Decreasing Body Mass Index of NYC Children 5-13 Years Old Through a Behavioral Change Program

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Disease burden in terms of disease, costs, quality of life

- Obesity in young children is highly associated with developing diabetes, cancer and cardiovascular diseases
- A large portion of medical costs associated with diabetes costs is for comorbidities, which were much more frequently reported in young individuals that are obese.
- The estimated cost of diabetes in 2017 was $327 billion, which includes $237 billion in direct medical costs and $90 billion in lost productivity.
- Annual per capita health care expenditure is 2.3 times higher for people with than without diabetes.
- Children who are obese often develop other comorbidities which essentially reduces their quality of life.
- Some of these may be having to follow a strict diet plan, remembering to take lifelong medication and osteoarthritis as a result of too much weight for their joints to carry.

(Bendor et al., 2020)

Is the public health issue increasing or an emerging burden?

- Childhood Obesity is an increasing burden to public health.
- Over the past three decades, childhood obesity rates have tripled in the U.S.
- For children and adolescents aged 2-19 years in 2017-2021, the prevalence of obesity was 19.7% and affected about 14.7 million children and adolescents.
- In 2017–2018, about 1 in 5 school-aged children were affected by obesity (20.3% of all 6-11 year olds, 21.2% of all 12-19 year olds)
- As mentioned before, childhood obesity is linked to many other disease processes that decreases quality of life and places a great financial burden on the healthcare economy.

(Day et al., 2014)

Evidence of importance to the community or an organization presenting a population

1. **Health Impact**: Childhood obesity is associated with a range of health issues such as heart disease, type 2 diabetes, certain cancers, and musculoskeletal disorders. By addressing childhood obesity, the overall health and well being of the community would drastically improve (Fruh, 2017).

2. **Economic Burden**: Childhood obesity places a substantial economic burden on the society. The costs associated with healthcare, absenteeism, reduced productivity, and disability related to obesity are significant. Tackling obesity can help alleviate these financial burdens (Tremmel, 2017).

3. **Social Impact**: Childhood obesity can lead to social stigma and discrimination, negatively affecting the quality of life and mental health of individuals. By addressing childhood obesity, communities will see a decline in the prevalence of mental disorders and improvement in the quality of life in school age children (Westbury et al, 2023).

What is Our Priority Group?

Priority group→ Children from age 5-13 years old who attend NYC public schools. Why?

- We found that 43% of public elementary school children in New York City were overweight, with a BMI-for-age at or above the 85th percentile. **One in 4 (24%) elementary school children were obese, and an additional 19% of children were overweight but not obese** (Thorpe, 2004)

In another study: Participants from **public schools** had a significantly higher prevalence of obesity (37.8% vs. 31.1%) and a greater occurrence of obesity compared to those from **private schools** (Baniisa, 2020)

How are obesity rates broken down by age?

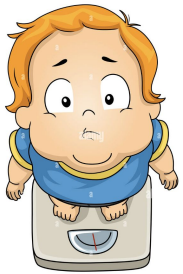
Age	Obesity Prevalence
2-5 year olds	12.7%
6-11 year olds	20.7%
12-19 year olds	22.2%

Data from- National Health and Nutrition
Examination Survey, 2017-2020

At What Age Group Should We Intervene and Tackle The Obesity Rate?

There is a critical period when we can prevent obesity rates from becoming worse among children-

- In an early childhood longitudinal study a cohort of kindergarten students were followed for over 9 years (1998-2007). Heights and weights for 4240 white, 640 black, and 1070 Hispanic children were measured from kindergarten and 1st, 3rd, 5th, and 8th grades (Datar. 2011).
- **Results of this study showed that the largest increase in BMI was between 1st to 3rd grade, with no increase during middle school years.**
- Therefore, implementing a program to combat this problem earlier in life, especially during children's elementary school years is crucial!



