Food Insecurity Is Under-reported in Surveys That Ask About the Past Year

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Introduction: Food insecurity affects 1 in 10 Americans in a typical year; recent U.S. Department of Agriculture data show that this food insecurity rate was stable from 2019 to 2021. However, data from Los Angeles County and other U.S. regions show that food insecurity spiked during the early months of the COVID-19 pandemic. One reason for this discrepancy may be that food insecurity measures assess experiences over different time frames. This study investigated the discrepancies in food insecurity rates by comparing past-week and past-year food insecurity measures and explored the role of recall bias.

Methods: Data were obtained from a representative survey panel of Los Angeles adults (N=1,135). Participants were surveyed about past-week food insecurity 11 times throughout 2021 and once about past-year food insecurity in December 2021. Data were analyzed in 2022.

Results: Of the participants who reported past-week food insecurity at any time in 2021, only two thirds also reported past-year food insecurity in December 2021, suggesting that one third of participants under-reported past-year food insecurity. Logistic regression models indicated that 3 characteristics were significantly associated with under-reporting of past-year food insecurity: having reported past-week food insecurity at fewer survey waves, not reporting recent past-week food insecurity, and having a relatively high household income.

Conclusions: These results suggest substantial under-reporting of past-year food insecurity, related to recall bias and social factors. Measuring food insecurity at multiple points throughout the year may help to improve the accuracy of reporting and public health surveillance of this issue.
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INTRODUCTION

*F*ood insecurity is defined as not having access to enough food to maintain an active and healthy lifestyle for all individuals in a household and is characterized by reductions in food intake because of limited money or resources.[1] Risk factors for food insecurity include financial hardship and high costs of living,[2,3] and job losses and missed work during the coronavirus disease 2019 (COVID-19) pandemic put many people at risk of food insecurity.[4,5] Local reports of spiking food insecurity during the early months of the pandemic came from Los Angeles (LA) County, CA and other U.S. regions,[6−8] and the Household Pulse Survey[9] showed national and state-level increases in food insecurity.[10] Follow-up surveys suggested that food insecurity returned to prepandemic levels by late 2021.[11,12]

In contrast, national data from the Current Population Survey (CPS), reported by the U.S. Department of Agriculture (USDA),[13] showed that annual food insecurity rates remained stable across 2019 (10.5%), 2020 (10.5%), and 2021 (10.2%).[1] The USDA also reported stable or decreased state-level food insecurity rates, including a decline in California from 11.2% in 2015 −2017 to 9.8% in 2018−2020.[1] However, these estimates seem implausible, given unprecedented long lines at food pantries nationwide, particularly in the early months of the pandemic in 2020.[14,15]

One explanation for discrepancies in food insecurity rates in 2020 may be related to the period that participants are asked to recall in food insecurity questions. Each December, the CPS Food Security Supplement asks individuals to recall their experiences of food insecurity over the past year.[16] In contrast, studies conducted throughout 2020 asked about food insecurity over shorter time periods (e.g., past week).[6,17] Under-reporting is more likely when surveys ask participants to remember events over longer recall periods,[18] such as the past month or their lifetime rather than the past day or week, on topics such as health problems, community violence, and alcohol use.[19−22]

The recall bias literature suggests that under-reporting of past-year food insecurity may especially be seen in survey respondents who experienced food insecurity that was less frequent, did not occur close to the annual survey (less recent), and/or was less severe. First, self-reports tend to be less accurate for events that are less frequent; for example, healthcare research shows that annual visitors were more likely to under-report the healthcare usage documented in their records than monthly visitors.[23,24] Second, research shows that under-reporting is more likely for events that were less recent.[25,26] For example, patients' memory of the painfulness of a medical procedure reflects the last 3 minutes of the procedure rather than the earlier moments of the procedure.[27] Third, less severe events may be under-reported; for example, drivers who watched film clips of traffic situations and were asked 2 weeks later about what they saw were less likely to report mild near-accidents than severe near-accidents.[28]

This study investigates food insecurity under-reporting using data from the Understanding America Study (UAS). Participants completed multiple survey waves and were asked to report past-week food insecurity multiple times throughout 2021 and past-year food insecurity in December 2021. These past-week and past-year questions were selected, respectively, to understand the rapidly changing circumstances of the COVID-19 pandemic and to represent the most common recall period used to assess food insecurity. The first aim was to examine whether past-year food insecurity was under-reported by participants, compared with these same participants' reports of past-week food insecurity, provided multiple times throughout the year. The second aim was to investigate whether under-reporting was explained by recall bias: whether less frequent, less recent, and less severe past-week food insecurity were associated with a greater likelihood of under-reporting of past-year food insecurity (than of participants' past-week reports) among participants who reported past-week food insecurity at any time during 2021.

