



Community and International Nutrition

Prevalence and Severity of Food Insecurity Before and During the Coronavirus Disease 2019 Pandemic Among Adults and Youth in Australia, Canada, Chile, Mexico, the United Kingdom, and the United States

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ABSTRACT

Background: Disruptions from the coronavirus disease 2019 (COVID-19) pandemic potentially exacerbated food insecurity among adults and youth.

Objectives: The objective was to examine changes in the prevalence and severity of food insecurity among adults and youth from before (2019) to during (2020) the pandemic in multiple countries.

Methods: Repeated cross-sectional data were collected among adults aged 18–100 y ($n = 63,278$) in 5 countries in November to December in 2018–2020 and among youth aged 10–17 y ($n = 23,107$) in 6 countries in November to December in 2019 and 2020. Food insecurity in the past year was captured using the Household Food Security Survey Module and the Child Food Insecurity Experiences Scale. Changes in the prevalence and severity of food insecurity were examined using logistic and generalized logit regression models, respectively. Models included age, gender, racial-ethnic identity, and other sociodemographic characteristics associated with food insecurity to adjust for possible sample differences across waves. Models were weighted to reflect each country's population.

Results: Adults [adjusted OR (AOR): 1.15; 95% CI: 1.02, 1.31] and youth (AOR: 1.43; 95% CI: 1.19, 1.71) in Mexico were more likely to live in food-insecure households in 2020 compared to 2019. Adults in Australia (AOR: 0.81; 95% CI: 0.72, 0.92) and Canada (AOR: 0.87; 95% CI: 0.77, 0.99) were less likely to live in food-insecure households in 2020. Trends in severity aligned with changes in prevalence, with some exceptions. Youth in Australia (AOR: 2.24; 95% CI: 1.65, 3.02) and the United States (AOR: 1.39; 95% CI: 1.04, 1.86) were more likely to have many compared with no experiences of food insecurity in 2020 compared to 2019. There was no evidence of change among adults and youth in the remaining countries.

Conclusions: Except for Mexico, few changes in food insecurity among adults and youth were observed from before to during the COVID-19 pandemic. Action is needed to support households at risk of food insecurity. *J Nutr* 20XX;xx:xx–xx.

Keywords: household food security, youth food security, COVID-19 pandemic, cross-country comparison, public health nutrition

Introduction

The inability to access food owing to limited financial resources, or food insecurity [1], is a major global concern [2, 3]. In 2015, the United Nations set 17 Sustainable Development Goals, including the aim to “End hunger, achieve food security and improved nutrition and promote sustainable agriculture” by

2030 [4]. The State of Food Security and Nutrition in the World 2020 report indicated the individual-level prevalence of moderate or severe food insecurity globally, as measured by the Food Insecurity Experience Scale, was ~26% in 2019, with a steady increase observed since 2014 [5].

Food insecurity is a serious public health problem given its numerous nutritional, mental, and physical health consequences

Abbreviations used: AOR, adjusted OR; BIPOC, Black, Indigenous, People of Color; COVID-19, coronavirus disease 2019; HFSSM, Household Food Security Survey Module.

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[6–8]. Among adults in Canada, the United Kingdom, and the United States, lower fruit and vegetable consumption has been observed among those living in food-insecure compared to food-secure households [6, 9, 10]. Higher prevalence estimates of inadequate nutrient intakes have also been observed among adults living in food-insecure relative to those in food-secure households [6]. In addition to nutritional concerns, numerous mental and physical health conditions among adults, such as depression, anxiety, hypertension, and diabetes, are associated with living in food-insecure households [7, 8, 11].

Similar associations between food insecurity and poor health have been observed among youth [6, 12, 13], with concerns about detrimental effects on development [14, 15]. In Canada and the United States, youth living in food-insecure households have been found to consume fewer servings of fruits, vegetables, and dairy products [6, 16, 17]. Moreover, youth living in food-insecure households have been found to experience poorer mental health than those living in food-secure households [12, 18]. For example, experiences of food insufficiency, or not having enough food to eat, and hunger, an indicator of severe food insecurity, among youth are associated with dysthymia and suicidality in the short [12] and long terms [18]. Moreover, associations between hunger and poor general health have been observed [13]. Furthermore, youth experiencing food insecurity are more likely to experience delayed academic and psychosocial development than their food-secure peers [14, 15]. Overall, food insecurity during early life is troubling given the range of effects during childhood and beyond.

Adults and youth who are socially and economically disadvantaged are most vulnerable to food insecurity and its devastating consequences [1]. Research in North America has repeatedly demonstrated that individuals living with low income, who are precariously employed or unemployed, and who have lower levels of formal education are more likely to experience food insecurity [1, 19, 20]. Given the link with structural disadvantage, experiences of food insecurity disproportionately burden individuals who are lone parents, identify as women, or identify as Black, Indigenous, or Latino [1, 21]. Similar patterns have been observed among culturally and linguistically diverse communities in Australia and the United Kingdom [22, 23]. Consequently, the burden of food insecurity and associated outcomes is not equally distributed among the population.

Disruptions induced by the coronavirus disease 2019 (COVID-19) pandemic have heightened disadvantage faced by subgroups of the population [24–27], including the potential exacerbation of food insecurity globally [5, 25–28]. Although concern is highest about increases in the Global South, there is also concern about rates of household food insecurity in the Global North, with lower but not trivial prepandemic prevalence estimates of ~10% at the individual and household levels [1, 5, 29]. Existing research suggested that the prevalence of food insecurity in numerous countries, such as Australia [30], Canada [28], the United Kingdom [26], and the United States [31], may have increased during the early stages of the pandemic. These investigations, among others, provided rapid insight into the potential effect of the COVID-19 pandemic and associated public health measures on food insecurity. However, differences in measures used to assess the prevalence and severity of food insecurity before and during the COVID-19 pandemic complicate comparisons across time points [32]. Furthermore, some

previous investigations focused on adults living in a particular state or individuals who identify as women [25, 30, 31], again hindering comparisons across studies and limiting generalizability to broader populations. The purpose of this study was to examine changes in the prevalence and severity of food insecurity among adults aged 18–100 y and youth aged 10–17 y in multiple countries using consistent measures of food insecurity before to during the COVID-19 pandemic.

