Multilevel Correlates of Healthy BMI Maintenance and Return to a Healthy BMI among Children in Massachusetts

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Abstract

Objectives: To examine predictors of healthy BMI maintenance (HBM) or return to a healthy BMI (RHB) among children.

Methods: We studied 33,272 children in Massachusetts between 2008 and 2012. We used multinomial logistic regression to examine associations of individual- and neighborhood-level factors with the odds of: (1) HBM: maintenance of a healthy BMI ≥ 5 th to < 85 th percentile and (2) RHB: transition to a healthy BMI range from an initial BMI ≥ 85 th percentile between two clinic visits spanning an average of 3.5 years.

Results: Racial/ethnic minorities had lower odds of HBM and RHB than non-Hispanic white children. Higher neighborhood educational attainment was associated with an increased odds of HBM and RHB. Higher neighborhood median household income, proximity to a supermarket, and access to more open recreational space were associated with a higher odds of HBM. Children of ages 2–5 years at baseline had higher odds of RHB and HBM than children 13 years and older.

Conclusions: Early childhood interventions and efforts to create health-promoting neighborhoods including improving access to supermarkets and open recreational space could have important effects on obesity prevention and management.

Keywords: childhood obesity; built environment; return to healthy weight

Introduction

Since the 1980s, the prevalence of childhood obesity in the United States has been increasing to alarming levels such that from 2011 to 2014, 17% of all U.S. children and adolescents had obesity.¹ Childhood obesity is associated with both short- and long-term adverse outcomes,^{2–5} including hyperlipidemia, diabetes, and hypertension,^{4,6–8} and with higher morbidity and mortality in adulthood.⁹ Children with obesity tend to continue to have obesity as adults, and, once present, obesity is notoriously hard to treat.^{10–12} Although recent estimates suggest that childhood obesity rates may have plateaued in some U.S. population subgroups, overall

rates remain high, and racial/ethnic and socioeconomic disparities appear to be widening.¹³

A better understanding of what predicts healthful BMI trends could provide insight into where prevention and treatment should focus. This may be especially relevant for disadvantaged groups in light of racial/ethnic and socioeconomic disparities in childhood obesity. Previous studies have examined the individual-level factors that predict healthful BMI,^{10,14} but few have examined individual and neighborhood variables concurrently. Many individual-level characteristics (e.g., race/ethnicity) cannot be modified, but attributes of a child's environment could be areas for potential change, and may therefore be critical in reducing disparities. For example, previous

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research has shown that access to parks¹⁵ and supermarkets could be associated with a lower BMI.^{16,17} Although these studies did not experimentally modify children's environments, which is important for proving causality, they did find that access to existing resources was beneficial for children's weight outcomes.

Studies examining these modifiable attributes or a child's built environment have had small sample sizes, often lacking substantial diversity among their participants, and are cross-sectional. Thus, the objective of this study is to examine the individual- and neighborhood-level predictors of three distinct weight trajectories among more than 33,000 children in eastern Massachusetts (MA) between 2008 and 2012. We explicitly examined factors associated with children's healthy BMI maintenance (HBM), return to healthy BMI (RHB) after an unhealthy BMI ≥ 85 th percentile, and persistent unhealthy BMI. We hypothesized that younger children, those living in higher income neighborhoods, and those living closer to supermarkets and open recreational spaces would be more likely to have healthful BMI trends (e.g., maintain healthy BMIs or return to healthy BMIs over time).

Materials and Methods

Study Design and Participants

We examined electronic health record (EHR) data across a two-point time frame for 33,272 children aged 2 to 18 years who were seen for at least two well-child visits at any of the 14 pediatric practices of Harvard Vanguard Medical Associates (HVMA), a large multisite, multispecialty physician group practice in eastern Massachusetts. HVMA practices cover largely urban and suburban areas but also some rural areas. Eligible children were those who had height and weight measurements recorded during an initial clinic visit between January 1, 2008 and December 31, 2009 (hereafter, Time 1, or "T1") and a subsequent visit between August 1, 2011 and August 31, 2012 (hereafter, Time 2, or "T2").

We excluded children with (1) residential addresses outside of Massachusetts, (2) any history of medical diagnoses potentially affecting growth and nutrition (e.g., pregnancy, leukemia, or inflammatory bowel disease), and (3) implausible BMI z-scores (less than -6.0 and greater than 6.0). The Harvard Pilgrim Health Care Institutional Review Board approved the study protocol. A waiver of informed consent was obtained for this study, given the use of existing EHR data.