METHODS

Study Sample

The UAS is a national panel that conducts repeated online surveys over time with the same participants,[29] who are recruited through address-based sampling. Participants receive $20 for every 30 minutes of participation and receive Internet and computer/tablet access as needed. The UAS includes a representative subsample of LA County adults, who are the focus of this study. All study protocols were approved by the University of Southern California IRB.

Measures

Past-year food insecurity was measured in December 2021 with the U.S. Household Food Security Survey Module short form.[16] Referencing the last 12 months, participants indicated (1) *The food that I bought just didn't last, and I didn't have money to get more* and (2) *I couldn't afford to eat balanced meals* (often=1, sometimes=1, never=0), (3) *Did you ever cut the size of your meals or skip meals because there wasn't enough money for food?* (almost every month=2, some months but not every month=2, only 1 or 2 months=1, no=0), (4) *Did you ever eat less than you felt you should because there wasn't enough money for food?* (yes=1, no=0), and (5) *Were you ever hungry but didn't eat because there wasn't enough money for food?* (yes=1, no=0). Consistent with
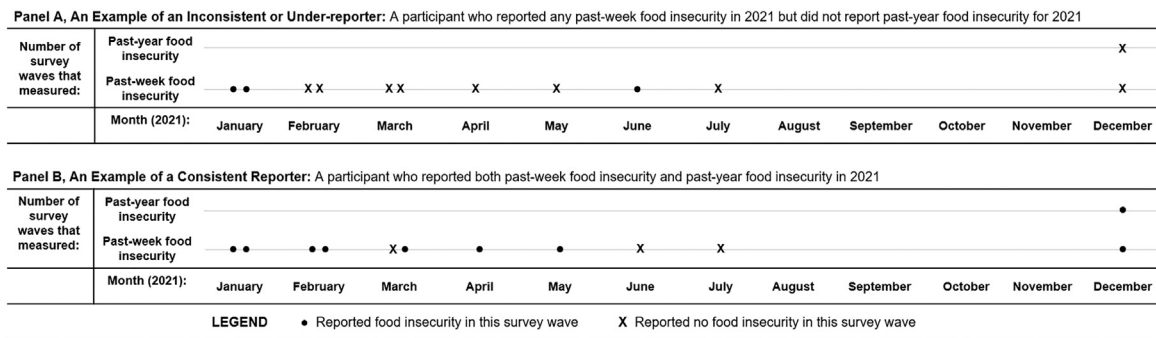
Figure 1. Timeline of food insecurity assessment on the Understanding America Study in 2021, based on the end date for each survey wave, showing examples of (A) an inconsistent or under-reporter and (B) a consistent reporter.
Note. The survey wave marked as December 2021 ended on January 9, 2022.

scoring guidelines,[16] participants who had scores of 2 or more across the 5 questions were considered to have experienced past-year food insecurity in 2021 (1=past−year food insecurity in 2021, 0=no past-year food insecurity in 2021).

Past-week food insecurity was measured during 11 survey waves fielded between January and December 2021 (Figure 1). The Food Insecurity Experiences Scale was utilized because of its brevity and validity in assessing past-week food insecurity.[30] Two Food Insecurity Experiences Scale questions that correspond to items in the USDA past-year measure (Appendix Table 1, available online) were included, referencing the past 7 days: (1) *Did you eat less than you thought you should because of a lack of money or other resources*? and (2) *Did you go without eating for a whole day because of a lack of money or other resources*? (yes=1, no=0). These questions assessed behavioral markers of moderate and severe levels of food insecurity, respectively. Participants who responded *yes* to at least 1 question in a given survey wave were considered to have experienced past-week food insecurity in that wave, whereas participants who responded *no* to both questions or did not respond were considered to have not experienced food insecurity in that wave. Participants who experienced past-week food insecurity in at least 1 wave were considered to have experienced any past-week food insecurity in 2021 (1=any past-week food insecurity in 2021; 0=no reported past-week food insecurity in 2021).

To compute the frequency of past-week food insecurity during 2021, participants were grouped into 5 categories on the basis of reported past-week food insecurity: no waves (0), 1 wave (1), 2 or 3 waves (2), 4 or 5 waves (3), 6 or more waves of past-week food insecurity (4).

To compute the recency of past-week food insecurity, participants who responded *yes* to either or both past-week food insecurity questions in the December 2021 survey were considered to have experienced recent past-week food insecurity (1=reported past-week food insecurity in December 2021; 0=no past-week food insecurity in December 2021). To compute the severity of past-week food insecurity during 2021, participants who responded *yes* to the question about severe past-week food insecurity in any survey wave were considered to have experienced severe food insecurity (1=reported severe past-week food insecurity; 0=no severe past-week food insecurity).

Finally, *inconsistent reporting of past-year food insecurity* was defined by comparing participants' reports of past-week and past-year food insecurity. Participants who reported any past-week food insecurity in 2021 but did not report past-year food insecurity for 2021 were considered inconsistent or under-reporters (Figure 1A), whereas those who reported both past-week food insecurity and past-year food insecurity were considered consistent reporters (Figure 1B).