Methods

Repeated cross-sectional data were drawn from the International Food Policy Study, conducted in Australia, Canada, Chile (youth only), Mexico, the United Kingdom, and the United States [33]. These countries were selected because of similarities in culture, official languages, and food environments [34]. Self-administered web-based surveys were conducted in November to December in 2018 (adults only), 2019, and 2020. Surveys were conducted in English in Australia and the United Kingdom, Spanish in Chile and Mexico, English and French in Canada, and English and Spanish in the United States. French and Spanish translations were reviewed by members of the research team who were fluent in each language.

Adults aged 18–100 y were recruited through the Nielson Consumer Insights Global Panel and their partner panels in 2018, 2019, and 2020. Age and sex quotas facilitated recruitment of adults with characteristics reflective of each country's population. In 2018, quotas based on device screen size were used to minimize scrolling to view images associated with some questions. E-mail invitations with unique survey access links were sent to a random sample of adult panelists within each country. Youth aged 10–17 y were indirectly recruited through parent/guardians enrolled in the same panels in 2019 and 2020. Recruitment of youth respondents was not contingent on recruitment of caregivers to the adult study. Survey invitations were sent to adults who confirmed they had a child within the age range of interest living in their household. Only 1 child per household was invited to participate. Sex and age quotas in the United Kingdom and the United States facilitated recruitment of youth reflective of the broader population (quotas were not used in the other countries owing to limited panel sizes). In 2019, no adults and youth were recruited from the same households, with 13 dyads recruited from the same households in 2020.

After eligibility screening based on age, sex, and residing in a target country, potential respondents were provided with information about the study and an opportunity to consent (adults) or assent (youth). Adult respondents and parents/guardians of youth respondents received remuneration in accordance with their panel's usual incentive structure (for example, points-based or monetary rewards and chances to win prizes). Research demonstrates these incentives increase response rates and decrease response bias [35–37]. The study was reviewed by and received ethics clearance through a University of Waterloo Research Ethics Committee (adult: ORE# 30829, youth: ORE# 41477). Full descriptions of the study methods are available in the Technical Reports for each wave (<http://foodpolicystudy.com/methods/>).

The adult sample included both repeat and new respondents in 2019 and 2020. To mitigate the influence of remembering previous responses on survey completion, only the first instance

of survey completion by a given respondent was retained [38], resulting in the exclusion of 1684 respondents in 2019 and 342 respondents in 2020. Respondents with missing food security data were also excluded (adults: $n = 77$ in 2018, $n = 59$ in 2019, and $n = 105$ in 2020; youth: $n = 18$ in 2019 and $n = 14$ in 2020), leaving analytic samples of 22,747, 19,225, and 21,306 adults from the 2018, 2019, and 2020 surveys, respectively, and 11,090 and 12,017 youth from the 2019 and 2020 surveys, respectively. The numbers of adults and youth who completed the surveys, whose data were excluded, whose data were available for analysis, and who were included in the analytic samples for each of 2018 (adults only), 2019, and 2020 are summarized in Table 1.

Poststratification sample weights were constructed using a raking algorithm, with population estimates drawn from the census in each country based on age group, sex, region, ethnicity (except in Canada), and education (except in Mexico) [39–43].

Measures

The 18-item Household Food Security Survey Module (HFSSM), routinely used in research and surveillance in the Global North [44–46], was used to assess household food security status over the past year among respondents to the adult survey [47, 48]. Ten items assess food security status among adults in the household, and where applicable, the remaining 8 items query about the experiences of children aged <18 y. The HFSSM probes experiences ranging from worrying about running out of food and not being able to afford balanced meals to going a whole day without eating [49]. Using Health Canada's coding method [49], adults were classified as living in households that were food-secure (no affirmations), marginally food insecure (1 affirmation), moderately food insecure (2–5

TABLE 1

Number of adults aged 18–100 y and youth aged 10–17 y who completed the surveys, whose data were excluded, whose data were available for analysis, and whose data were included in the analytic samples from the International Food Policy Study survey in 2018, 2019, or 2020 in Australia, Canada, Chile, Mexico, the United Kingdom, or the United States

Sample type	2018	2019	2020
Adult surveys			
Completed	28,684	29,290	30,131
Excluded ¹	5860	8322	8378
Available for analysis	22,824	20,968	21,753
Analytic ^{2,3}	22,747	19,225	21,306
Youth surveys			
Completed	Not applicable	11,491	12,489
Excluded ¹	Not applicable	383	458
Available for analysis	Not applicable	11,108	12,031
Analytic ³	Not applicable	11,090	12,017

¹ Data were excluded by the International Food Policy Study team because the respondent was ineligible or owing to missing information on region, inadequate sample size to reliably construct sample weights (for example, participants within the Canadian territories), invalid response to a data quality question, survey completion time under 15 min for adults and 10 min for youth, and/or invalid responses to ≥ 3 of 20 open-ended measures (adults only). ² Only the first instance that respondents answered the survey were retained, excluding 1684 respondents in 2019 and 342 respondents in 2020. ³ Data were excluded for respondents with missing food security data: adults: $n = 77$ in 2018, $n = 59$ in 2019, $n = 105$ in 2020; youth: $n = 18$ in 2019, $n = 14$ in 2020.

affirmations adult scale; 2–4 affirmations child scale), or severely food insecure (6 or more affirmations adult scale; 5 or more affirmations child scale) [49]. If there was discordance between the classifications based on adults and children, the more severe classification denoted the food security status of the household. For these analyses, in addition to a 4-level variable indicating severity of food insecurity, a dichotomous variable was constructed, considering those living in marginally, moderately, and severely food-insecure households to be food insecure. Marginal food insecurity was considered within the food-insecure category because of its adverse influence on health [50].

The youth survey included the 10-item Child Food Insecurity Experiences Scale [51], comprising items that span worrying about running out of food, compromises to diet quality, eating less, going hungry, and experiencing emotional elements of food insecurity, such as shame, over the past year. This scale has been assessed for reliability, accuracy, and cross-context equivalence among youth aged 6–17 y in 13 countries, including those in this study [51]. High internal consistency was found using Cronbach α (0.88–0.94 across countries) and a confirmatory factor analysis, and acceptable criterion validity relative to other markers of food insecurity and cross-context equivalence was demonstrated. A youth-reported measure of food insecurity was included because previous research suggests youth are aware of and can report experiences of food insecurity, with their reports diverging from those of their caregivers [52–54]. Response options for each item include never (scored value of zero), 1 or 2 times (scored value of 1), and many times (scored value of 2). Based on the resulting continuous score, youth were categorized as having no (zero affirmations), few (1–6 affirmations), several (7–10 affirmations), or many (11–20 affirmations) experiences of food insecurity over the past year [51]. In addition to the 4-category variable indicative of the number of experiences of food insecurity, a dichotomous variable was constructed, considering those with few or more experiences of food insecurity as food insecure.