Outcomes of Interest

At each well-child visit, medical assistants measured height and weight following HVMA's written standardized protocol, which is consistent with the standard of care in pediatric primary care described in detail in a previously published work.¹⁸ We calculated BMI as kg/m^2 and used CDC growth curves to define children's age and sex-specific BMI percentiles.¹⁹ We then categorized children into four mutually exclusive groups representing those who

(1) maintained healthy BMIs between the ≥ 5 th and < 85 th percentile from T1 to T2 (HBM), (2) returned to healthy BMIs of between ≥ 5 th and < 85 th percentile at T2 after recording unhealthy BMIs of ≥ 85 th percentile at T1 (RHB), (3) had persistently unhealthy BMIs of ≥ 85 th percentile at both T1 and T2 clinic visits, and (4) had initially healthy BMIs at T1 and transitioned into an unhealthy BMI at T2.

We chose to focus on the transition to less than the 85th percentile and maintenance of a BMI less than the 85th percentile because previous research has demonstrated that these children have better cardiometabolic outcomes than their counterparts.^{20–22} To examine healthy BMI trends, our findings focus on the HBM and RHB groups, with persistently unhealthy BMI as the referent group. The complete results from the multinomial regression, which include associations for participants with unhealthy BMI onset, are presented as Supplementary Table S1 (Supplementary Data are available online at www.liebertpub.com/chi).

Independent Variables

Individual-level variables were assessed from the EHR at T1 and included children's sex, age (2–5, 6–13, and 13–18 years), and race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, Asian, and other). We assessed neighborhood-level and built environment factors using the child's most recent residential address, also available from the EHR, and ArcGIS version 10 Network Analyst Extension Closest Facility tool and StreetMap USA Detailed Streets (ESRI, Redlands, CA) software. Spatial analyses were conducted using the Massachusetts State Plane Projection, North American Datum, 1983 (m). We obtained neighborhood median household income (divided into quartiles) and percentage of adults without a high school education (divided into quartiles) by linking children's geocoded residential addresses with the 2006–2010 American Community Survey data at the U.S. census tract level.

We mapped children's geocoded addresses to the number of fast-food restaurants, which included pizza stores and any fast-food franchises (defined by Standard Industrial Classification [SIC] 581222, 581208), within their 800 m street networked buffer (divided into 0, 1–2, and 3 or more fast-food restaurants), open recreational spaces (defined as the count of open spaces with the primary purpose of recreation or both conservation and recreation, obtained from MassGIS) within 800 m street networked buffer (divided into quartiles), and networked street distance to the closest large supermarket with 50 or more employees (SIC codes 541101, 541105; categorized into < 1 mile [< 1.6 km], 1–2 miles [1.6–3.2 km], and > 2 mile [> 3.2 km] distances from the child's home). We chose to use distance to supermarkets as a proxy of access to low-price fresh fruit and vegetables and density of fast-food restaurants as a proxy for oversaturation of unhealthy food establishments. We obtained food establishment data from the 2009 InfoUSA database.

Statistical Analyses

We first examined descriptive associations of the individual- and neighborhood-level factors across the BMI outcome groups. We then used multinomial logistic regression models to examine associations of individual child (baseline age, sex, race/ethnicity) and neighborhood-level (median household income, percentage without a high school education, density of fast-food restaurants, density of open recreational spaces, and distance to a large supermarket) characteristics with HBM and RHB. Children with persistently unhealthy BMIs comprised the referent group. We report odds ratios and 95% confidence intervals (CIs) for each individual- and neighborhood-level characteristic. All models mutually adjusted for all of the independent variables. We conducted statistical analyses using SAS version 9.3 (SAS Institute, Inc., Cary, NC).

