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Weight Gain during the COVID-19 Pandemic in a High-Risk Cohort of Children in San Francisco, CA

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Abstract

Pandemic mitigation measures may lead to excess weight gain in children. Our objective was to assess weight gain during the COVID-19 pandemic in children of ages 4–12 years with overweight and obesity in San Francisco, CA. Children with BMI \geq 85th percentile measured at a clinic visit from January to March 2020 were recruited. Follow-up BMI measurements were obtained between October 2020 and March 2021 from the electronic medical record or through a video study visit. Pre- and post-BMI measurements were obtained on $n=91$ participants. The majority were Latino (85%) and publicly insured (91%). Mean monthly weight gain was 0.73 kg [standard deviation (SD) 0.47], equivalent to yearly weight gain of 8.8 kg. Mean monthly change in BMI z-score was 0.02 (SD 0.04) equivalent to yearly increase in BMI-z of 0.24. Weight gain among children in San Francisco with overweight and obesity during the COVID-19 pandemic far exceeded healthy weight gain for this age group.

Keywords: children; COVID-19; weight gain

Introduction

Although children are largely spared from direct effects of COVID-19,¹ there is concern that pandemic mitigation strategies will lead to increases in childhood obesity.^{2–5} In particular, prolonged closures of schools, playgrounds, and recreational facilities may negatively affect lifestyle behaviors that protect against obesity. Surveys with parents during the pandemic reveal increased child screen time, decreased physical activity, and worsening dietary patterns, all of which may contribute to excess weight gain.^{6–10}

Prior research also reveals that children tend to gain excessive amounts of weight during periods of school closure (*i.e.*, summer vacation), with the sharpest gains among school-age children with overweight and obesity and among African American and Latino children.^{11–14} Studies of Palestinian and Chinese youth reveal excess weight gain during the pandemic.¹⁰ In addition, a serial cross-sectional study of obesity prevalence among children receiving care in a large U.S.-based health system revealed an increase in obesity during the pandemic at the popula-

tion level.¹⁵ However, there is a paucity of data longitudinally tracking weight gain among individual children in the United States during the pandemic.

Understanding the impact of pandemic mitigation measures on child weight gain is critical for informing responses to the current pandemic and to future pandemics, as well as for guiding allocation of resources in the post-pandemic recovery period. San Francisco, CA, provides an important case study for examining the impact of COVID-19 mitigation strategies on child health.

Although San Francisco has had low rates of severe COVID-19 disease, stringent pandemic mitigation approaches may have resulted in worsening of other health disparities, including childhood obesity. In particular, prolonged closures of playgrounds and recreational facilities as well as disparities in access to in-person education may have had adverse impacts on cardiovascular and metabolic health among vulnerable school-age children. We investigated weight gain during the COVID-19 pandemic among a largely low-income cohort of children of ages 4–12 years with overweight and obesity living in San Francisco, CA.

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Methods

Children were recruited between June and August 2020 to participate in a study of weight status during the COVID-19 pandemic. Children were eligible to participate if they were of age 4–12 years and had a BMI \geq 85th percentile measured at a clinic visit at either the Zuckerberg San Francisco General Hospital (ZSFG) Children’s Health Center (a federally qualified health center) or at a University of California San Francisco (UCSF) Health primary care site in San Francisco between January 1 and March 15, 2020. Exclusion criteria included parents speaking a language other than English or Spanish, the child having a medical condition that predisposes to obesity, or the child taking medications that cause weight gain (*i.e.*, antipsychotics).