Adult respondents entered their age using a numeric response option [47]. Recognizing the gendered nature of food insecurity [55, 56], gender identity was used instead of sex and was queried using categories recommended by the Canadian Institutes of Health Research [57]. Categories included man, woman, transmale/transman, transfemale/transwoman, gender queer/gender nonconforming, other, do not know, and refuse to answer. For analytic purposes, response options were condensed to man (including transmale/transman), woman (including transfemale/transwoman), and gender queer/gender nonconforming/other/not stated. Response categories for racial-ethnic identity and cultural diversity were country-specific and grouped by the study team into Black/Indigenous/People of Color (BIPOC) and/or speaks language other than English at home; White, not Indigenous, and/or English-speaking at home (White and/or English-speaking); or not stated [47]. The White and/or English-speaking category encompasses respondents in Australia who only spoke English at home and did not identify as Indigenous (Aboriginal or Torres Strait Islander). In Australia, language is used as a component of cultural diversity [58]. The White and/or English-speaking category also included individuals in Mexico who did not identify as Indigenous and individuals in Canada, the United Kingdom, and the United States who identified as White only. All other response options were

considered to align with the BIPOC and/or speaks language other than English at home category. Response options for highest level of educational attainment were also country-specific and categorized into low (secondary education or less), medium (some postsecondary education), high (university degree or above), or not stated. For employment status, respondents were provided with 14 options, including providing an open-ended response [47]. Within the current analyses, responses were classified as working, not working (for example, parental leave), unemployed, and not stated. Perceived income adequacy was gauged by asking respondents how easy or difficult it is to make ends meet [47]. Response options ranged from very difficult to very easy, with the opportunity to select do not know or prefer not to answer. For these analyses, these categories were combined into very difficult/difficult (difficult), neither easy nor difficult (neither), easy/very easy (easy), and not stated [59]. Respondent living arrangement was queried using 11 response options and consolidated into no other adults or children, other adults but no children, no other adults but children, other adults with children, and not stated [59].

Youth selected their age from a prepopulated list that ranged from 10–17 y [47]. Youth were asked to identify their sex as male or female (gender identity was not queried among youth). Racial-ethnic identity and cultural diversity reported by respondents were grouped using the same method as applied to the adult survey [47], resulting in 3 categories: BIPOC and/or speaks language other than English at home, White and/or English-speaking, and not stated. Perceived income adequacy was gauged using a youth-oriented question: “Does your family have enough money to pay for things your family needs?” [47]. Response options ranged from not enough to more than enough money and were consolidated into not enough/barely enough money (not enough), enough/more than enough money (enough), and not stated.

Statistical analyses

Analyses were conducted using SAS, version 9.4 (Cary), with SURVEY commands applied to allow for the application of sample weights. Univariate frequency tables were used to characterize sociodemographic characteristics and adult-reported household and youth self-reported food security using the 4-category variables, by country and year. Weighted logistic models stratified by country assessed changes in the prevalence of living in households with any level of food insecurity or having any experiences of food insecurity (that is, using the dichotomous variables) in 2020 relative to 2019. To account for possible differences in the samples across waves, models were adjusted for variables associated with food insecurity in previous research [1, 22, 29, 59], including age, gender identity (adult) or sex (youth), racial-ethnic identity and cultural diversity, educational attainment (adult only), employment status (adult only), perceived income adequacy, and living arrangement (adult only). The adult model included an indicator of food insecurity status in 2018 to strengthen inference about changes in food security between 2019 and 2020 (2018 data were not available for youth). Weighted generalized logit models examined changes in the severity of food insecurity among adults and youth in each country using the 4-category food security variables and adjusting for the aforementioned covariates. Sensitivity analyses excluding

perceived income adequacy from all models were conducted given the effect of the COVID-19 pandemic on economic stability [60].

The analyses in this study are intended to be primarily descriptive, and the limited inferences made consider the strength of the evidence from point estimates and CIs in a holistic manner [61]. *P* values are reported to facilitate strict inference by readers, although explicit adjustment for multiple testing may be complicated owing to the nonindependence of some tests [62].

Results

The country-specific distributions of the adult sample from 2018 to 2020 (Table 2) and the youth sample from 2019 to 2020 (Table 3) were consistent with each country’s population distributions by age, gender identity (adults) or sex (youth), and racial-ethnic identity and cultural diversity, per the weighting protocol. The sociodemographic characteristics of the samples by year are summarized in Supplemental Tables 1–5.

In the most recent wave (2020), approximately half of the adult respondents in Mexico reported it was difficult to make ends meet. In the remaining countries, the prevalence of adults reporting difficulty making ends meet ranged from 20.3% to 30.6%. The proportions of adults living in households with any level of food insecurity ranged from 36.6% to 74.6% (Figure 1). The prevalence of youth reporting their families did not have enough money to meet their needs ranged from 17.9% to 37.7% across countries. Among youth in Mexico, the prevalence of food insecurity, based on few or more experiences, was 73.1% in 2020. In the remaining countries, the prevalence of food insecurity, based on few or more experiences, ranged from 35.0% to 70.3% in 2020 (Figure 2).

Changes in the odds of adult food insecurity from 2019 to 2020 (adjusting for food security status in 2018) differed by country. Among adults in Mexico, the odds of living in households with any level of food insecurity were higher [adjusted OR (AOR): 1.15; 95% CI: 1.02, 1.31] in 2020 than in 2019 (Table 4). Relatedly, among adults in Mexico, the odds of living in moderately (AOR: 1.18; 95% CI: 1.02, 1.36) and severely (AOR: 1.40; 95% CI: 1.19, 1.66) food-insecure compared to food-secure households were higher in 2020 than in 2019 (Table 4). The odds of living in households with any level of food insecurity were lower in Australia (AOR: 0.81; 95% CI: 0.72, 0.92) in 2020 than in 2019. Considering severity, the odds of adults in Australia living in either moderately (AOR: 0.78; 95% CI: 0.67, 0.91) or severely (AOR: 0.79; 95% CI: 0.66, 0.94) food-insecure households compared with food-secure households were lower in 2020 than in 2019. In Canada, the odds of living in a household with any level of food insecurity were lower (AOR: 0.87; 95% CI: 0.77, 0.99) in 2020 than in 2019 (Table 4). The adjusted odds of living in moderately food-insecure households relative to living in food-secure households were lower in Canada (AOR: 0.84; 95% CI: 0.72, 0.97) in 2020 than in 2019. There was little evidence of changes in the odds of living in households with food insecurity from 2019 to 2020 in the United Kingdom (AOR: 0.90; 95% CI: 0.79, 1.02). When considering severity, the odds of adults living in severely food-insecure households were lower in the United Kingdom (AOR: 0.82; 95% CI: 0.68, 0.99) in 2020 than in 2019. In the United States, little evidence of changes in the odds of living in households with food insecurity from 2019