Regarding demographics, household poverty level was computed using participants' December 2021 reports of past-year household income and household size[31]: <100% of the federal poverty level (FPL), 100%−200% of FPL, 200%−300% of FPL, and >300% of FPL. In December 2021, participants also reported their sex (with response options male or female), race (with response options Black, White, Asian, American Indian/Alaska Native, and Native Hawaiian/other Pacific Islander), ethnicity (with response options Hispanic or non-Hispanic), age in years, educational attainment (with 16 response options representing years of school completed), employment status (with response options currently working, unemployed, retired, disabled, or other), and household structure (i.e., number of children in the household; number of children aged <5 years in the household). Race and ethnicity were recoded as 1 variable (non-Hispanic Black, non-Hispanic White, non-Hispanic Asian, non-Hispanic other race), age was recoded as a categorical variable (18−30, 31−40, 41−50, 51−64, 65+ years), and educational attainment was recoded into a 3-category variable (high-school diploma or less, some college, bachelor's degree or more).

Statistical Analysis

Weighted descriptive statistics—representative of all LA County adults—were computed for all study variables for the analytic sample. Unweighted descriptive statistics were computed for the subsample of participants who reported any past-week food insecurity; survey weights were not designed for use with subsamples.

The first aim was to compare participants' reports of past-week and past-year food insecurity. Among the subsample who reported any past-week food insecurity during the year, we computed the percentage of participants who under-reported past-year food insecurity. This analysis was repeated focusing only on

responses to the most similar question on the past-week and past-year measures: *Did you eat less than you thought/felt you should?* (Appendix Table 2, available online).

To address the second aim, analyses again focused on the subsample of participants who reported any past-week food insecurity. Unweighted descriptive statistics and chi-square tests were used to examine the characteristics (i.e., frequency, recency, severity of reported past-week food insecurity) of inconsistent/under-reporters and consistent reporters.

To investigate whether inconsistent reporting of past-year food insecurity was explained by frequency, recency, and severity of reported past-week food insecurity, an unweighted logistic regression model predicted under-reporting of past-year food insecurity as the binary outcome, with frequency, recency, and severity of past-week food insecurity as predictors. Demographics were included as covariates.

RESULTS

Data from 1,135 LA County residents who responded to the December 2021 UAS survey wave (fielded from December 9, 2021 to January 9, 2022) were analyzed for this study. All participants who completed the food insecurity measures in the December 2021 wave were included in the study sample, even if they missed other survey waves in 2021 because past-year food insecurity on the December 2021 survey was used to assess consistency in reporting. Participation rates for UAS survey waves included in this study are shown in Appendix Table 3 (available online).

Among LA County residents, 16.6% reported past-year food insecurity in December 2021; 19.4% (*n*=206) reported any past-week food insecurity in 2021 (Table 1). A larger proportion of participants who reported any past-week food insecurity in 2021 were female (52% vs 66%), were Hispanic (48% vs 63%), were unemployed (15% vs 22%), had completed some college (23% vs 42%), and had incomes below 100% of FPL (20% vs 33%) than the overall study sample.

Of the 206 participants who reported any past-week food insecurity in 2021, two thirds (67.0%) also reported past-year food insecurity in December 2021 (Table 2). The remaining one third (33.0%) reported no past-year food insecurity in December 2021, despite reporting past-week food insecurity in 2021. Limiting the analysis to the most similar question on the past-week and past-year measures, these findings were replicated, suggesting that differences in reporting were not explained by the use of different food insecurity measures (Appendix Table 2, available online).

Among the 206 participants who reported any past-week food insecurity in 2021, under-reporters of past-year food insecurity were more likely than consistent reporters to report past-week food insecurity that was (1) less frequent (55.9% vs 23.9% at 1 survey wave;

8.8% vs 39.9% at 6 or more waves), (2) less recent (10.3% vs 63.0% reported past-week food insecurity in December 2021), and (3) less severe (51.5% vs 61.6% reported any severe past-week food insecurity). Considering demographic differences, a larger proportion of under-reporters had incomes above 300% of FPL (39.7% vs 16.7% of consistent reporters), whereas a larger proportion of consistent reporters had incomes below 100% of FPL (39.9% vs 19.1% of under-reporters).

Table 3 shows the multivariate regression model predicting under-reporting (versus consistent reporting) of past-year food insecurity among the 206 participants who reported any past-week food insecurity in 2021. Frequency of past-week food insecurity was significantly associated with under-reporting: individuals who reported past-week food insecurity at 1 survey wave had 9.68 times the odds of under-reporting past-year food insecurity (95% CI=2.61, 35.85) as individuals who reported past-week food insecurity at 6 or more waves. Recency of past-week food insecurity was also a significant predictor: individuals who did not report past-week food insecurity in December 2021 had 34.20 times the odds of under-reporting past-year food insecurity (95% CI=9.93, 117.81) as those who did report past-week food insecurity in December 2021. Severity of past-week food insecurity was not significantly related to under-reporting.

