Pandemic-related financial hardship and disparities in sugar-sweetened beverage consumption and purchasing among San Francisco Bay Area residents during COVID-19

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ABSTRACT

Some reports suggest that the COVID-19 pandemic resulted in shifts to unhealthier diets. These unhealthier diets may include sugar-sweetened beverages (SSBs), which strongly contribute to diabetes and other chronic diseases. Using cross-sectional surveys in the San Francisco Bay Area, California, USA we sought to assess self-reported SSB consumption during the pandemic’s shelter-in-place and self-reported changes in SSB purchasing from before to during the pandemic’s shelter-in-place, stratifying by indices of pandemic-related financial hardship. Nearly 60% of our diverse sample (N = 943) reported that it was harder to pay for basics (like food and utilities) during shelter-in-place. Among those who found it harder to pay for basics and received financial assistance during shelter-in-place, we found a ten-fold higher frequency of daily SSB consumption compared to those not facing new financial hardship (2.76 [95% CI: 1.78, 3.74] versus 0.30 [95% CI: 0.23, 0.37] times/day). There were no statistically significant increases in reported purchasing of any SSB, but those with new financial hardship during shelter-in-place reported greater purchasing of regular soda relative to those with no new hardship (0.20 on a 3-point scale [95% CI: 0.03, 0.37]). Our findings suggest that new hardship may increase unhealthy behaviors and worsen existing disparities in SSB consumption. Such disparities are a reminder of the urgent need to reduce economic inequity and improve the quality of our emergency food system in order to mitigate the impact of public health crises like the COVID-19 pandemic.

1. Introduction

Disruptions stemming from the COVID-19 pandemic have dramatically impacted the financial stability of households (Fox and Bartholomae, 2020), with nearly 40% of lower-income households reporting new financial hardship during the COVID-19 pandemic (Cantor and Landry, 2020). These pandemic-related disruptions have also been associated with changes in lifestyle behaviors. Increased stress during the pandemic has been associated with greater eating and alcohol consumption and increased added-sugar intake (Cummings et al., 2021), as well as increases in other unhealthy, addictive behaviors, such as tobacco use and vaping, among U.S. adults during shelter-in-place (Zhang et al., 2021). The impact of pandemic-related stressors on lifestyle and dietary behaviors is especially concerning for low-income adults, roughly 44% of whom reported being food insecure in mid-March 2020 (Wolfson and Leung, 2020). The COVID-19 pandemic could magnify existing disparities based on income, including differences in sugar-sweetened beverage (SSB) consumption; despite long-term declines in recent years, SSB consumption remains high among low-income U.S. adults (Bleich et al., 2018; Zagorsky and Smith, 2020). Surveying residents of the San Francisco Bay Area, our study sought to explore whether new financial hardship was associated with reported SSB consumption or reported changes in SSB purchasing during shelter-in-place.

2. Methods

This cross-sectional study recruited adults (age 18 years or older) living in Berkeley, Oakland, Richmond, and San Francisco, California, USA to complete an online survey about their SSB consumption and purchasing patterns and the impact of pandemic-related stressors. We
A $5 electronic gift card was provided as an incentive. To construct the hardship indices for analysis, we considered those who reported it was harder to pay for basics during shelter-in-place, how much harder is it for you to pay for basics like food, housing, medical care, and utilities? We also asked about receiving in-kind food assistance: “...have you gotten free groceries from a food pantry, food bank, church, school, work, or other place that helps with free food?”, and financial assistance: “have you received SNAP, WIC, or vouchers specifically for food?”, with response options “Yes” or “No.” Because securing financial assistance may represent a higher level of need than receiving in-kind food assistance, we created separate indices for financial assistance and in-kind food assistance. Each index (financial assistance or in-kind assistance) was composed of three levels: those who did not report that it was harder to pay for basics regardless of receiving that type of assistance; those who reported that it was harder to pay for basics, not receiving that type of assistance; and those reported that it was harder to pay for basics and receiving that type of assistance. All aspects of this study received ethical approval from the Committee for Protection of Human Subjects (Institutional Review Board) of the University of California Berkeley.

We converted all beverage consumption responses to daily frequencies (times per day) and determined total SSB consumption by summing daily frequencies for the 5 SSB categories (Lee et al., 2019). Generalized linear models with a log link function and a gamma distribution (accounting for the non-negative and right-skewed nature of count data) modeled mean frequency of daily SSB consumption by level of financial hardship. Among those who reported purchasing SBs, we conducted linear regressions to compare self-reported changes in SSB purchasing by level of financial hardship. All models were adjusted with fixed effects for age, race and ethnicity, gender, education, and city of residence. We calculated robust standard errors to correct for hetero-skedasticity. We conducted sensitivity analyses for all outcomes excluding participants from Berkeley due to concerns that a large proportion of relatively well-educated participants living in Berkeley may bias our results. All analyses were conducted in Stata/SE 15.1 (StataCorp LLC, College Station, TX, USA).

