# Effects of Fruit and Vegetable Intake as Part of the National School Lunch Program on BMI z-score in 3rd-5th Graders

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BACKGROUND

Increasing Rates of Childhood Obesity
- Childhood obesity rates tripled since 1970.[1]
- Approximately 1 in 5 children (5-18 years old) are overweight or obese.[2]
- Body mas index (BMI) has been indicated as a strong predicter of health and weight status by the Centers for Disease Control (CDC).[2]

World Health Organization BMI z-score charts for boys
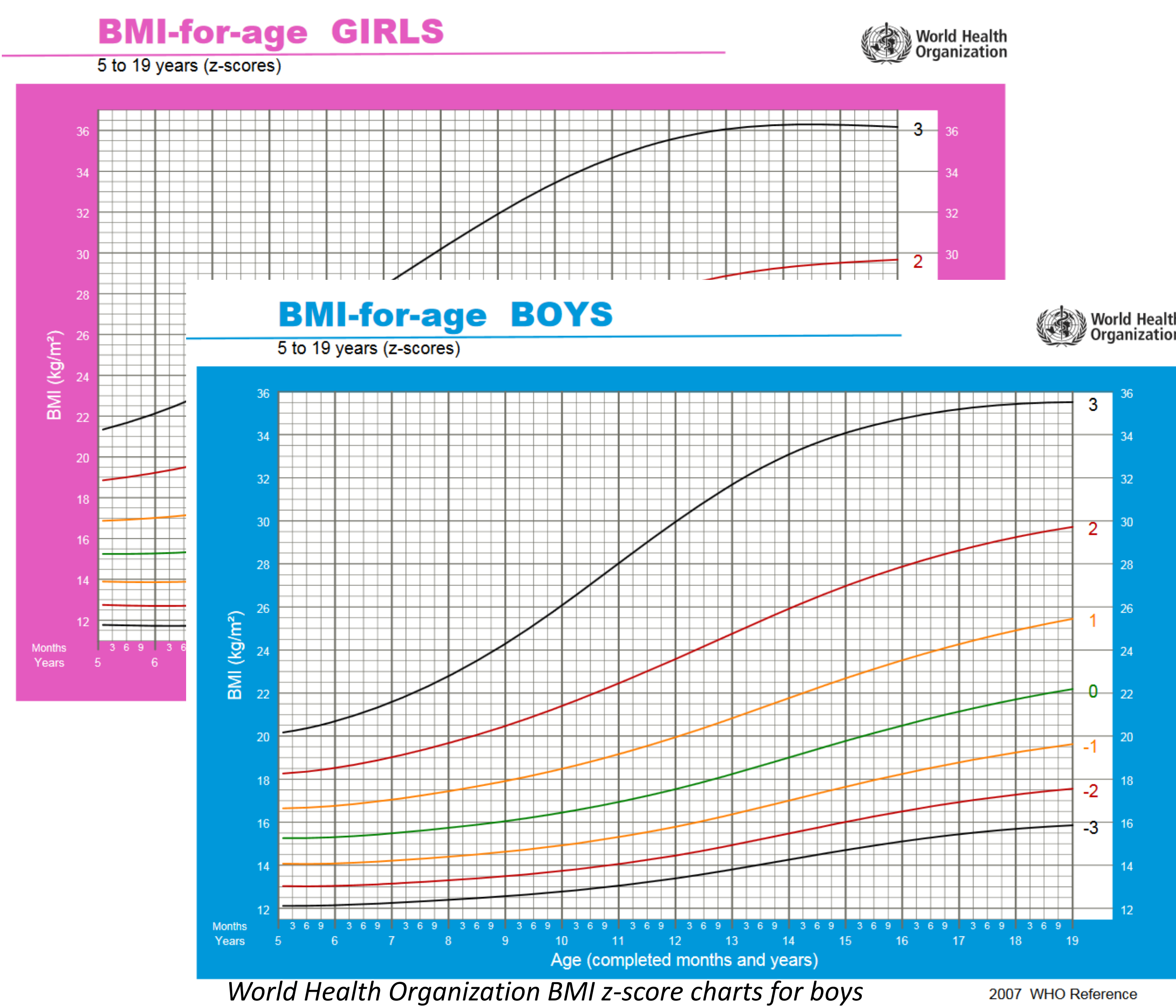
National School Lunch & Breakfast Program (NSLP & SBP)
- Goals include reducing childhood obesity through improved meals
- Provides free and reduced price meals based on income
- Schools receive reimbursement for meals served.
- Meals must meet specific nutrient standards