In addition, household poverty level significantly predicted under-reporting of food insecurity. Those with incomes 100%−200% of FPL had 3.36 times the odds of under-reporting past-year food insecurity (95% CI=1.04, 10.85) as those living in poverty (<100% of FPL), and those with incomes >300% of FPL had 7.20 times the odds of under-reporting past-year food insecurity (95% CI=1.95, 26.55). Other covariates were not significantly associated with under-reporting.

DISCUSSION

This study examined the consistency with which participants responded to survey questions about food insecurity that asked about different recall periods: the past week and the past year. Findings suggest substantial under-reporting of food insecurity when people are asked about the past year: only two thirds of participants who reported past-week food insecurity 1 or more times in 2021 also reported, in December 2021, experiencing food insecurity in the past year. This under-reporting was explained by recall biases: among individuals who reported any past-week food insecurity during 2021, under-reporting of past-year food insecurity in December 2021 was more common among those who reported

Table 1. Sample Characteristics

Demographics	Study sample, % (95% CI), weighted N=1,135	Participants with any past-week food insecurity, January 2021−December 2021, % (*n*), unweighted *n*=206
Food insecurity		
Past-year food insecurity	16.6 (14.4, 18.7)	67.0 (138)
Any past-week food insecurity, through December 2021	19.4 (16.3, 22.5)	100.0 (206)
Reported past-week food insecurity in December 2021	8.9 (6.7, 11.2)	46.1 (94)
Income		
<100% of FPL	19.6 (16.4, 22.8)	33.0 (68)
100%−200% of FPL	22.6 (19.3, 26.0)	25.7 (53)
200%−300% of FPL	14.6 (11.9, 17.2)	17.0 (35)
>300% of FPL	43.2 (39.6, 46.7)	24.3 (50)
Sex		
Female	51.5 (47.7, 55.2)	65.5 (135)
Male	48.5 (44.8, 52.3)	34.5 (71)
Race/ethnicity		
Hispanic	47.5 (43.8, 51.3)	63.1 (130)
Non-Hispanic Black	8.0 (5.9, 10.0)	7.8 (16)
Non-Hispanic White	28.6 (25.4, 31.7)	15.5 (32)
Non-Hispanic Asian	14.3 (11.8, 16.8)	12.1 (25)
Non-Hispanic other race	1.6 (0.9, 2.4)	1.5 (3)
Age category, years		
18−30	19.7 (16.6, 22.7)	32.6 (67)
31−40	24.4 (21.1, 27.6)	22.3 (46)
41−50	15.5 (12.9, 18.1)	22.8 (47)
51−64	23.1 (20.0, 26.2)	16.0 (33)
65+	17.3 (14.6, 20.2)	6.3 (13)
Education		
High-school diploma/GED or less	42.7 (38.7, 46.6)	28.2 (58)
Some college	22.6 (20.1, 25.2)	41.7 (86)
Bachelor's degree or more	34.7 (31.5, 37.9)	30.1 (62)
Employment		
Currently working	54.0 (50.3, 57.7)	53.9 (111)
Unemployed	14.9 (12.0, 17.7)	22.3 (46)
Retired	12.8 (10.3, 15.2)	3.9 (8)
Disabled	4.5 (2.8, 6.2)	5.8 (12)
Other	13.8 (11.2, 16.5)	14.1 (29)
Household structure		
Children in household	31.4 (27.9, 34.9)	37.4 (77)
Children under 5 years in the household	9.5 (7.3, 11.7)	12.6 (26)

CI, confidence interval; FPL, federal poverty line.

less frequent and less recent past-week food insecurity and those with higher incomes. These results may help to explain why surveys assessing past-year food insecurity, typically conducted in December, yielded lower food insecurity rates in 2020[1] than surveys assessing past-week food insecurity more frequently throughout that first pandemic year.[6,10,17]

The finding that less frequent and less recent food insecurity predicted under-reporting of past-year food insecurity is in line with research documenting recall bias for less frequent and less recent events.[19−23] Yet, measuring peoples' experiences of past-year food insecurity is a widely used method in public health[32,33] because it is practical regarding implementation and cost. Measuring experiences of past-week food insecurity likely yields more accurate results but requires more frequent assessments. One solution may involve including past-week food insecurity measures multiple times throughout the year on the CPS and other surveys, although this may be impractical owing to cost. Another solution may

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Table 2. Characteristics of Participants Who Reported Any Past-Week Food Insecurity in 2021 (*n*=206)