TABLE 2Sociodemographic characteristics of adults aged 18–100 y participating in the International Food Policy Study in 2018, 2019, and 2020, by country (n = 63,278)¹

Country	Australia (n = 11,645), n (%)	Canada (n = 12,570), n (%)	Mexico (n = 12,621), n (%)	United Kingdom (n = 13,294), n (%)	United States (n = 13,148), n (%)
Year					
2018	4083 (34.9)	4386 (34.9)	4132 (32.8)	5516 (41.5)	4630 (35.1)
2019	3479 (30.1)	3908 (31.1)	4210 (33.3)	3703 (27.9)	3925 (29.9)
2020	4083 (35.0)	4276 (34.0)	4279 (33.9)	4075 (30.6)	4593 (34.9)
Age ² (y)	46.0 (45.7–46.4)	47.7 (47.3–48.1)	39.7 (39.3–40.0)	47.9 (47.6–48.2)	46.7 (46.4–47.1)
Gender identity					
Men (including transmale/transman)	5674 (48.9)	6129 (49.4)	6449 (47.5)	6502 (48.5)	6173 (47.6)
Women (including transfemale/transwoman)	5942 (50.8)	6380 (50.1)	6118 (52.1)	6755 (51.2)	6920 (51.9)
Other/not stated	29 (0.3)	61 (0.6)	54 (0.4)	37 (0.3)	55 (0.5)
Racial-ethnic identity and cultural diversity					
BIPOC and/or speaks language other than English at home	1799 (25.8)	2541 (20.4)	2038 (20.2)	1278 (11.4)	3885 (36.0)
White and/or English-speaking	9810 (73.9)	9797 (77.5)	10,321 (77.8)	11,912 (87.9)	9198 (63.4)
Not stated	36 (0.3)	232 (2.1)	262 (2.0)	104 (0.7)	65 (0.6)
Educational attainment ³					
Low	4133 (42.0)	3429 (42.4)	2693 (22.0)	4200 (49.6)	4612 (57.4)
Medium	3972 (32.0)	4953 (33.2)	1582 (13.4)	3694 (21.2)	2846 (9.9)
High	3500 (25.5)	4138 (24.0)	8322 (64.5)	5324 (28.5)	5649 (32.5)
Not stated	40 (0.4)	50 (0.4)	24 (0.2)	76 (0.7)	41 (0.3)
Employment status					
Working	5678 (48.9)	6125 (45.3)	8644 (65.8)	6423 (47.5)	6005 (41.0)
Not working	4655 (38.9)	5129 (42.0)	3012 (26.3)	5622 (40.9)	5621 (44.5)
Unemployed	1182 (11.0)	1128 (10.9)	824 (6.7)	1144 (10.7)	1182 (11.1)
Not stated	130 (1.2)	188 (1.9)	141 (1.2)	105 (0.9)	340 (3.4)
Perceived income adequacy					
Difficult	2992 (26.1)	3114 (27.6)	5472 (45.5)	2817 (23.4)	3671 (30.3)
Neither	4437 (38.7)	4747 (38.2)	4848 (37.7)	4762 (37.2)	4392 (34.6)
Easy	4108 (33.9)	4591 (33.0)	2206 (16.0)	5592 (38.4)	4949 (33.9)
Not stated	108 (1.2)	118 (1.1)	95 (0.7)	123 (1.0)	136 (1.3)
Living arrangement					
No other adults or children	2344 (19.0)	2943 (24.0)	679 (6.0)	2820 (21.4)	2718 (20.8)
Other adults but no children	5444 (46.9)	5981 (47.6)	4329 (34.7)	6147 (44.5)	5492 (42.9)
No other adults but children	802 (7.0)	688 (5.5)	820 (7.4)	3494 (26.9)	897 (7.3)
Other adults with children	3003 (26.6)	2926 (22.6)	6750 (51.5)	793 (7.0)	3999 (28.6)
Not stated	52 (0.5)	32 (0.4)	43 (0.4)	40 (0.3)	42 (0.4)

BIPOC, Black, Indigenous, People of Color. ¹Cell sizes are unweighted and may not align with the percentages, which are weighted using sample weights. Percentages may not sum to 100% owing to rounding. ²Mean and 95% CI for age. Sample size is equivalent to the sample size noted by country. ³Low educational attainment includes secondary education or less, medium includes some post-secondary education, high educational attainment includes university degree or above.

to 2020 was observed (AOR: 1.05; 95% CI: 0.93, 1.19). Similarly, no changes were observed in the United States when considering severity (Table 4).

There was little or weak evidence of changes in the likelihood of youth-reported experiences of food insecurity from 2019 to 2020 in any country, except in Mexico, where the odds of youth experiencing food insecurity were higher in 2020 (AOR: 1.43; 95% CI: 1.19, 1.71) (Table 5). Among youth in Mexico, the odds of few (AOR: 1.42, 95% CI: 1.18–1.71) and several (AOR: 1.48; 95% CI: 1.07, 2.04) experiences of food insecurity compared with no experiences were higher in 2020 than in 2019 (Table 5). The odds of many compared with no experiences of food insecurity were higher in Australia (AOR: 2.24; 95% CI: 1.65, 3.02) and the United States (AOR: 1.39; 95% CI: 1.04, 1.86) in 2020 than in 2019. There was little or weak evidence of other changes

in the number of experiences of food insecurity among youth. Sensitivity analyses excluding perceived income adequacy yielded similar findings among adults and youth (results not shown).