Results

Table 1 presents the baseline characteristics of the 33,272 children in our sample. At T1, 30.9% of children recorded an unhealthy BMI, with 14.2% having obesity. The majority of children (62%) were between 6 and 12 years of age, approximately half (50.5%) were male, 67% were non-Hispanic white, 14% were non-Hispanic black, and 5.5% were Hispanic. Nearly half of children lived within 800 m of a fast-food restaurant, with a mean (SD) density of fast-food restaurants of 1.3 (2.1). The mean (SD) median neighborhood household income was \$86,500 (\$32,500) and the mean (SD) neighborhood percentage of adults without a high school education was 8.3% (7.6). The average (SD) network distance to a large supermarket was 1.6 miles (1.1). The mean (SD) density of open recreational space was 2.6 (2.9) per 800 m. The mean (SD) amount of time in years between T1 and T2 for the sample was 3.5 (0.6), whereas the mean (SD) change in BMI z-score between T1 and T2, was -0.02 (0.6).

Table 2 presents the change in children's BMI status over the period of interest. Between T1 and T2, 62.0% of children maintained a healthy BMI, whereas 8.0% returned to a healthy BMI after recording an unhealthy BMI at T1. Nearly one in four children (23.0%) recorded a persistently unhealthy BMI over the study period.

As shown in Table 3, males had a lower odds of HBM than females (adjusted odds ratio [AOR] 0.82; 95% CI 0.77–0.86). Non-Hispanic black (AOR 0.54; 95% CI 0.50–0.59) and Hispanic (AOR 0.52; 95% CI 0.46–0.58) children were also less likely to demonstrate HBM than non-Hispanic white children. Younger children of ages 2–5 years old were more likely to demonstrate HBM (AOR 1.46; 95% CI 1.33–1.60) than those 13 years or older. Living within the third (AOR 1.22; 95% CI 1.10–1.35) and fourth (AOR 1.69; 95% CI 1.49–1.91) quartiles of neighborhood median household income was associated with higher odds of HBM than those living in the lowest quartile of neighborhood median income. Living in a census tract with the lowest percentage (AOR 1.46; 95% CI 1.30–1.64) of adults

lacking high school education was associated with a higher odds of HBM than those living in the fourth quartile.

Living in neighborhoods with a higher density of open recreational space was associated with higher odds of HBM (AOR for Q4 1.20; 95% CI 1.10–1.31) than those living in the first quartile. Surprisingly, children living near three or more fast-food restaurants were more likely to have a HBM than those not living near fast-food restaurants (AOR 1.30; 95% CI 1.14–1.48). In addition, children living further than 2 miles from a large supermarket had lower odds HBM (AOR 0.89; 95% CI 0.81–0.97) than those living <1 mile away.

With respect to RHB, non-Hispanic black and Hispanic children were less likely to RHB than their non-Hispanic white counterparts (AOR 0.76; 95% CI 0.65–0.88) and (AOR 0.77; 95% CI 0.63–0.94), respectively. Children of ages 2 to 5 years (AOR 3.01; 95% CI 2.57–3.51) at baseline had higher odds of RHB than those 13 years and older. Living in a neighborhood with the lowest percentage of adults without a high school education was associated with higher odds of RHB versus those with the highest percentage of adults without a high school education (AOR 1.31; 95% CI 1.07–1.60). There was no association between child sex or neighborhood median household income, fast food, open recreational space density, and distance to a large supermarket and RHB.

Discussion

In this large, prospective cohort study of children living in Massachusetts, we found that non-Hispanic black and Hispanic children of all ages were less likely to maintain a healthy BMI and to return to a healthy BMI than their non-Hispanic white counterparts. We also found that children of ages 2 to 5 years were 1.46 times more likely to have a healthy BMI and three times more likely to return to a healthy BMI range than those 13 years and older. Those children living in higher income neighborhoods were 1.2 to 1.7 times more likely to have HBM than those in lower income neighborhoods. Those children living in neighborhoods with higher educational attainment were more likely to have HBM and return to a healthy BMI range versus children in the lowest quartile of educational achievement.

Contrary to intuition, those living in areas with more fast-food restaurants were 1.3 times more likely to have HBM versus those living in areas with no fast-food restaurants. Those living near more areas for open recreational space were 1.2 times more likely to have HBM versus those having less access to open recreational space. Finally, those living further away from a large supermarket were 1.1 times less likely to have HBM versus those living within 1 mile of a supermarket.