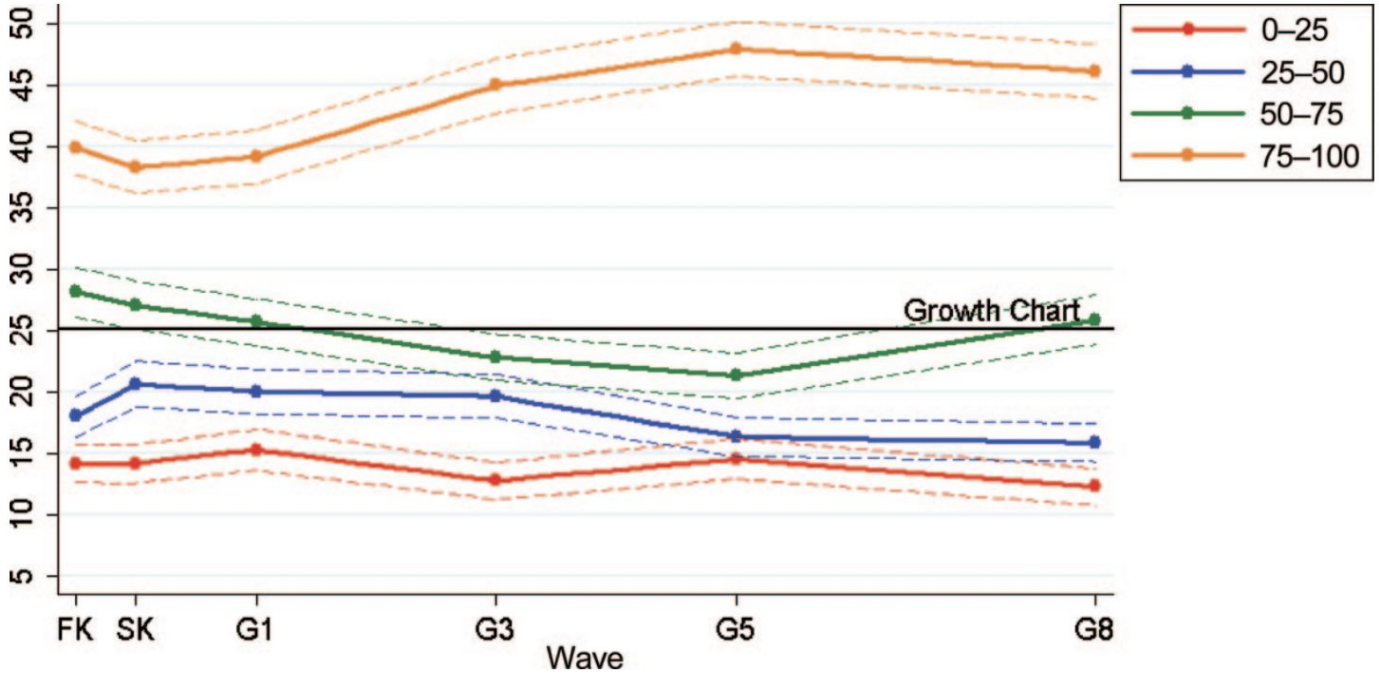


FIGURE 1

Proportions of the ECLS-K sample in each quartile of the reference-population BMI distribution, according to wave. FK indicates fall, kindergarten; SK, spring, kindergarten; G1, grade 1; G3, grade 3; G5, grade 5; G8, grade 8.

One Reason Behind High Obesity Rates: children are not meeting their daily dietary requirements

- In NYC more than 4 out of 5 children drink one or more sugary beverage daily and eat 1.4 cups of combined fruits and vegetables versus the recommended 2.5 cups (Child Health Survey, 2009).
- **Healthier eating habits need to be encouraged!**

What might be stopping these children from making healthier food choices?

- **Low socioeconomic status of families:**

  Children in the lowest quintile of SES were 70% more likely to be overweight or obese than children in the highest quintile (Williams, 2018) → **Cost hinder healthier food choices**

  Poorer Communities and neighborhoods: limit access to healthier restaurant, grocery stores, higher quality schools and lack of outdoor play areas.

- **Parent education:**

  Children whose parents received higher level of education are more likely to have higher paying jobs, more knowledgeable of healthier foods, diets and physician activity therefore leading to lower obesity rates (Noh, 2020)

What behavior do we want to change?

- Dietary and health related behaviors and food preferences are **established in early childhood and continue into adulthood**
  - Poor food choices and overconsumption are associated with a higher risk of developing obesity (Kim and Lim, 2019).

Why do we want to change this behavior?