Discussion

A previous cross-country comparison raised concerns about increases in the prevalence of food insecurity after the onset of the COVID-19 pandemic in March 2020 [60], as have studies conducted early in the pandemic in the countries considered in this study [26, 28, 30, 31, 63, 64]. We found evidence of increasing likelihood and severity (adults) or numbers of experiences (youth) of food insecurity from 2019 to 2020 in Mexico. The proportions of youth reporting many experiences of food insecurity also increased in Australia and the United States from

TABLE 3Sociodemographic characteristics of youth aged 10–17 y participating in the International Food Policy Study in 2019 and 2020, by country (n = 23,107)¹

Country	Australia (n = 3021), n (%)	Canada (n = 7564), n (%)	Chile (n = 2867), n (%)	Mexico (n = 3438), n (%)	United Kingdom (n = 3036), n (%)	United States (n = 3181), n (%)
Year						
2019	1431 (47.4)	3674 (48.6)	1252 (43.7)	1616 (47.0)	1518 (50.0)	1599 (50.3)
2020	1590 (52.6)	3890 (51.4)	1615 (56.3)	1822 (53.0)	1518 (50.0)	1582 (49.7)
Age ² (y)	13.4 (13.3–13.5)	13.5 (13.4–13.5)	13.5 (13.4–13.6)	13.5 (13.4–13.5)	13.4 (13.4–13.5)	13.5 (13.4–13.6)
Sex						
Male	1626 (51.4)	3869 (50.9)	1593 (51.1)	1924 (50.6)	1498 (51.3)	1629 (51.1)
Female	1395 (48.6)	3695 (49.1)	1274 (48.9)	1514 (49.4)	1538 (48.7)	1552 (48.9)
Racial-ethnic identity and cultural diversity						
BIPOC and/or speaks language other than English at home	600 (24.6)	1957 (27.3)	310 (14.4)	439 (20.3)	364 (17.0)	886 (47.9)
White and/or English-speaking	2409 (75.0)	5480 (71.0)	2485 (83.3)	2906 (76.8)	2646 (82.1)	2287 (51.7)
Not stated	12 (0.4)	127 (1.7)	72 (2.2)	93 (3.0)	26 (0.9)	8 (0.4)
Perceived income adequacy						
Not enough	678 (21.9)	1318 (17.6)	887 (31.8)	1065 (33.3)	759 (24.7)	762 (26.2)
Enough	2314 (77.1)	6144 (81.0)	1946 (67.2)	2350 (66.1)	2242 (74.1)	2393 (73.0)
Not stated	29 (1.0)	102 (1.4)	34 (1.1)	23 (0.6)	35 (1.1)	26 (0.8)

BIPOC, Black, Indigenous, People of Color. ¹Cell sizes are unweighted and may not align with the percentages, which are weighted using sample weights. Percentages may not sum to 100% owing to rounding. ²Mean and 95% CI for age. Sample size is equivalent to the sample size noted by country.

2019 to 2020. However, among adults and youth in the remaining countries, the likelihood of food insecurity was either lower or unchanged from 2019 to 2020, with assessment of severity suggesting improvements or no changes.

Consistent with our findings for adults and youth, research conducted early in the pandemic suggested the prevalence of household food insecurity increased in Mexico compared to before the pandemic [64]. However, the observed decline in the likelihood of adults living in food-insecure households from 2019 to 2020 in Australia and Canada and the lack of change in the likelihood among adults in the United Kingdom and United States contrast findings of research conducted in those countries early in the pandemic. Research conducted in Australia, Canada, the United Kingdom, and the United States between March and August of 2020 found increases in the proportions of adults living in food-insecure households and the prevalence of household food insecurity within the past 30 d [28, 30], 3 mo [65], 6 mo [26, 66], or since the onset of the pandemic [31]. In late 2020, it was estimated that a lower proportion of individuals aged ≥ 12 y in Canada lived in food-insecure households in the past year compared to before the pandemic [67]. Other investigations conducted in the United States in May and December of 2020 found no change in the prevalence of household food insecurity in the previous 12 mo [68, 69].

To our knowledge, no other studies have compared the prevalence of food insecurity from before to during the COVID-19 pandemic using youth-reported data. A study of youth in grades 6 and 7 living in New Orleans in the fall of 2020 found that almost 3-in-10 “had worried about the amount or type of food available” [70]. In the United Kingdom, 18% of youth aged between 8 and 17 y experienced food insecurity through the 2020 summer break, as measured using 7 questions that queried about going to a friend’s house to eat, eating less, and feeling hungry [26, 66]. These estimates of food insecurity among youth are lower than those observed in this study and do not shed light on changes from before to during the pandemic.

The differences in trends in food insecurity across countries considered in this study, based on consistent measures of food insecurity and data collection time points, likely reflect heterogeneity in the timing and stringency of public health restrictions to mitigate the spread of COVID-19 (for example, workplace closures and stay-at-home orders), the transient disruptions in food supply chains, and the timing and adequacy of social protection measures by country [60, 71–73]. The observed increases in food insecurity in Mexico versus other countries may relate to the lack of policy responses compared to the other countries in this investigation. Social protection programs such as the Coronavirus Supplement in Australia [74], the Canadian Emergency Response Benefit [73], the Emergency Family Income program in Chile [75], Universal Credit in the United Kingdom [76], and the Federal Pandemic Unemployment Compensation program in the United States [73] were altered or implemented, potentially contributing to the declines or lack of change in food insecurity observed between 2019 and 2020. By contrast, limited economic responses to the pandemic in Mexico have been noted, for example, including the provision of loans to small- and medium-sized business and enabling advanced withdrawal of pension funds [77, 78]. As of October 2020, spending on social protection measures, such as income supports, during the pandemic was equal to 0.5% of Mexico’s gross domestic product [78, 79]. The levels of spending in Australia, Canada, Chile, the United Kingdom, and the United States were higher (7.6% to 11.6% of gross domestic product) during the same timeframe [79], potentially improving the capacity of households and individuals to buffer economic shocks associated with the pandemic and associated public health restrictions. Nonetheless, across all countries considered, the proportions of adults and youth affected by food insecurity remain high, with worrisome implications for health [6–8, 12, 13].