Our study builds on previous research in that it examines concurrently the influence of individual- and neighborhood-level variables on children's BMI trends over time. Our results that younger and white children are more likely to return

Table 1. Baseline Sample Characteristics of 33,272 Children Aged 2–18 Years in Massachusetts

	N (%)
Total	33,272 (100)
Child characteristics	
Baseline BMI status, 2008–2009	
Healthy BMI	22,982 (69.1)
Unhealthy BMI	10,290 (30.9)
Overweight	5580 (16.8)
Obese	4710 (14.2)
Sex	
Male	16,802 (50.5)
Female	16,470 (49.5)
Race/Ethnicity	
White	22,253 (66.9)
Black	4618 (13.9)
Asian	2614 (7.9)
Hispanic	1822 (5.5)
Other race/ethnicity	1965 (5.9)
Baseline age, years	
2–5	6039 (18.2)
6–12	20,647 (62.1)
13+	6586 (19.8)
Neighborhood characteristics	
Median household income, quartiles	
First (lowest) (\$12,429–\$63,750)	8285 (24.9)
Second (\$63,751–\$82,083)	8321 (25.0)
Third (\$82,084–\$108,102)	8341 (25.1)
Fourth (highest) (\$108,103–\$218,667)	8316 (25.0)
Percentage without high school education, quartiles	
First (lowest) (0%–3.2%)	8355 (25.1)
Second (3.3%–5.9%)	8267 (24.9)
Third (6%–11%)	8349 (25.1)
Fourth (highest) (11.1%–60.4%)	8301 (25.0)
Fast-food density	
None	18,585 (55.9)
1–2	7986 (24.0)
3 or more	6701 (20.1)

*continued***Table 1. Baseline Sample Characteristics of 33,272 Children Aged 2–18 Years in Massachusetts continued**

	N (%)	
Density of open recreational space, quartiles		
None	7836 (23.6)	
1	7311 (22.0)	
2–3	8768 (26.4)	
4 or more	9357 (28.1)	
Network distance to large supermarket, miles		
<1	11,519 (34.6)	
1–2	12,936 (38.9)	
>2	8817 (26.5)	
	Mean (SD)	Median (IQR)
Average time between visits, years	3.5 (0.6)	3.4 (3.1 to 4.0)
Baseline visit, 2008–2009		
Age, years (SD)	9.0 (3.8)	9.1 (5.8 to 12.2)
BMI z-score (SD)	0.5 (1.0)	0.5 (–0.1 to 1.2)
Most recent visit, 2011–2012		
Age, years (SD)	12.5 (3.8)	12.6 (9.2 to 15.7)
BMI z-score (SD)	0.5 (0.9)	0.5 (–0.2 to 1.2)
Change between 2008–2009 and 2011–2012		
Age, years (SD)	3.5 (0.6)	3.4 (3.1 to 4.0)
BMI z-score (SD)	–0.02 (0.6)	–0.04 (–0.4 to 0.3)
Median household income, thousands	86.5 (32.5)	82.1 (63.8 to 108.1)
Percentage without high school education	8.3 (7.6)	5.9 (3.2 to 11.0)
Fast-food density	1.3 (2.1)	0.0 (0.0 to 2.0)
Density of open recreational space	2.6 (2.9)	2.0 (1.0 to 4.0)
Network distance to large supermarket, miles	1.6 (1.1)	1.3 (0.8 to 2.1)
Network distance to fast-food restaurants, miles	0.88 (0.74)	0.62 (0.35 to 1.2)

to a healthy weight are consistent with the findings in previous studies examining individual-level characteristics and healthful BMI trends. For example, Hernandez et al.'s study of 9416 school-aged children reported a higher incidence of return to healthy weight among Kindergarteners versus fifth-grade students.¹⁴ This is also consistent with the Massachusetts Pediatric Nutrition Surveillance System data, which found in 2010 that the overall prevalence of obesity in

Table 2. Children's BMI Status 2008–2009 to 2011–2012

	Healthy BMI range at follow-up	Unhealthy BMI range at follow-up
Healthy BMI range at baseline	Healthy weight maintenance 20,631 (62.0%)	Unhealthy BMI onset 2351 (7.1%)
Unhealthy BMI range at baseline	Return to healthy BMI range 2650 (8.0%)	Persistent unhealthy BMI range 7640 (23.0%)

Massachusetts among children aged less than 5 years decreased from 14.5% in 2001 to 14.4% in 2010. Decreases were also found in 3-year-olds (17.2% in 2001 to 16.6% in 2010) as well as in 2-year-olds (15.1% in 2001 to 13.9% in 2010).²³ These decreases in the younger age groups could be related to greater access to Women Infant and Children (WIC) Nutrition Program. For example, a recent study by Andreyeva and Tripp found that low-income, WIC-participating households in Connecticut and Massachusetts improved the overall healthfulness of their food purchases after the implementation of WIC food package revisions.²⁴