Characteristics	Inconsistent/under-reporters: participants who reported past-week food insecure and past-year food secure, % (*n*), unweighted *n*=68	Consistent reporters: participants who reported past-week and past-year food insecure, % (*n*), unweighted *n*=138
Food insecurity		
Frequency of reported past-week food insecurity		
1 wave food insecure	**55.9 (38)**	**23.9 (33)**
2−3 waves food insecure	**23.5 (16)**	**22.5 (31)**
4−5 waves food insecure	**11.8 (8)**	**13.8 (19)**
6+ waves food insecure	**8.8 (6)**	**39.9 (55)**
Recency of reported past-week food insecurity		
Reported past-week food insecurity in Dec 2021	**10.3 (7)**	**63.0 (87)**
Severity of reported past-week food insecurity		
Severe food insecurity reported at least once	**51.5 (35)**	**61.6 (85)**
Severe food insecurity not reported in 2021	**48.5 (33)**	**38.4 (53)**
Demographic characteristics		
Income		
<100% of FPL	**19.1 (13)**	**39.9 (55)**
100%−200% of FPL	**28.0 (19)**	**24.6 (34)**
200%−300% of FPL	**13.2 (9)**	**18.8 (26)**
>300% of FPL	**39.7 (27)**	**16.7 (23)**
Sex		
Female	67.7 (46)	64.5 (89)
Male	32.3 (22)	35.5 (49)
Race/ethnicity		
Hispanic	60.3 (41)	64.5 (89)
Non-Hispanic Black	8.8 (6)	7.3 (10)
Non-Hispanic White	11.8 (8)	17.4 (24)
Non-Hispanic Asian	17.7 (12)	9.4 (13)
Non-Hispanic other race	1.4 (1)	1.4 (2)
Age category		
18−30 years	33.8 (23)	31.9 (44)
31−40 years	20.6 (14)	23.2 (32)
41−50 years	23.5 (16)	22.5 (31)
51−64 years	14.7 (10)	16.7 (23)
65+ years	7.4 (5)	5.7 (8)
Education		
High-school diploma/GED or less	25.0 (17)	29.7 (41)
Some college	38.2 (26)	43.5 (60)
Bachelor's degree or more	36.8 (25)	26.8 (37)
Employment		
Currently working	63.2 (43)	49.3 (68)
Unemployed	20.6 (14)	23.2 (32)
Retired	4.4 (3)	3.6 (5)
Disabled	0.0 (−)	8.7 (12)
Other	11.8 (8)	15.2 (21)
Household structure		
Children in household	30.9 (21)	40.6 (56)
Children under 5 years in the household	13.2 (9)	12.3 (17)

Note: Boldface indicates statistical significance (*p*<0.05).
Statistical significance shows that participants who reported past-year food insecurity in December 2021 and those who reported past-year food security in December 2021 differ significantly at a 0.05 significance level, as indicated by chi-square tests.
FPL, federal poverty line.

Table 3. Results of Logistic Regression Predicting Inconsistent Reporting of Past-Year Food Insecurity in December 2021

Predictors	OR (95% CI)
Frequency of reported past-week food insecurity, January 2021−December 2021 (ref: 6+ waves past-week food insecurity)	
1 wave past-week food insecurity	**9.68 (2.61, 35.85)**
2−3 wave past-week food insecurity	3.64 (0.97, 13.68)
4−5 waves past-week food insecurity	3.10 (0.69, 13.98)
Recency of reported food insecurity (ref: reported past-week food insecurity in December 2021)	
Past-week food insecurity not reported in December 2021	**34.20 (9.93, 117.81)**
Severity of reported past-week food insecurity (ref: severe food insecurity reported at least once in 2021)	
Severe past-week food insecurity not reported in 2021	2.58 (0.93, 7.17)
Income (ref: ≤100% of FPL)	
100%−200% of FPL	**3.36 (1.04, 10.85)**
200%−300% of FPL	1.21 (0.32, 4.61)
>300% of FPL	**7.20 (1.95, 26.55)**
Sex (ref: male)	
Female	1.13 (0.45, 2.89)
Race/ethnicity (ref: Hispanic)	
Non-Hispanic Black	3.49 (0.59, 20.65)
Non-Hispanic White	0.57 (0.16, 2.09)
Non-Hispanic Asian	1.80 (0.45, 7.28)
Non-Hispanic other race	1.83 (0.08, 43.00)
Age category (ref: ≥65 years)	
18−30	1.44 (0.16, 12.89)
31−40	0.43 (0.04, 4.28)
41−50	0.84 (0.09, 8.13)
51−64	0.57 (0.05, 5.97)
Education (ref: high-school diploma/GED or less)	
Some college	0.56 (0.19, 1.65)
Bachelor's degree or more	0.82 (0.24, 2.74)
Employment (ref: unemployed)	
Currently working	0.89 (0.28, 2.82)
Retired	0.46 (0.03, 8.14)
Disabled	—
Other	0.99 (0.23, 4.29)
Household structure	
Children in household (ref: no kids)	1.47 (0.48, 4.51)
Children under 5 years in the household (ref: no kids)	1.05 (0.25, 4.39)

Note: Outcome of interest: inconsistent reporting of past-year food insecurity (versus consistent reporting of past-year food insecurity) among the subsample of participants who reported any past-week food insecurity in 2021 (*n*=206). Boldface indicates statistical significance (*p*<0.05).
CI, confidence interval; FPL, federal poverty line; OR, odds ratio.

involve assessing past-year food insecurity several times throughout the year, thus sampling peoples' experiences at different times. These solutions could help to ensure that variations in food insecurity over time, such as the food insecurity spikes in 2020, are captured. In addition, future research should assess the ideal recall period to avoid under-reporting on food insecurity surveys.