Potential participants were identified through medical records search. Primary care providers of each potential participant were then contacted to confirm that the child met the eligibility criteria. Research staff contacted parents and briefly explained the study to them. If parents were interested, research staff provided full details of the study and obtained verbal consent. Families were then mailed a study information sheet. At the time of enrollment, parents completed a survey on family demographics and child health behaviors before and during the pandemic. Findings from the survey were published previously.¹⁶

Follow-up data were collected between October 2020 and March 2021 in two ways. For children who had a BMI measured at a clinic visit in the follow-up period, BMI data were taken from the medical record. For the remainder, families participated in a video visit. Families were mailed adhesive wall measuring tapes, and those who did not have a scale were mailed a scale. Research team members guided parents through obtaining the measurements at home during the video study visit. Children were weighed without shoes in light clothing. Weights were recorded in kilograms and height in centimeters to the nearest 0.1. The study was approved by the institutional review board of the University of California San Francisco.

We determined pre- and post-BMI percentiles using the United States Centers for Disease Control (CDC) Growth Curves.¹⁷ We then classified each BMI measurement as *normal weight* (BMI <85th percentile), *overweight* (BMI \geq 85th percentile–<95th percentile), *obese* (BMI \geq 95th percentile–<99th percentile), or *severely obese* (BMI \geq 99th percentile). We calculated *z*-scores for each BMI measurement using the *z*-anthro function in *Stata* and CDC growth curves. We determined mean monthly change in weight (in kilograms) and mean monthly change in BMI-*z* score using descriptive statistics.

Results

There were 322 potential participants identified by medical records search and confirmed eligible by their primary care provider. The research team was able to reach 200 parents on the phone, of whom 145 consented and

Table 1. Demographic Characteristics of Participants in a Study Evaluating Weight Gain during the COVID-19 Pandemic among Children of Ages 4–12 Years with Overweight and Obesity

	%	Mean (SD)
Child demographics (n=91)		
Sex		
Male	41	8.1 (2.6)
Female	59	
Age in years		
Insurance type		
Public	91	
Private	9	
Type of school		
Public or charter	87	
Private or parochial	11	
Not yet enrolled in school	2	
Race ethnicity		
Latino	85	
African American	4	
Asian	2	
White	1	
Mixed race ethnicity	8	
Main language spoken in home		
Spanish	81	
English	16	
Other	2	
Parent demographics		
Parent country of origin		
United States	21	
Mexico	34	
El Salvador	24	
Guatemala	9	
Honduras	5	
Peru	3	
Other	3	
Parent educational level		
Less than high school degree	44	
High school degree	42	
College degree or beyond	14	
Employed outside the home before March 16, 2020	71	

SD, standard deviation.

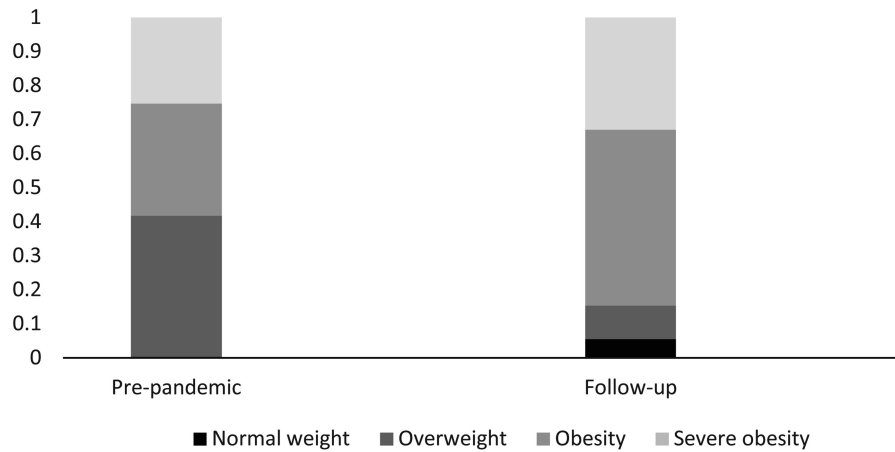


Figure 1. Weight categorization before and during the COVID-19 pandemic in a cohort of children with baseline overweight and obesity in San Francisco, CA. Overweight defined as BMI \geq 85th percentile–<95th percentile, obese defined as BMI \geq 95th percentile–<99th percentile, and severe obesity defined as BMI \geq 99th percentile.