Childhood obesity is associated with:

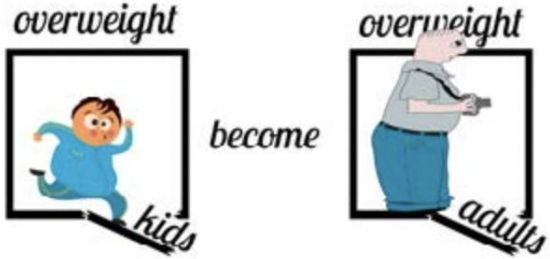
- Psychological problems
- Low self esteem
- Social problems such as bullying

Long term effects:

- Hypertension
- Type 2 diabetes
- Breathing problems such as asthma and sleep apnea
- Joint problems and many more!

Obesity in childhood can lead to obesity as adults as well if factors such as unhealthy eating habits are continued.

Dietary factors are the most important factors associated with childhood obesity, and prevalence rates of obesity and diabetes in children have prompted **prioritizing healthy diets**



(Simmonds et al., 2016)

Why do we want to change this behavior?

- The prevalence of **diet related** metabolic disorders (obesity, glucose intolerance, elevated blood pressure, and dyslipidemia) is increasing due to unbalanced food intake among adolescents.

(Kim and Lim, 2019).

Table 1

Diet-related modifiable factors affecting childhood obesity

Factor	Harmful	Beneficial
Nutrient	- Excessive intake of total energy, proteins (from animal products), fat, saturated fat, sodium17,28	- Adequate intake of vitamins C and D, non-starch polysaccharides (fiber), calcium, folate, iron17,29,36
Food	- Excessive intake of energy-dense foods: pizza, fast food, discretionary food, soda, sugar-sweetened beverages, and ice cream23,27,34	- Adequate intake of whole grains30,31 - Low daily consumption of milk, fruits, vegetables, fish37,38
Dietary pattern	- Westernized dietary patterns high in saturated fatty acids, dense in energy, and poor in micronutrients17,18,23 - Processed food dietary patterns, including meat, soda, fried food, instant noodles, burgers, and pizza24	- Balanced diet based on five food groups17,28–31 - Stop-light/traffic-light diet, with food divided into three categories: green (low-energy, high-nutrient foods), yellow (moderate-energy foods), and red (high-energy, low-nutrient foods)39,40
Dietary behaviors and eating habits	- Eating while watching TV19 - Skipping breakfast26,27 - Frequent snacking and eating19	- Family mealtimes, eating together19,32 - Portion control29,33 - Regular mealtimes19,32,33

(Kim and Lim, 2019).

How this change can benefit NYC children...

- In a study, it was found that **higher educated parents** have a higher level of awareness and knowledge regarding positive effects of maintaining a healthy body weight – including both being **physically active and having a healthier diet** (Ruedl et al., 2021).
- Children's food habits and choices are **influenced** by family, caregivers, friends, schools, marketing, and the media (Roblin, 2007).
- Successful interventions for preventing childhood obesity combine **family and school based programs, nutrition education, dietary change, physical activity, family participation,** and **counseling** (Roblin, 2007).

Our Implementation plan is based off of a Behavioral Change Program called “Planning Health in School”

(Carvalho & Vieira, 2021)

- Our goal is to promote nutritional education to kids in public schools.

- As part of the curriculum for kids in public schools, we will be implementing learning modules about healthy eating.

- The aim is to change the *behavior* and *attitude* of kids regarding healthy eating so that they will pick healthier choices.
- We will have **8 modules**, and we will show 1 each month during the school year starting from Sept thru May.
    - We will be continuing this programming for the foreseeable future, as long as it continues to yield satisfactory results.

The New York State Department of Health will be our Stakeholders

- The New York State Department of Health finds it very important to promote healthy eating habits in school aged kids to prevent and control diabetes, heart disease, obesity and associated risk factors
- According to the CDC's website, the NYSDOH already uses federal and state funding to implement health initiatives in public schools.

We will need a Task Force to implement our Initiatives

- The task force will be employed by the New York State Department of Health.
- It will be made up of PE teachers who already work in public schools.
- They will have additional responsibilities:
    1. They will be responsible for presenting the modules once a month to their students during regularly scheduled class time.
    2. They will be responsible for collecting the surveys from the students that will help us assess the effectiveness of our initiative.

We need to Publicise this Initiative!

- Parents should be aware of the implementation of this program at their child's school
- In order for children to be making healthier choices, they need the support of their parents.

Data To Be Collected

- In one study, a behavioral change programme called **“Planning Health in School”** attempted to assess and improve the eating habits of children, particularly the intake of fruit and vegetables, and tried to guide them towards healthy choices.