Poverty is a known risk factor for food insecurity.[3,34] Thus, surveillance and interventions are often focused, justly, on low-income populations; indeed, numerous

food assistance programs were launched and expanded during the COVID-19 pandemic to help lower-income individuals, but during the pandemic, many people experienced food insecurity who likely had never experienced it before,[35] including some with higher incomes.[6,8,36] The extent of this issue may be underestimated given the finding that households living above the federal poverty line are more likely to under-report past-year food insecurity. These findings defy stereotypes of who is vulnerable to food insecurity and should challenge policymakers to consider whether surveillance

and food assistance efforts meet the needs of all food-insecure households, particularly during a crisis.

Future research should investigate why individuals with higher incomes were more likely to under-report past-year food insecurity. Experiencing food insecurity has been related to perceived social stigma.[37] It is possible that higher-income individuals in our sample accurately reported their past-week food insecurity but, after having time to reflect, inaccurately reported past-year food insecurity owing to social desirability bias (i.e., providing an answer they think makes them look good rather than the answer representing their experience[38]). Moving forward, researchers should consider that survey data about food insecurity are likely influenced by both recall bias and social stigma.

Substantial research shows the negative health impacts of food insecurity, including increased risk of chronic disease (e.g., diabetes, hypertension)[39] and poor mental health.[40] However, under-reporting of food insecurity may lead to underestimates of its impacts on population health. Future work should explore this. In addition, race and ethnicity typically do not predict food insecurity (or in this study, food insecurity under-reporting). However, research has shown that food insecurity is more common among some communities of color,[6,32] which have greater exposures to barriers that increase the risk of food insecurity. Accurately measuring food insecurity is critical for documenting and addressing inequities in food access and health.

Limitations

This study has limitations. First, 2 different measures were used to assess past-week and past-year food insecurity, with different response options and scoring methods. This could explain some mismatch between participants' responses. However, this is unlikely to explain the results for several reasons: (1) participants' responses to the past-week and past-year food insecurity measures on the December 2021 survey were moderately correlated ($r=0.61$, $p<0.001$); (2) the measure of past-year food insecurity encompassed a wider range of food insecurity experiences, yet substantial under-reporting was still seen compared with the past-week measure; (3) evidence of under-reporting held when limiting analyses to the most similar question on the past-week and past-year measures; and (4) under-reporting was explained by systematic recall biases and thus unlikely to be random response error. A second limitation is that owing to cost and concerns for respondent burden, it was not feasible to ask questions with additional recall periods (e.g., past month). Future research should examine whether

recall bias is reduced when asking about the past month rather than the past year. Third, past-week food insecurity data were collected for only 8 months of 2021; thus, it was not possible to examine over-reporting of past-year food insecurity. Finally, it is unclear how the results from this sample of individuals in LA County who reported past-week food insecurity may generalize to other populations.

CONCLUSIONS

Substantial under-reporting of food insecurity was found on a measure that assesses experiences over the past year compared with repeated measures of past-week food insecurity in the same study sample. Recall biases may have caused rates of food insecurity to be underestimated in many studies, particularly involving crises that increase the risk for food insecurity early in the calendar year (e.g., those caused by the COVID-19 pandemic early in 2020, when past-year food insecurity was assessed in December) or involving acute events that lead to spikes in food insecurity (e.g., natural disasters). Because measuring food insecurity in the past year is more affordable, conducting such surveys at multiple time points during the year may improve the quality of food insecurity estimates.

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SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at https://doi.org/10.1016/j.amepre.2023.03.022.