Grades 3rd-5th Meal Requirements (Daily)				
	Breakfast	Lunch	Total	*RDI
Fruits (cups)	1.00	0.50	1.5	1.50
Vegetables (cups)	0.00	0.75	0.75	2.00

Age range for RDI (recommended daily intake) is 8 to 11 years old

Fruit and Vegetable (FV) Requirements
- Offer FV as two separate meal components
- Fruits offered daily at breakfast & lunch, vegetables at lunch
- Can be fresh, frozen or in light syrup

OBJECTIVES

Primary
- Determine impact of the NSLP & SBP at reducing childhood obesity.

Secondary
- Measure the relationship between FV selection and intake for children
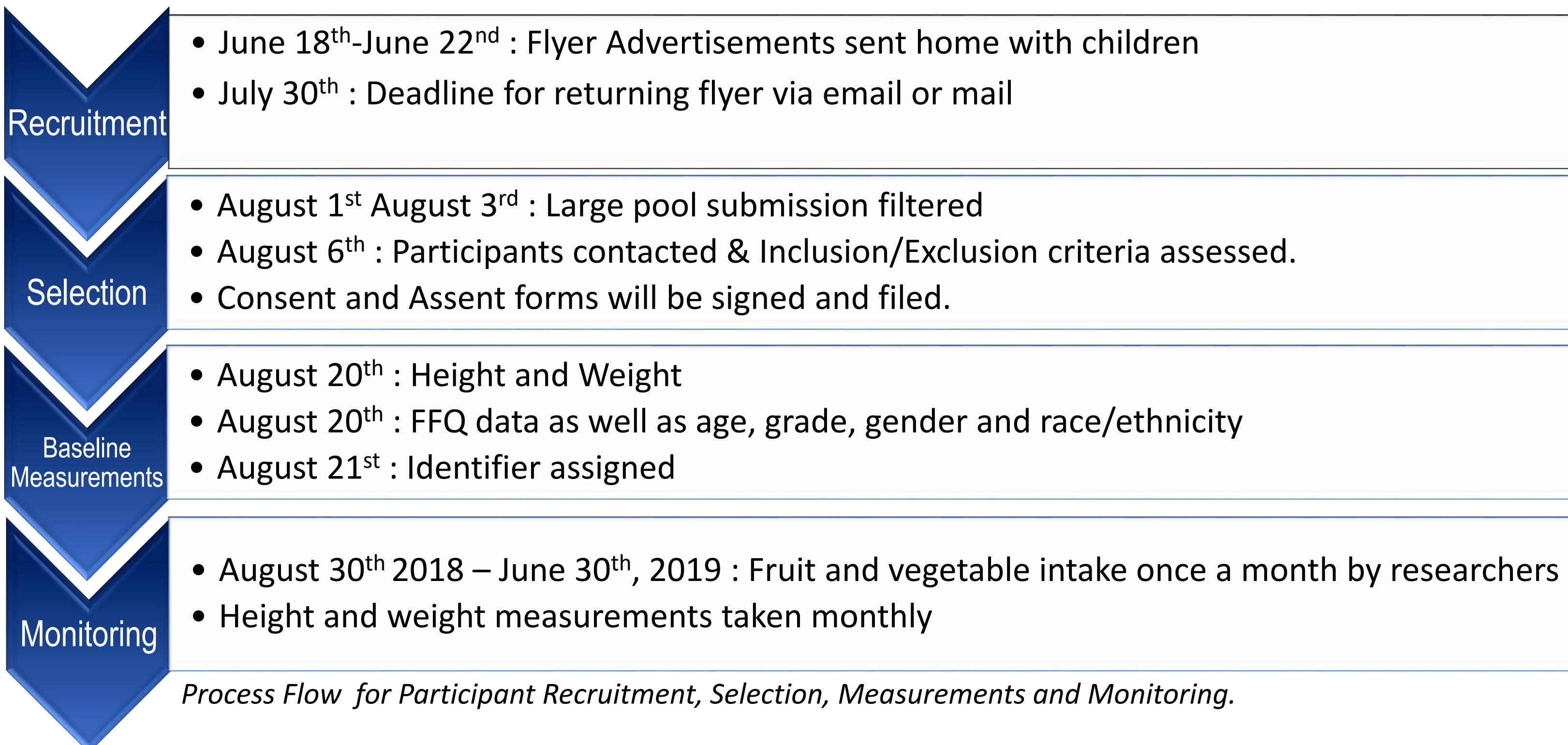- Assess FV intake in 3rd-5th grade children compared to RDI