Other longitudinal research from Oregon found that Hispanic students were more likely to have higher BMI at baseline and less likely to return to a normal weight.²⁵ Finally, a longitudinal study examining 11,624,864 BMI records in California found that black and Hispanic girls increased in prevalence of overweight and obesity over time, whereas non-Hispanic white, Asian youth, and Hispanic boys decreased in prevalence of overweight or obesity over time.²⁶ These findings are consistent with the increasing prevalence of obesity nationwide among ethnic minorities and low-income populations.^{27,28}

Our study builds upon this prior work by demonstrating the independent impact of neighborhood-level factors on children's weight trajectories. In our analysis, children living in neighborhoods with higher education and income levels had proportionally higher odds of healthful BMI trends. Consistent with this finding, a cross-sectional study of Massachusetts youth found that for every 1% increase in low-income students in a school district, there was a 1.17% increase in children's overweight/obese status.²⁹ Another cross-sectional study of children of age 5–7 years in Germany demonstrated that those living in a higher socioeconomic position and higher educational attainment neighborhood had a lower odds of overweight.³⁰ Similar findings have been reported in China.³¹ Although we did not explore potential reasons why higher neighborhood socioeconomic indicators influence children's BMI trends, factors may include cultural norms or increased opportunities for healthy eating and physical activity.

In addition to SES predictors of healthful BMI trends, the finding that increasing distance to a large supermarket had a negative effect on HBM is consistent with previous studies that demonstrated that living closer to large supermarkets was associated with a lower BMI.^{32,33} Amuta et al. found that 57% and 67% of the variance in fruit and

vegetable intake, respectively, were explained by having access to fruit and vegetables in the home.³⁴ The protective effect of proximity to supermarkets on BMI we observed is likely because all families face time and financial constraints, and closer access to affordable healthy foods such as fruits and vegetables is likely to promote the availability of these in a child's home and potentially leads to healthier diets and weight.

The association between living in a neighborhood with more fast-food restaurants and HBM contrasts with some^{16,35,36} but not all findings from prior research.³⁷ Although this result may be counterintuitive, we hypothesize that the density of fast-food restaurants may be a proxy for living within more walkable or urban neighborhoods. Moreover, because fast-food restaurants and supermarkets are often colocated, it is possible that the higher number of fast-food restaurants may symbolize access to other more "healthful" stores as well. Fast-food restaurants may also be located near opportunities for physical activity (*i.e.*, high schools where children participate in afterschool sports). Given that some fast-food establishments have moved toward making more healthful options available, it is possible that the increased availability of fast food had a beneficial impact on children's diets, although we did not have data to determine whether families actually purchased fast food at these locations.

Finally, we found that children living in the higher quartiles of density of open recreational space were also more likely to return to a healthier weight. This is consistent with a previous study by our group that demonstrated that those living in the closest quartile to recreational open space had lower BMI z-scores than those living farthest away. We also found that those living in neighborhoods with fewer recreational open spaces had an increase in BMI z-score over time.³⁸ Furthermore, in a study of 3173 children who were followed from 9 to 18 years of age, those living within 500 m from a park had a lower BMI at age 18.³⁹

Strengths of our study include the large sample size and longitudinal data structure, which provided repeated weight and height measurements for a diverse sample of children across multiple age groups. Our simultaneous assessment of both individual and neighborhood characteristics on children's weight trajectories is an advance over previous research and points to several potentially modifiable opportunities for intervention. Our study also has several potential limitations. First, our data were taken from EHRs, which lack data on

Table 3. Associations of Individual- and Neighborhood -Level Predictors with HBM and RHB from 2008 to 2012