REFERENCES

1. Coleman-Jensen A, Rabbitt MP, Gregory CA, Singh A. *Household food security in the United States in 2021.* Washington, DC: U.S. Department of Agriculture, Economic Research Service; 2022. https://www.ers.usda.gov/publications/pub-details/?pubid=104655.
2. Gundersen C, Ziliak JP. Childhood food insecurity in the U.S.: trends, causes, and policy options. *Future Child.* 2014;24(2):1–19. https://doi.org/10.1353/foc.2014.0007.
3. Gundersen C, Ziliak JP. Food insecurity research in the United States: where we have been and where we need to go. *Appl Econ Perspect Policy.* 2018;40(1):119–135. https://doi.org/10.1093/aepp/ppx058.
4. Couch KA, Fairlie RW, Xu H. Early evidence of the impacts of COVID-19 on minority unemployment. *J Public Econ.* 2020;192:104287. https://doi.org/10.1016/j.jpubeco.2020.104287.
5. Fang D, Thomsen MR, Nayga RM Jr, Yang W. Food insecurity during the COVID-19 pandemic: evidence from a survey of low-income Americans. *Food Secur.* 2022;14(1):165–183. https://doi.org/10.1007/s12571-021-01189-1.
6. de la Haye K, Miller S, Weber K, Wilson J, Bruine de Bruin W. *The impact of COVID-19 on food insecurity in Los Angeles County: April to May 2020.* Los Angeles, CA: USC Dornsife College of Letters, Arts and Sciences, Keck School of Medicine of USC; 2020. https://publicexchange.usc.edu/wp-content/uploads/2020/07/USCLAC-Food-Insecurity-Report-April-%E2%80%93-May-2020.pdf.
7. Dubowitz T, Dastidar MG, Troxel WM, et al. Food insecurity in a low-income, predominantly African American cohort following the COVID-19 pandemic. *Am J Public Health.* 2021;111(3):494–497. https://doi.org/10.2105/AJPH.2020.306041.
8. Wolfson JA, Leung CW. Food insecurity and COVID-19: disparities in early effects for US adults. *Nutrients.* 2020;12(6):1648. https://doi.org/10.3390/nu12061648.
9. Household pulse survey: measuring social and economic impacts during the coronavirus pandemic. U.S. Census Bureau. https://www.census.gov/householdpulse. Updated March 13, 2023. Accessed March 21, 2023.
10. Schanzenbach D, risen? Pitts AHow much has food insecurity. *Evidence from the census household pulse survey.* Evanston, IL: Northwestern Institute for Policy Research; 2020. https://www.ipr.northwestern.edu/documents/reports/ipr-rapid-research-reports-pulse-hh-data-10-june-2020.pdf. Published June 10, 2020. Accessed March 21, 2023.
11. Waxman E, Gupta P. *Food insecurity fell nearly 30 percent between spring 2020 and 2021.* Washington, DC: Urban Institute; 2021. https://www.urban.org/research/publication/food-insecurity-fell-nearly-30-percent-between-spring-2020-and-2021. Published May 26, 2021. Accessed March 21, 2023.
12. de la Haye K, Livings MS, Bruine de Bruin W, Wilson J, Babboni M, Wald R. *2021 Food insecurity in Los Angeles County.* Los Angeles, CA: USC Dornsife College of Letters, Arts and Sciences, Keck School of Medicine of USC; 2022. https://publicexchange.usc.edu/wp-content/uploads/2022/03/2021-Food-Insecurity-in-LA-County-Brief.pdf. Published March 2022. Accessed March 21, 2023.
13. Documentation: overview of surveys. U.D. Department of Agriculture, Economic Research Service. https://www.ers.usda.gov/data-products/food-security-in-the-united-states/documentation/. Updated October 17, 2022. Accessed March 21, 2023.
14. Kulish N. 'Never seen anything like it': cars line up for miles at food banks. The New York Times. April 8, 2020. https://www.nytimes.com/2020/04/08/business/economy/coronavirus-food-banks.html. Accessed March 21, 2023.
15. Vesoulis A. Families strained by the pandemic are turning to food banks struggling to keep up. *Time.* 2020 November 23 https://time.com/5914551/food-banks-covid-19-photos/. Accessed March 21, 2023.
16. Blumberg SJ, Bialostosky K, Hamilton WL, Briefel RR. The effectiveness of a short form of the Household Food Security Scale. *Am J Public Health.* 1999;89(8):1231–1234. https://doi.org/10.2105/ajph.89.8.1231.
17. Altman CE, Dondero M, Heflin CM, Nusbaum D. Current and future food insufficiency during Covid-19: examining disparities by race/ethnicity and recent work loss. *J Racial Ethn Health Disparities.* 2022;9(5):1794–1806. https://doi.org/10.1007/s40615-021-01116-2.
18. Jenkins P, Earle-Richardson G, Slingerland DT, May J. Time dependent memory decay. *Am J Ind Med.* 2002;41(2):98–101. https://doi.org/10.1002/ajim.10035.
19. Stull DE, Leidy NK, Parasuraman B, Chassany O. Optimal recall periods for patient-reported outcomes: challenges and potential solutions. *Curr Med Res Opin.* 2009;25(4):929–942. https://doi.org/10.1185/03007990902774765.
20. Lemmens P, Tan ES, Knibbe RA. Measuring quantity and frequency of drinking in a general population survey: a comparison of five indices. *J Stud Alcohol.* 1992;53(5):476–486. https://doi.org/10.15288/jsa.1992.53.476.
21. Wolfer TA. It happens all the time": overcoming the limits of memory and method for chronic community violence experience. *J Interpers Violence.* 1999;14(10):1070–1094. https://doi.org/10.1177/088626099014010005.
22. Verbrugge LM. Health diaries. *Med Care.* 1980;18(1):73–95. https://doi.org/10.1097/00005650-198001000-00006.
23. Short ME, Goetzel RZ, Pei X, et al. How accurate are self-reports? Analysis of self-reported healthcare utilization and absence when compared with administrative data. *J Occup Environ Med.* 2009;51(7):786–796. https://doi.org/10.1097/JOM.0b013e3181a86671.
24. Bhandari A, Wagner T. Self-reported utilization of health care services: improving measurement and accuracy. *Med Care Res Rev.* 2006;63(2):217–235. https://doi.org/10.1177/1077558705285298.
25. Broadbent DE, Broadbent MHP. Recency effects in visual memory. *Q J Exp Psychol A.* 1981;33(1):1–15. https://doi.org/10.1080/14640748108400762.
26. Sudman S, Bradburn NM. Effects of time and memory factors on response in surveys. *J Am Stat Assoc.* 1973;68(344):805–815. https://doi.org/10.1080/01621459.1973.10481428.
27. Redelmeier DA, Kahneman D. Patients' memories of painful medical treatments: real-time and retrospective evaluations of two minimally invasive procedures. *Pain.* 1996;66(1):3–8. https://doi.org/10.1016/0304-3959(96)02994-6.
28. Chapman P, Underwood G. Forgetting near-accidents: the roles of severity, culpability and experience in the poor recall of dangerous driving situations. *Appl Cognit Psychol.* 2000;14(1):31–44. https://doi.org/10.1002/(SICI)1099-0720(200001)14:1<31::AID-ACP622>3.0.CO;2-9.
29. Alattar L, Messel M, Rogofsky D. An introduction to the Understanding America Study Internet Panel. *Soc Secur Bull.* 2018;78(2):13–28. https://www.ssa.gov/policy/docs/ssb/v78n2/v78n2p13.html.