METHODS

Study Design: Quasi-experimental, pretest-posttest design
Participants: 210 3rd-5th grade children from Red Bank & East Side Elementary School District in Chattanooga, TN, (n-105 from each)
Setting: In the school environment, during breakfast and lunch
Time Period: August 30th , 2018- June 30th , 2019

Recruitment
- June 18th-June 22nd : Flyer Advertisements sent home with children
- July 30th : Deadline for returning flyer via email or mail

Selection
- August 1st August 3rd : Large pool submission filtered
- August 6th : Participants contacted & Inclusion/Exclusion criteria assessed.
- Consent and Assent forms will be signed and filed.

Baseline Measurements
- August 20th : Height and Weight
- August 20th : FFQ data as well as age, grade, gender and race/ethnicity
- August 21st : Identifier assigned

Monitoring
- August 30th 2018 – June 30th, 2019 : Fruit and vegetable intake once a month by researchers
- Height and weight measurements taken monthly

Process Flow for Participant Recruitment, Selection, Measurements and Monitoring.

	School A - Red Bank	School B - East Side
Baseline Measures	• Height • Weight • FV Intake • Age • Gender • Grade • Race/Ethnicity	• Height • Weight • FV Intake • Age • Gender • Grade • Race/Ethnicity
Monthly Measures	• Height • Weight • FV Selection/Intake	• Height • Weight • FV Selection/Intake
School Meal Participation Requirement	Children must eat school meals 95% of the time or >	Children are required to eat school meals <90% of the time
Researcher Monitoring	Once a month in cafeteria for fruit/vegetable selection and consumption	Once a month in cafeteria for fruit/vegetable selection and consumption
Fruit and Vegetable Requirements	At least 1 fruit serving (0.5 cups) for breakfast and lunch. At least 1 serving (1.0 cup) of vegetables for lunch	No Requirements

Participant Compensation: None
Identifiers Used: Deidentifying letter-number combinations
Data Collection Methods:
   Observations in Café: measuring FV selected vs. eaten
   School Health Center Measurements: Height and Weight to determine BMI z-scores.

METHODS cont.

Sample size determined by independent t-test using a 95% power and 0.50 effect size & .05 error rate. H1: children from intervention group with a BMI z-score of 2 or greater will have a reduction of 2.0 as a result of increased FV compared with the control group who will have a reduced BMI of 1.0.

	School A (East Side Elementary School)				School B (Red Bank Elementary School)			
Gender	n	%	mean BMI	Mean z-score	n	%	mean BMI	Mean z-score
Male								
Female								

	School A (East Side Elementary School)				School B (Red Bank Elementary School)			
Age	n	%	mean BMI	Mean z-score	n	%	mean BMI	Mean z-score
<8								
8-9								
9-10								
10-11								
11+								

Age & BMI means will be compared between schools using independent t-tests to identify significant difference between the groups and adjust covariates accordingly.

Paired t-test will be used within groups to compare BMI z-score changes between baseline and final to determine if they are significant using two-tailed t-test.
Pearson's correlation will be used to assess the correlation between BMI z-score changes and FV intake from month to month for each group.
Monthly FV selection/intake data will be reviewed to determine effectiveness of NSLP at increasing FV intake.
P-value <0.05.

RESULTS

Compared with the control group, we hypothesize that for children in the intervention group with BMI of 25 or >, their mean change in z-score will be significantly greater as a result of increased fruit and vegetable intake.

CONCLUSIONS

The outcome of this research will add to the body of knowledge surrounding the effectiveness of the NSLP & SBP at increasing FV intake as well as improving BMI status for school aged children.

References:
1.) Fryar CD, Carroll MD, Ogden CL. Prevalence of overweight and obesity among children and adolescents: United States, 1963-1965 through 2011-2012. Health E-Stats. 2014. https://www.cdc.gov/nchs/data/hestat/obesity_child_11_12/obesity_child_11_12.htm. Accessed December 21, 2017.
2.) Healthy Weight. Centers for Disease Control and Prevention. https://www.cdc.gov/healthyweight/assessing/bmi/index.html. Published July 6, 2018. Accessed July 27, 2018