	Healthy BMI maintenance ^a	Return to healthy BMI range ^a
	AOR (95% CI)	AOR (95% CI)
Child characteristics		
Sex		
Male	0.82 (0.77–0.86)	0.98 (0.89–1.08)
Female	1.00 (Reference)	1.00 (Reference)
Race/ethnicity		
White	1.00 (Reference)	1.00 (Reference)
Black	0.54 (0.50–0.59)	0.76 (0.65–0.88)
Asian	1.38 (1.23–1.55)	1.10 (0.90–1.33)
Hispanic	0.52 (0.46–0.58)	0.77 (0.63–0.94)
Other race/ethnicity	0.74 (0.66–0.82)	0.79 (0.64–0.96)
Baseline age, years		
2–5	1.46 (1.33–1.60)	3.01 (2.57–3.51)
6–12	0.85 (0.80–0.92)	1.16 (1.02–1.33)
13+	1.00 (Reference)	1.00 (Reference)
Neighborhood characteristics		
Median household income, quartiles		
First (lowest) (\$12,429–\$63,750)	1.00 (Reference)	1.00 (Reference)
Second (\$63,751–\$82,083)	1.10 (1.01–1.19)	1.02 (0.88–1.19)
Third (\$82,084–\$108,102)	1.22 (1.10–1.35)	1.13 (0.95–1.35)
Fourth (highest) (\$108,103–\$218,667)	1.69 (1.49–1.91)	1.18 (0.95–1.46)
Percentage without high school education, quartiles		
First (lowest) (0–3.2%)	1.46 (1.30–1.64)	1.31 (1.07–1.60)
Second (3.3–5.9%)	1.28 (1.16–1.42)	1.23 (1.03–1.46)
Third (6–11%)	1.14 (1.05–1.24)	1.17 (1.00–1.36)
Fourth (highest) (11.1–60.4%)	1.00 (Reference)	1.00 (Reference)
Fast-food density		
None	1.00 (Reference)	1.00 (Reference)
1–2	1.04 (0.96–1.12)	1.05 (0.91–1.20)
3 or more	1.30 (1.14–1.48)	1.22 (0.98–1.53)
Density of open recreational space, quartiles		
None	1.00 (Reference)	1.00 (Reference)
1	0.99 (0.91–1.07)	1.05 (0.91–1.21)
2–3	1.10 (1.01–1.19)	1.08 (0.94–1.24)
4 or more	1.20 (1.10–1.31)	1.07 (0.92–1.25)
Network distance to large supermarket, miles		
<1	1.00 (Reference)	1.00 (Reference)
1–2	0.92 (0.86–0.98)	0.91 (0.81–1.03)
>2	0.89 (0.81–0.97)	0.89 (0.76–1.04)

Models control for the time between appointments and all other variables.

^aVersus persistent unhealthy BMI range.

AOR, adjusted odds ratio; CI, confidence interval; HBM, healthy BMI maintenance; RHB, return to healthy BMI.

Bold values indicate statistically significant values.

other critical influences to children's BMI, including screen time, sleep duration, physical activity, diet, parental behaviors, family income, parent weight status,⁴⁰ and information on whether the family was participating in WIC or Supplemental Nutrition Assistance Program.

We also lacked data on participants' pubertal status, which may have impacted their weight trajectories. We also assessed neighborhood variables cross-sectionally and lacked information on whether or not the child moved during the study period. Although we found significant associations between some neighborhood-level factors and healthful BMI trends, we could not discern from our data whether or not children accessed the resources in their neighborhoods. Furthermore, all participants resided in eastern Massachusetts where rates of uninsurance, especially among children, are extremely low. All had access to healthcare, making the sample not generalizable to those without health insurance or access to healthcare. Many of our participants were white and lived in areas with neighborhood median household incomes higher than the state and the national averages. In addition, our participants mostly lived in neighborhoods with high educational attainment levels, as the average number of people lacking a high school education (8%) is lower than in Massachusetts as a whole.⁴¹ Our analyses nevertheless clearly show the importance of individual- and neighborhood-level factors to children's BMI trends and highlight modifiable factors that could be the target of intervention efforts.

Public Health Implications

This study adds to the literature through its longitudinal examination of a large and diverse cohort of children and its concurrent investigation of both individual- and neighborhood-level predictors of return to a healthy BMI and HBM. Our findings of the high likelihood of a return to a healthy BMI and a HBM among 2–5-year-olds suggest that more funding and interventions should target this age group to both prevent and treat obesity. Our findings also suggest that improvements in the neighborhood environment such as greater access to open recreational space and supermarkets could be beneficial in preventing childhood obesity. By addressing these actionable steps, we may be able to begin to improve the prevalence of childhood obesity in our most vulnerable communities.

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Author Disclosure Statement

No competing financial interests exist.

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