys sent home and returned completed, and the number of parents present at PTA meetings. Another evaluation method would be calculating the percentage of students using facilities purchased through the program for physical activities in school through student surveys and attendance records for the programs physical activities. This would evaluate if students are utilizing facilities purchased through the program for physical activities in school.

The two main outcome evaluations are firstly to determine if there is an increase in physical activity among adolescents. This can be captured by determining the percentage of students who have increased their physical activities through pre-and post-Fit check records and focus groups. Secondly, determining if the percentage of students who are overweight and obese has reduced through the above evaluations.

**CONCLUSION**

Obesity is one of the most pressing issues facing our youth today. Obesity continues to disproportionately plague ethnic minorities such as the African American population at higher rates. In Baltimore city with more than half of the population identifying within this ethnic group, the city has taken great strides towards raising awareness and implementing programs tackling obesity, however there is an urgent need for improvement. Within the Baltimore community, dietary patterns and perceptions are molded by biological, behavioral, individual, family, community, and political beliefs. It is essential to delve deeper into societal structural influences to improve the quality and access to healthy food. A multidisciplinary approach is key to target obesity in adolescents while maintaining sustainability. It is a working effort in partnership with all key players to bear witness to change. With the continued rise of this public health burden, it is our responsibility as adults to protect our adolescents from co-morbidities haunting our current health and their future well-being through implementation of school and community based programs.
REFERENCES


3. Murray, C. & Ng, M. Nearly one-third of the world’s population is obese or overweight. Institute for health metrics and evaluation. 2014.