- In this study, children’s outcome evaluations were conducted through **3-day food records for their eating behaviours,** documented after each learning module, one module a month.

- Changes were observed in children’s eating behaviour.

Seven 3-Day Food Records for Eating Behaviours

- **There were 8 Learning Modules:**
  - 10 steps to be healthier
  - Water & milk help you to grow up
  - Training every day to be healthier
  - 3 fruits a day, how much good it does?
  - Fruits & Vegetables are essential to life
  - Start on moving!
  - The best snacks
  - Final game: who has learned about everything?(a programme overview).
    (Vieira & Carvalho, 2021)

- To measure the eating behaviour of children over the implementation of the Learning Modules and over the intervention, a 3-day food record was selected to assess all the food and beverages that children consumed **over 3 days**.

- The 3-day food record was considered the most accurate method, both in qualitative and quantitative terms, to describe the food consumed.

Learning Module – Expected Outcome in Food Record

Educational Components	Educational Goals	Behavior Change Goals and Expected Outcomes in the Food Record
Learning module-one (LM1): "10 steps to be healthier" - Basic principles of healthy eating presentation in a simple 10 stepwise format	To reinforce healthy eating and active living; To recognize short and long-term benefits; To enhance motivation for changing behaviour; To identify main obstacles for a healthy eating; To encourage daily attitudes for positive changes.	**Expected outcomes in Food Record 1 (FR1):** - To find behaviour changes such as: step 2 (starting lunch and dinner by eating vegetable soup), and step 7 (avoiding fried foods).

(Vieira & Carvalho, 2021)

Learning Module – Expected Outcome in Food Record

Educational Components	Educational Goals	Behavior Change Goals and Expected Outcomes in the Food Record
Learning module-two (LM2): Water & milk help you to grow up - Food items were identified (water, milk and yogurt) and their benefits for a healthy growth were described	Calling for consumption of healthy choices: water, milk and yogurt, which contribute to a proper growth; Identification of benefits and adequate portions; Recommendations to decrease/moderate consumption of sugar-sweetened soft drinks;	Children resolution: adopting water or milk instead of soft drinks **Expected outcomes in Food Record 2 (FR2):** - Increasing water consumption and milk, and decreasing of sugar-sweetened soft drinks.

(Vieira & Carvalho, 2021)

A Measure of Success - Food Record

- In the study, **Food Record 0** was taken to get a **baseline** of what the children consumed before the intervention.
- After Learning Module 1, **vegetable consumption** increased, doubling the median value from one to **two** servings over a 3-day period.
- For the fried food variable, there was no significant change.

(Vieira & Carvalho, 2021)

Table 3

Comparison of outcomes between baseline and post-intervention 3-day food records

Food behaviour evaluation between baseline and FR1				
Outcome	Sample size	Baseline	3-day FR1	
Consumption (servings)		Med (IQR)	Med (IQR)	*p*-value
Vegetable Soup	$n = 143$	1 (0–2)	2 (0–3)	0.003 *
Fried food		1 (0–1)	1 (0–2)	0.673

Data Collection Methods

- **Food records** - to analyze if our intervention brings about a behavioral change
- **Surveys** - to be given out to parents of children at the end of the behavioral diet change program, which will assess whether parents feel their children are making healthier food choices at home
- **Interviews** - carried out at the end of the program, to elicit in-depth responses from each participant

Limitations

1. Lack of access:
   - As previously mentioned, socioeconomic status is a prominent factor that frequently contributes to an unhealthy diet. Due to limited resources, children often face barriers in accessing healthier options.
   - Consequently, despite their inclination to make healthier choices, various circumstances may hinder their ability to do so.

Limitations

2. Funding

- The NYSDOH will need to give their approval for our initiative, so proving to them that we will be successful is a challenge we have to tackle.
- Furthermore, they have the power to halt our funding at any time if they don't perceive satisfactory results.

Limitations

3. Lack of Interest

- We're still talking about young kids here, so one thing we need to consider is whether they'll actually be interested in paying attention to the modules. That's why it's important to make the modules fun and exciting, so we can keep the kids engaged.
- Another thing to keep in mind is that what might be educational and informative for a 5-year-old could easily become boring and slow for a 13-year-old. So, we've got to make sure we create modules that are suitable for each age group, giving them something that matches their interests and keeps them hooked.

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