Direct comparison of food security classification between the HFSSM and Child Food Insecurity Experiences Scale is not possible because the HFSSM assesses food insecurity at the

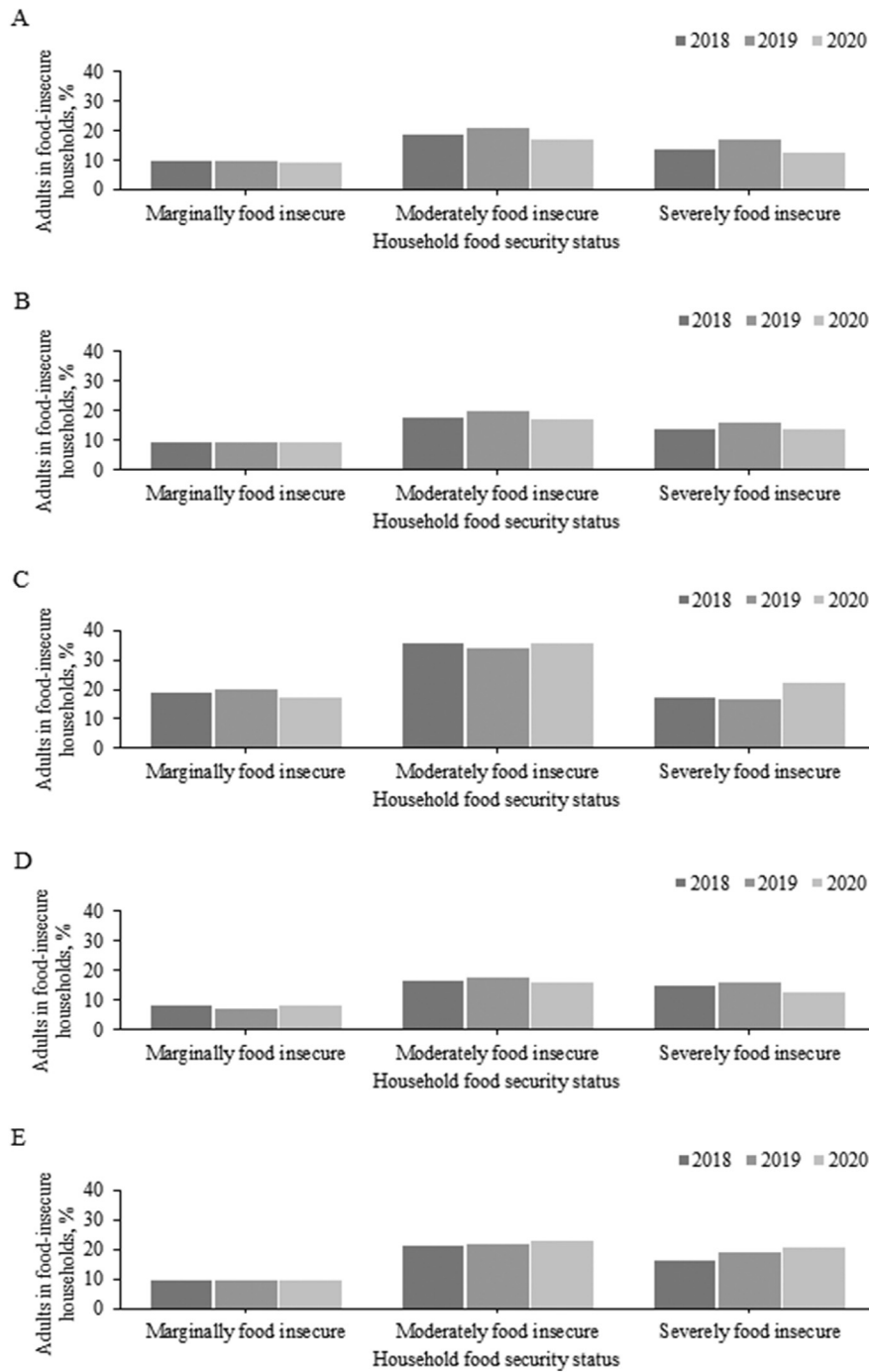


FIGURE 1. Proportions of adults aged 18–100 y living in food-insecure households in 2018, 2019, and 2020, by country, International Food Policy Study ($n = 63,278$). Weighted percentages of the proportions of adults living in food-insecure households in 2018, 2019, and 2020: (A) Australia ($n = 11,645$), (B) Canada ($n = 12,570$), (C) Mexico ($n = 12,621$), (D) the United Kingdom ($n = 13,294$), and (E) in the United States ($n = 13,148$).

household level based on manifestations with increasing severity, whereas the youth scale captures the overall number of experiences of food insecurity reported by youth [44, 51]. Nevertheless, in this study, similar trends in prevalence based on the adult and youth surveys were observed in Mexico and the United Kingdom. The ORs for adults and youth in Canada were also similar, although owing to the smaller sample size of youth, the CIs are wider for the youth estimate. In Australia and the United States, the trends for adults compared with those for youth seem to diverge.

Previous research suggests children may be partially shielded from food insecurity [80–82], such that differences in adults’ and youths’ experiences of food insecurity may reflect how household level food insecurity is managed. However, given the observed divergence in Australia and the United States, it is possible that relying on adult-level reporting for the household overlooks children’s experiences of food insecurity [51, 53, 54], underscoring the rationale for including a youth-reported measure in this study. Moreover, the contradictory trends based on the adult and youth surveys in Australia and the United States