3. Results

The primary analytic sample included 943 participants (Table 1), of whom 555 participants (58.9%) reported that it was harder to pay for basics since the beginning of shelter-in-place. Those reporting new financial hardship were more likely to be younger than 29 (38.2% vs. 21.1%), less likely to be a college graduate (63.8% vs. 81.1%), and more likely to identify as African-American or Black (12.2% vs. 6.8%), Asian (32.8% vs. 26.6%), or Hispanic or Latinx (16.1% vs. 8.6%). Among those reporting new financial hardship, 39.3% reported receiving in-kind food assistance (just over half of whom had received in-kind food assistance prior to shelter-in-place) and 22.9% reported receiving financial assistance (two-thirds of whom had received financial assistance prior to shelter-in-place). 96 participants were classified at the highest level of hardship (two-thirds of whom had received financial assistance prior to shelter-in-place). 96 participants were classified at the highest level of hardship (two-thirds of whom had received financial assistance prior to shelter-in-place). 96 participants were classified at the highest level of hardship (two-thirds of whom had received financial assistance prior to shelter-in-place).

Table 1 Sample demographics (N = 943).

| Characteristic | All participants (N = 943) | Participants reporting it was not harder to pay for basics during shelter-in-place (N = 388) | Participants reporting it was harder to pay for basics during shelter-in-place (N = 555) |
|----------------|--------------------------|---------------------------------------------|--------------------------------------------|
| Gender         | Man 234 (25.5%) 223 (22.4%) 246 (26.0%) | Woman 363 (39.1%) 259 (26.8%) 306 (33.0%) |
| Race and ethnicity | White 423 (45.0%) 205 (21.0%) 218 (24.2%) | African-American or Black 305 (32.6%) 154 (16.0%) 151 (16.6%) |
| City of residence | Berkeley 375 (40.0%) 154 (16.0%) 221 (24.2%) | Richmond 132 (14.0%) 44 (4.7%) 88 (9.6%) |
| Began receiving in-kind food assistance | Never 734 (78.1%) 356 (36.0%) 378 (41.9%) | During shelter-in-place 123 (13.1%) 15 (1.6%) 108 (12.0%) |
| Began receiving financial assistance | Never 853 (90.0%) 377 (39.5%) 476 (53.0%) | During shelter-in-place 43 (4.6%) 1 (0.1%) 42 (4.6%) |

3. Results

The primary analytic sample included 943 participants (Table 1), of whom 555 participants (58.9%) reported that it was harder to pay for basics since the beginning of shelter-in-place. Those reporting new financial hardship were more likely to be younger than 29 (38.2% vs. 21.1%), less likely to be a college graduate (63.8% vs. 81.1%), and more likely to identify as African-American or Black (12.2% vs. 6.8%), Asian (32.8% vs. 26.6%), or Hispanic or Latinx (16.1% vs. 8.6%). Among those reporting new financial hardship, 39.3% reported receiving in-kind food assistance (just over half of whom had received in-kind food assistance prior to shelter-in-place) and 22.9% reported receiving financial assistance (two-thirds of whom had received financial assistance prior to shelter-in-place). 96 participants were classified at the highest level of need for both indices.

In adjusted models, we observed that reported mean daily SSB consumption during shelter-in-place was significantly higher for groups...
332 participants who don’t purchase sports drinks. We detected no difference in purchasing of any SSB overall or between groups (Table 2), although there was a trend towards increased purchasing of fruit drinks (-0.08 to 0.00) and sports drinks (N = 570) for those who found it harder to pay for basics but did not receive in-kind food assistance (relative difference 0.20 [95% CI: 0.03, 0.37]). Analyses for change in purchasing exclude participants who reported that they “Don’t Buy” a particular SSB category, explaining the smaller sample size. Excludes 332 participants who don’t purchase regular soda, 248 participants who don’t purchase fruit drinks, and 356 participants who don’t purchase sports drinks.

who found it harder to pay for basics compared to those without new financial hardship, in a stepwise fashion (Table 2). Those with no new financial hardship reported consuming SSBs 0.30 times per day [95% CI: 0.23, 0.37] (reference), those who found it harder to pay for basics but did not receive financial assistance reported consuming SSBs 0.79 times per day [95% CI: 0.61, 0.98] and those who found it harder to pay for basics and received financial assistance reported consuming SSBs 2.76 times per day [95% CI: 1.78, 3.74]. We also found that those who found it harder to pay for basics but did not receive in-kind food assistance reported consuming SSBs 0.79 times per day [95% CI: 0.61, 0.98] and those who found it harder to pay for basics and received in-kind food assistance reported consuming SSBs 1.63 times per day [95% CI: 1.15, 2.11]. From our validation survey conducted through video-call (N = 51), we found good reliability for SSB consumption when comparing the online versus researcher-conducted survey (ICC 0.79; see Supplement for details).

