

Objective: To assess longitudinal impact of changes in childhood BMI on cardiac structure and function.

Background: Childhood obesity has increased dramatically in the US since 1980 and is associated with cardiovascular disease in adulthood. Echocardiographic studies have demonstrated cardiac remodeling and alterations in myocardial structure and function in obese adults. Associations between weight and cardiac structure and function in children are less well documented.

Methods: Project HeartBeat! recruited 678 children grouped in cohorts aged 8, 11, and 14 years at baseline.

Anthropometric, including BMI, and transthoracic echo data were collected at 4-month intervals for 4 years (1991–1995) for a total of 5779 person-exams. Fractional shortening (FS), left atrial dimension, left ventricular systolic and diastolic dimensions, and left ventricular mass indexed to body surface area (LVMI) were assessed as outcomes. Cross-sectional association between baseline BMI and baseline outcomes were assessed with linear regression models. We used random effects models for repeated measures, adjusted for covariates (age, sex, race and blood pressure), to model: 1) associations between baseline BMI and change in echo measures over time, and 2) associations between change in BMI and echo measures over time.

Results: Please reference Table 1

Conclusions: Elevated baseline BMI and increasing BMI over time are associated with higher baseline and greater increases in LVMI. Elevated baseline BMI and increases in BMI over time were also associated with increased left atrial and left ventricular dimensions. While there was no association between baseline BMI and baseline FS, higher baseline BMI and increased in BMI over time were associated with mild increases in FS. The results demonstrate that higher baseline BMI and increases in BMI over time negatively impact the heart in children as early as 8 years of age and through adolescence.

Table 1: Association between BMI percentile and echocardiographic outcomes.

Outcome	Baseline BMI Percentile and Outcomes at Baseline (per 10% Higher BMI Percentile)		Baseline BMI Percentile and Outcomes Over Time (per 10% Higher BMI Percentile)		BMI Percentile Over Time and Outcomes Over Time (per 10% Increase in BMI Percentile)	
	Point Estimate (95% CI)	p-value	Point Estimate (95% CI)	p-value	Point Estimate (95% CI)	p-value
LV Mass Indexed (Percentile)	3.45 (2.84-4.06)	<0.05	3.85 (3.34-4.36)	<0.05	3.56 (3.14-3.98)	<0.05
LA Diameter (mm)	0.48 (0.39-0.56)	<0.05	0.49 (0.42-0.56)	<0.05	0.49 (0.43-0.54)	<0.05
LV Diameter, systole (mm)	0.2 (0.11-0.29)	<0.05	0.17 (0.1-0.25)	<0.05	0.13 (0.07-0.19)	<0.05
LV Diameter, diastole (mm)	0.38 (0.29-0.48)	<0.05	0.37 (0.29-0.44)	<0.05	0.35 (0.29-0.41)	<0.05
Fractional Shortening (%)	0.11 (-0.05-0.27)	0.19	0.15 (0.05-0.25)	<0.05	0.21 (0.12-0.3)	<0.05

*Models adjusted for Gender, Ethnicity, Age, Systolic Blood Pressure, and Diastolic Blood Pressure