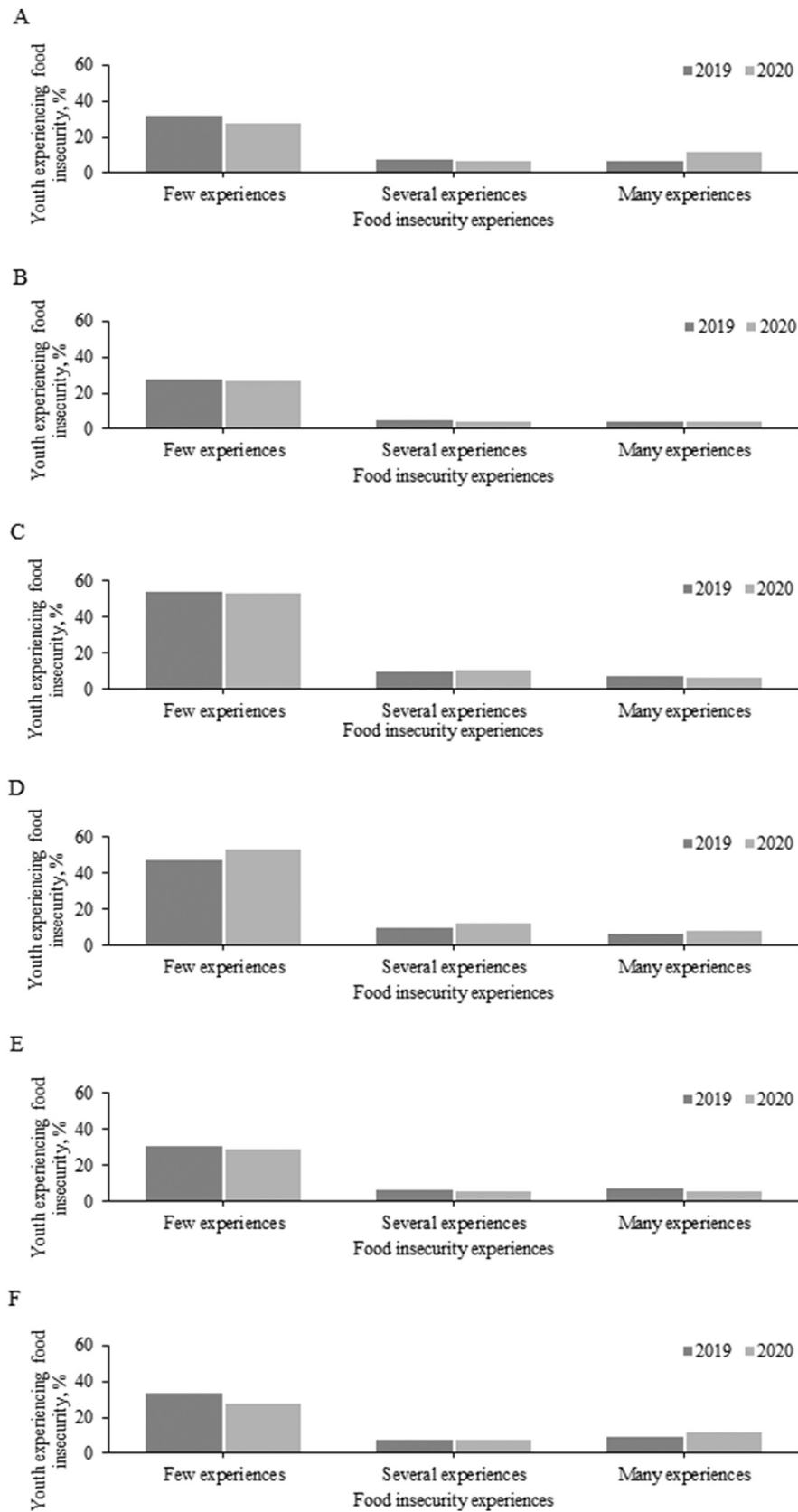


FIGURE 2. Proportions of youth aged 10–17 y experiencing food insecurity in 2019 and 2020, by country, International Food Policy Study ($n = 23,107$). Weighted percentages of the proportions of youth experiencing food insecurity in 2019 and 2020: (A) Australia ($n = 3021$), (B) Canada ($n = 7564$), (C) Chile ($n = 2867$), (D) Mexico ($n = 3438$), (E) the United Kingdom ($n = 3036$), and (F) the United States ($n = 3181$).

TABLE 4

Adjusted odds of living in households with any level of food insecurity and marginal, moderate, or severe food insecurity in 2020 compared to 2019 among adults aged 18–100 y, by country, International Food Policy Study ($n = 63,278$)¹

Country	Australia		Canada		Mexico		United Kingdom		United States		
	AOR (95% CI)	<i>P</i>	AOR (95% CI)	<i>P</i>	AOR (95% CI)	<i>P</i>	AOR (95% CI)	<i>P</i>	AOR (95% CI)	<i>P</i>	
2020 vs. 2019											
Any level of food insecurity ²	0.81 (0.72–0.92)	0.0009	0.87 (0.77–0.99)	0.0287	1.15 (1.02–1.31)	0.0246	0.90 (0.79–1.02)	0.11	1.05 (0.93–1.19)	0.42	
Marginally food insecure ³	0.90 (0.74–1.09)	0.26	0.97 (0.80–1.16)	0.72	0.99 (0.84–1.16)	0.89	1.05 (0.85–1.28)	0.68	1.00 (0.83–1.20)	0.98	
Moderately food insecure ³	0.78 (0.67–0.91)	0.0012	0.84 (0.72–0.97)	0.0216	1.18 (1.02–1.36)	0.0217	0.87 (0.74–1.03)	0.10	1.05 (0.91–1.22)	0.50	
Severely food insecure ³	0.79 (0.66–0.94)	0.0088	0.83 (0.69–1.01)	0.06	1.40 (1.19–1.66)	<0.0001	0.82 (0.68–0.99)	0.0391	1.08 (0.92–1.27)	0.34	

AOR, adjusted OR. ¹Sample sizes by year are as follows: 22,747 in 2018; 19,225 in 2019; and 21,306 in 2020. Sample sizes by food security category, irrespective of country and year, are as follows: 34,005 adults lived in food-secure households, 6657 adults lived in marginally food-insecure households, 13,222 adults lived in moderately food-insecure households, and 9394 adults lived in severely food-insecure households. ²Any level of food insecurity corresponds to 1 or more affirmations to questions in the Household Food Security Survey Module. ³Marginally food-insecure corresponds to 1 affirmation on the HFSSM, moderately food-insecure corresponds to 2–3 affirmations on the adult scale and/or 2–4 affirmations on the child scale, or severely food-insecure corresponds to 6 or more affirmations adult scale and/or 5 or more affirmations on the child scale.

6

TABLE 5

Adjusted odds of any experiences and by the number of experiences of food insecurity in 2020 compared to 2019 among youth aged 10–17 y, by country, International Food Policy Study ($n = 23,107$)¹

Country	Australia		Canada		Chile		Mexico		United Kingdom		United States	
	AOR (95% CI)	<i>P</i>	AOR (95% CI)	<i>P</i>	AOR (95% CI)	<i>P</i>	AOR (95% CI)	<i>P</i>	AOR (95% CI)	<i>P</i>	AOR (95% CI)	<i>P</i>
2020 vs. 2019												
Any experiences ²	1.16 (0.98–1.37)	0.08	0.90 (0.81–1.00)	0.06	0.94 (0.78–1.13)	0.49	1.43 (1.19–1.71)	0.0001	0.88 (0.74–1.04)	0.14	0.94 (0.79–1.13)	0.52
Few experiences ³	0.98 (0.82–1.18)	0.86	0.92 (0.82–1.03)	0.14	0.94 (0.78–1.14)	0.54	1.42 (1.18–1.71)	0.0002	0.90 (0.75–1.09)	0.28	0.83 (0.68–1.01)	0.06
Several experiences ³	1.18 (0.86–1.61)	0.30	0.82 (0.64–1.05)	0.11	1.02 (0.75–1.40)	0.90	1.48 (1.07–2.04)	0.0168	0.84 (0.59–1.18)	0.31	1.03 (0.74–1.44)	0.86
Many experiences ³	2.24 (1.65–3.02)	<0.0001	0.84 (0.65–1.07)	0.15	0.75 (0.53–1.08)	0.12	1.43 (0.99–2.07)	0.06	0.75 (0.54–1.05)	0.10	1.39 (1.04–1.86)	0.0249