completed initial data collection. We obtained follow-up BMI measurement on $n=91$ children. Of these, 19 were obtained during an in-person clinic visit and 72 were obtained through a video study visit. The mean difference between the baseline and follow-up BMI measurement was 10.1 months (SD 1.4). Table 1 presents demographics of the sample, which was largely Latino and publicly insured. At baseline, 42% had overweight, 33% had obesity, and 25% had severe obesity (data are restricted to the 91 participants for whom we have both pre- and post-BMI measurements). At follow-up, 5% had normal weight, 10% had overweight, 52% had obesity, and 33% had severe obesity (Figure 1).

Among the children whose weight normalized, 80% were Latino, female, and publicly insured; there were no significant difference in demographic characteristics compared with the rest of the study population. Mean monthly weight gain was 0.73 kg (SD 0.47), equivalent to yearly weight gain of 8.8 kg or 19.3 lb. Mean monthly change in BMI z-score was 0.02 (SD 0.04) equivalent to yearly increase in BMI-z of 0.24. There were no significant associations between reported health behaviors and change in BMI-z or weight category.

Discussion

In our sample of 91 children with baseline overweight and obesity, weight gain during the pandemic was far in excess of typical healthy weight gain for school-age children (generally 4–8 lb or 1.8–3.6 kg per year).¹⁷ Furthermore, although 58% of the sample started off with obesity or severe obesity, at follow-up 85% of children were classified as having obesity or severe obesity. Our findings show that weight status significantly worsened for children already at high risk for obesity in San Francisco, CA, during the COVID-19 pandemic and raise concern that comorbidities associated with weight status have also increased.

These findings should be interpreted in the context of local policy decisions regarding COVID-19 mitigation.

Notably, all K-12 schools in San Francisco closed for in-person learning in March 2020. Although private and parochial schools began opening in September 2020, public schools remained fully virtual until mid-April 2021. City playgrounds and basketball courts were also closed from March 2020 until mid-October 2020, and indoor municipal swimming pools were closed until May 2021 for anyone under the age of 14 years. Public transit was also significantly reduced, and thus low-income families had fewer options for accessing parks and other spaces where children could engage in outdoor physical activity.

There are several important limitations to our findings. Our sample size was small, and we were only able to obtain follow-up BMI measurements on 62% of our original cohort. In addition, the majority of the measurements were done by parents at home in the context of a video study visit, which could result in measurement error. An additional limitation is that we do not have a control group of normal weight children that would allow us to determine whether weight gain was greater in those with baseline overweight and obesity. Furthermore, given the very specific local policy context, our results may not be generalizable to other communities.

Strengths of this study include that we did measure individual weight trajectories in a high-risk population and were able to capture data on children who did not receive in-person care during the follow-up period. Future studies should evaluate weight gain during the COVID-19 pandemic among children who were at a normal weight at baseline and among adolescents. In addition, future studies should assess multiple BMI measurements over time before and since the start of the pandemic to better isolate the impact of mitigation strategies on BMI trajectory.

Notwithstanding these limitations, our findings have important implications. It is critical that policy makers consider that excess child weight gain and associated comorbidities may be a consequence of pandemic mitigation strategies. Given what is known now about the safety of

in-person learning with appropriate mitigation^{18,19} and the safety of outdoor activities,²⁰ it is imperative that children have the opportunity to attend in-person school with physical education, and low-cost or subsidized summer camps and recreational programs that allow for physical activity. Furthermore, pediatric care providers should actively encourage well child visits so that children who have gained excessive weight during the pandemic can be identified and receive intervention. Finally, clinicians and policy makers should anticipate an increased need for treatment of childhood obesity and associated comorbidities and should allocate resources accordingly.

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Author Disclosure Statement

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