In adjusted models, we assessed reported changes in purchasing among participants who reported purchasing SSBs (N = 595 for regular soda, N = 677 for fruit drinks, N = 570 for sports drinks). We detected no statistically significant increases in purchasing of any SSB overall or within groups (Table 2), although there was a trend towards increased purchasing of soda among those with new hardship receiving financial assistance (0.12 [95% CI: -0.03, 0.27]). In contrast, those without new hardship reported decreased purchasing of regular soda and sports drinks (-0.1 on a 3-point scale; Table 2). Relative to those without hardship, the reported change in purchasing of soda among those with hardship receiving financial assistance was statistically significant (relative difference 0.20 [95% CI: 0.03, 0.37]). Our sensitivity analyses excluding participants living in Berkeley yielded similar findings (Supplemental Table 3).

4. Discussion

Nearly 60% of our sample found it harder to pay for basics during shelter-in-place and we found a ten-fold difference in reported SSB consumption between those with the greatest financial hardship during shelter-in-place and those with no new hardship. Several studies have documented higher SSB consumption among low-income individuals compared to their high-income counterparts (Han and Powell, 2013; Rehm et al., 2008; Welsh et al., 2011). A recent study using a nationally-representative sample found that individuals in the bottom decile of income and wealth drank 2.5 more SSBs per week than adults in the top income and wealth decile (Zagorsky and Smith, 2020). We document a much larger difference of almost 2.5 SSBs per day between the lowest and highest categories of financial hardship in our sample, recruited from a region with a highly diverse socioeconomic composition.

We found that, relative to those without hardship, reported purchasing of regular soda increased among those with new financial hardship; thus, the large difference in SSB consumption we demonstrate could indicate that new financial hardship and pandemic-related stressors amplified existing disparities in SSB consumption. Given the large reliance on in-kind food assistance in our study (reported by nearly 40% of our sample), it is possible that participants were also receiving SSBs through food assistance programs. There has long been concern about the nutritional quality of the emergency food system, which continues to provide both healthy and unhealthy food and beverage options to families in need (Handforth et al., 2013). The high prevalence of increased hardship during shelter-in-place and increased reliance on food programs highlight the critical nature of fixing the emergency food system. Shocks like the pandemic will have larger health impacts than just COVID-related disease if they also lead to unhealthy diets. Further, to reduce diet-related health inequalities (in and out of pandemic circumstances), we should eliminate targeted marketing of SSBs to low-income populations and to children, as other countries have already done (Taillie et al., 2020). Additional interventions that address commercial determinants of health, such as front-of-package labeling, may further reduce disparities in SSB consumption (Gupta et al., 2021; Roberto et al., 2021).

External validity of our findings is limited by our study’s reliance on a convenience sample of participants. Because shelter-in-place restrictions necessitated online survey administration, we were unable to reach residents with limited access to a computer or smartphone. As a
result, our sample’s characteristics do not mirror the demographic distribution of samples from previous years (Lee et al., 2019), precluding a longitudinal analysis of changes in SSB consumption. We did not collect data on the participant’s role in obtaining household groceries nor on household size, and we only asked about purchasing of soda and sports and fruit drinks. However, our oversampling of zip codes with higher proportions of low-income residents produced a diverse sample with respect to financial burden as assessed by receipt of in-kind food and financial assistance. Bias from self-reported responses may also impact our study findings. Despite these limitations, this study offers important findings on the relationship between financial hardship and SSB consumption and purchasing.

In our study sample, we find a high prevalence of new financial hardship and high levels of SSB consumption among those facing new financial hardship and receiving in-kind or financial assistance during shelter-in-place. Whether these findings represent pre-existing but previously undocumented levels of disparity in SSB consumption or worsening disparities during shelter-in-place, they are cause for alarm. Our findings emphasize the need to prioritize addressing economic inequity in public health research and advocacy to minimize the impact of shocks like the pandemic. Additionally, we must work to improve the nutritional quality of the emergency food system, to ensure that our “safety net” (including food banks and other food assistance programs) mitigates, rather than exacerbates, the long-term health impacts of pandemics.

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CRediT authorship contribution statement

Richard Pulvera: Conceptualization, Methodology, Formal analysis, Investigation, Writing – original draft. Emily Altman: Conceptualization, Validation, Writing – review & editing. Lizette Avina: Validation, Investigation, Writing – review & editing. Hannah Thompson: Validation, Writing – review & editing. Dean Schilling: Writing – review & editing, Funding acquisition. Kristine Madsen: Conceptualization, Methodology, Writing – review & editing, Supervision, Funding acquisition.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.pmedr.2022.101759.

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