AOR, adjusted OR. ¹Sample sizes by year are as follows: 11,090 in 2019 and 12,017 in 2020. Sample sizes by food security category, irrespective of country and year, are as follows: 11,947 youth reported no experiences of food insecurity, 7989 youth reported few experiences of food insecurity, 1587 youth reported several experiences of food insecurity, and 1584 youth reported many experiences of food insecurity. ²Any experiences of food insecurity corresponds to 1 or more affirmations to questions on the Child Food Insecurity Experiences Scale. ³Few experiences corresponds to 1–6 affirmations on the Child Food Insecurity Experiences Scale, several experiences corresponds to 7–10 affirmations, many experiences corresponds to 11–20 affirmations.

may relate to household composition, given the differential effect of the COVID-19 pandemic on various subgroups [25, 26, 28, 69]. Given the particular vulnerability of households with children to food insecurity [1, 29, 59, 83], increases in the proportion of adults living in food-insecure households in Mexico may relate to the fact that over half of adults in the sample lived in households with children. Household composition data were not available for the youth survey, limiting the ability to speculate how compositional differences related to changes in food insecurity experiences.

This study used measures intended to capture experiences of food insecurity in the past 12 mo, with the reporting period for 2020 thus overlapping with the periods examined in studies conducted in earlier stages of the pandemic. The measures in this study theoretically should have captured increases in food insecurity observed in other studies of adults conducted early in the pandemic [26, 28, 30, 31, 63, 64]. The available data preclude us from examining the dynamics of food insecurity within the 12-mo period from late 2019 to late 2020. The lower or unchanged prevalence observed in some countries in late 2020 compared to late 2019 in this study and other research in Canada and the United States [67, 69] could reflect a recency effect, which is a cognitive bias such that more recent experiences are recalled more easily than those that are more distal [84]. However, in a comparison of 12-mo and 30-d recall periods for assessment of prevalence of food insecurity in the United States with the HFSSM, the 30-d prevalence was lower than the 12-mo prevalence [85], consistent with expectation that a longer recall period captures more experiences and inconsistent with a recency effect.

Furthermore, differences in estimates from studies conducted during the pandemic may relate to the use of various versions of the HFSSM, including modules with 3, 6, 10, or 18 items and reference periods ranging from 30 d to 12 mo [25, 26, 28, 30, 31, 65–69]. Estimates of the prevalence of household food insecurity from before to during the pandemic have also been based on the Food Insecurity Experience Scale and the 8-item Latin American and Caribbean Food Security Scale, with 1- and 3-mo reference periods, respectively [63, 64]. These differences in measurement make it challenging to directly compare across studies. Heterogeneity in the populations examined may also contribute to differences across studies. This study used sample quotas and survey weights to reflect the populations of adults and youth in each country. Some previous investigations conducted in March/April, May/June, and October/November in 2020 focused on subgroups including adults living in a particular state or individuals who identify as women [25, 30, 31] suggested that the estimated prevalence of adults in food-insecure households increased after the onset of the pandemic relative to prepandemic estimates. Future country-specific research using data from the International Food Policy Study will examine changes in food insecurity among subgroups characterized by gender identity, racial-ethnic identity, and perceived income adequacy to provide insight into trends among different subpopulations and the need for targeted policy responses. More broadly, the COVID-19 pandemic has deepened inequities [86, 87], underscoring the importance of ongoing monitoring to identify subgroups particularly vulnerable to food insecurity. This is particularly important given overlapping emergencies

associated with infectious disease, the climate crisis, and conflicts in various regions of the world, and their potential to continue to undermine food security [88, 89].

The repeated cross-sectional data used in this study afforded the opportunity to examine changes in the prevalence and severity of food insecurity over time among adults and youth in several countries. The use of survey weights to account for potential differences in sample composition between years and adjustment for food insecurity status among adults in 2018 strengthened our ability to assess changes over time. The opportunity to conduct longitudinal analyses using data from respondents who participated in >1 wave was limited by small cell counts. Furthermore, the findings reflect a snapshot in time and may not be generalizable to future time points given the fluid and everchanging nature of the COVID-19 pandemic and other global crises, such as inflation [90], highlighting the importance of ongoing monitoring.

The HFSSM has been used extensively in North America [45, 46]; however, it does not capture all experiences of food insecurity, such as relying on food that is considered culturally inappropriate [91]. The HFSSM also does not capture how food was obtained, whereas data suggest increasing use of food banks and other emergency programming during the pandemic [92–94]. Federal responses to concerns about food insecurity in Canada, for example, focused on supporting food banks, in addition to income supports provided to individuals [24]. Given the stigma associated with use of food banks and the constraints in accessing food that meets dietary preferences and restrictions [95, 96], important domains of food insecurity that may have implications for health and well-being were not considered here. Furthermore, the categorization of socio-demographic characteristics was shaped by capacity to conduct cross-country comparisons. This resulted in oversimplification of complex social identity factors, such as racial-ethnic identity and cultural diversity, which were consolidated into 3 categories [97].

In conclusion, in contrast with observed increases in food insecurity in multiple countries based on data collected early in the pandemic, findings from Canada, Chile, and the United Kingdom indicate there were declines or little change in food insecurity from late 2019 to late 2020, possibly suggesting that income support and other program responses to the pandemic may have mitigated vulnerability to food insecurity. In Australia and the United States, the trends from 2019 to 2020 diverged among adults and youth, and increased prevalence of food insecurity was observed among adults and youth in Mexico. Furthermore, in 2020, approximately one-third to three-quarters of adults and youth across the countries considered were affected by food insecurity. Ongoing monitoring is needed to assess longer-term trends and the subgroups most affected to enable targeted intervention. Additional research to assess the effect of specific policies on vulnerability to food insecurity during the pandemic may inform interventions to ameliorate food insecurity and its devastating consequences during other emergencies.

Author disclosures

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <http://doi.org/10.1016/j.tjnut.2022.12.031>.

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Data Availability

Data described in the manuscript, code book, and analytic code can be accessed on request pending application and approval. Study information can be found on the International Food Policy Study website: <http://foodpolycystudy.com/about/>

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