30. Cafiero C, Viviani S, Nord M. Food security measurement in a global context: the Food Insecurity Experience Scale. *Measurement.* 2018;116:146–152. https://doi.org/10.1016/j.measurement.2017.10.065.

31. ASPE. Office of the Assistant Secretary for Planning and Evaluation. Poverty guidelines. Washington, DC: ASPE, Office of the Assistant Secretary for Planning and Evaluation; 2023. https://aspe.hhs.gov/topics/poverty-economic-mobility/poverty-guidelines. Published January 19, 2023. Accessed March 21, 2023.

32. Myers AM, Painter MA. Food insecurity in the United States of America: an examination of race/ethnicity and nativity. *Food Secur.* 2017;9 (6):1419–1432. https://doi.org/10.1007/s12571-017-0733-8.

33. Zepeda L. Hiding hunger: food insecurity in middle America. *Agric Hum Values.* 2018;35(1):243–254. https://doi.org/10.1007/s10460-017-9818-4.

34. Gundersen C, Kreider B, Pepper J. The economics of food insecurity in the United States. *Appl Econ Perspect Policy.* 2011;33(3):281–303. https://doi.org/10.1093/aepp/ppr022.

35. Niles MT, Bertmann F, Belarmino EH, Wentworth T, Biehl E, Neff R. The early food insecurity impacts of COVID-19. *Nutrients.* 2020;12 (7):2096. https://doi.org/10.3390/nu12072096.

36. Lauren BN, Silver ER, Faye AS, et al. Predictors of households at risk for food insecurity in the United States during the COVID-19 pandemic. *Public Health Nutr.* 2021;24(12):3929–3936. https://doi.org/10.1017/S1368980021000355.

37. Purdam K, Garratt EA, Esmail A. Hungry? Food insecurity, social stigma and embarrassment in the UK. *Sociology.* 2016;50(6):1072–1088. https://doi.org/10.1177/0038038515594092.

38. Paulhus DL. Measurement and control of response bias. In: Robinson JP, Shaver PR, Wrightsman LS, eds. Measures of Personality and Social Psychological Attitudes. Cambridge, MA: Academic Press, 1991:17–59. https://doi.org/10.1016/B978-0-12-590241-0.50006-X.

39. Weaver LJ, Fasel CB. A systematic review of the literature on the relationships between chronic diseases and food insecurity. *Food Nutr Sci.* 2018;9(5):519–541. https://doi.org/10.4236/fns.2018.95040.

40. Pourmotabbed A, Moradi S, Babaei A, et al. Food insecurity and mental health: a systematic review and meta-analysis [published correction appears in Public Health Nutr. 2020;23(10):1854]. *Public Health Nutr.* 2020;23(10):1778–1790. https://doi.org/10.1017/S136898001900435X.