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Food sufficiency and the utilization of free food resources for working-age Americans with disabilities during the COVID-19 pandemic

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Background: Working-age people with disabilities are an economically disadvantaged population more likely than those without disabilities to live in food insecure households.

Objective/hypothesis: Compare rates of food sufficiency and utilization of free food sources between working-age persons with and without disabilities in the US during the COVID-19 pandemic.

Methods: In September 2020, an online survey was conducted with n = 13,277 working-age individuals with and without disabilities to gather information about food sufficiency prior to COVID-19 (i.e., in March 2020) and within the last seven days as well as receipt of free groceries or meals, use of food programs or pantries, and concerns with using free food sources over the past week. Descriptive and multivariate statistics were used to compare these measures for persons with and without disabilities.

Results: Controlling for sociodemographic characteristics, the proportion of working-age persons who were food sufficient decreased from March 2020 to September 2020 for persons with disabilities (65% – 57%, an eight-percentage point decrease) and for persons without disabilities (78% – 73%, a five-percentage point decrease). The rates of change were not significantly different between groups. In September 2020, higher proportions of persons with disabilities (58%) used free food resources in the past week than persons without disabilities (41%).

Conclusions: The low rate of food sufficiency, the high rate of free food resource utilization, and the concerns noted by working-age persons with disabilities in using these sources suggest a need for continuing nutrition assistance policy and program development targeted towards the needs of persons with disabilities.

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Introduction

Persons who lack consistent access to enough food for an active, healthy life are considered food insecure. In the United States (US), almost 11% of households were food insecure at some point during 2019. Only an estimated 58% of households which were food insecure participated in one of more of the three primary U.S. nutrition assistance programs (Supplemental Nutrition Assistance Program [SNAP], Special Supplemental Nutrition Assistance Program for Women, Infants and Children [WIC], or National School Lunch Program [NSLP]). The remaining 42% of households which were food insecure likely had unmet food needs or accessed other resources to obtain the food their households needed. Households participating in SNAP, WIC, or NSLP may have accessed additional resources as well as these programs often do not fully address food or nutritional needs. These additional resources might include family or friends as well as community-based resources such as food pantries or soup kitchens. As the economic effects of the COVID-19 pandemic started to become apparent in the spring of 2020 within the US, rates of food insecurity rose nationwide and demands on existing community-based nutrition supports increased.

Prior studies have determined that Americans with disabilities are disproportionately impacted by economic downturns, are more likely to reside in households that experience food insecurity and are more likely than others to visit food banks, it is likely that Americans with disabilities are experiencing higher rates of food insufficiency and more frequent use of free food resources than others during the pandemic. Recent evidence has also suggested that the employment of working-age individuals with disabilities, 19% of the total working-age population in the US, are disproportionately affected by the economic
slowdown. The combined economic downturn and health impacts of the COVID-19 pandemic may have resulted in disparate increases in food insufficiency during the pandemic for this population. If so, understanding barriers to food access as well as concerns with accessing community or other nutrition assistance programs can highlight ways for these systems to better serve persons with disabilities. Using newly available survey data, this paper examines these issues in detail.

Literature review

In the US, food security is typically measured at the national level using data from the Current Population Survey (CPS), a nationally representative household survey conducted by the U.S. Census Bureau. While the CPS is administered monthly, the associated 18-question Household Food Security Module (HFSM) developed by the U.S. Department of Agriculture (USDA), is administered only once per year, in December. The HFSM measures past-year experience with food security. The timing of the survey, as well as the covered time frame (past year food security) does not allow for a nuanced look at the impact of COVID-19. Further, reports using the December 2020 CPS data will likely not be available until September 2, 2021.

As an alternative form of data collection, the U.S. Census Bureau has been conducting a weekly Household Pulse Survey (HPS) since April 23, 2020. Among other things, the survey measures food sufficiency in the last seven days. Food sufficiency, a narrower measure than food security, is measured using four questions which ask respondents whether they 1) have enough of the types of food wanted; 2) have enough food, but not always the types wanted; 3) sometimes do not have enough to eat; or, 4) often do not have enough to eat. Whereas food insecurity measures include individuals concerned about food inadequacy, food sufficiency measures only include individuals who are experiencing food inadequacy. Households that report having enough of the types of food they want are deemed to be food sufficient. Prior to COVID-19, approximately 62% of U.S. households were food sufficient. In September 2020, however, 53% of households were food sufficient.

The HPS website routinely provides food sufficiency estimates broken out by a number of demographic characteristics (e.g., age, sex, ethnicity, education, marital status, household size, presence of children in the home). Data from the HPS are available for independent analyses, allowing for further breakdowns by demographic characteristics including disability. This disability measure is restricted to persons who are out of work due to a non-coronavirus illness or disability. Gaffney et al. estimated that 20.8% of non-working persons with a non-coronavirus illness or disability were experiencing food insufficiency in the early months of the pandemic (April and May of 2020).

Of course, the working-age population with disabilities is substantially larger than just persons who are not working, pointing to a need for more inclusive measures of disability in the HPS.

Food insufficiency for persons with disabilities can be driven by family situations (e.g., limitations in financial resources), individual characteristics (e.g., functional limitations which impact the ability to access and prepare food), or local environment characteristics (e.g., living in a “food desert”, an area with a scarcity of food outlets). Schwartz et al. found that persons with mobility disabilities have greater difficulty with grocery shopping and food preparation, leading to reduced food access. Additionally, they more often face transportation barriers and have to rely on others, which could limit which stores they are able to access. Accessibility for people with mobility disabilities is also a major concern. Some grocery stores have ill-placed products, a lack of accessible entrances and parking, and crowds. Disability-accessible food stores are most commonly major chains and less commonly convenience stores; major chain food stores are less likely to be available in impoverished urban neighborhoods, thus disadvantaging persons with disabilities who live in these areas. The COVID-19 pandemic has exacerbated these inequities, as disruptions in the supply chain led to food shortages and increased prices, further limiting access for disadvantaged populations.

Among all the federally run food assistance programs, SNAP is the most utilized. It provides eligible individuals and families with monetary benefits to purchase food each month. In calendar year 2019, SNAP supported approximately 35.7 million people, with average monthly benefits of $130 per person. The USDA has worked to increase food access during the COVID-19 pandemic, expanding food assistance programs and providing more flexibility around eligibility for nutrition assistance programs. This includes increasing SNAP benefits by approximately 40% and the initiation of a pilot online shopping option for SNAP beneficiaries. The Emergency Food Assistance Program provided emergency food assistance to food banks as well. Several programs also expanded food access to children, such as Disaster Household Distributions which reaches rural areas where food sources were cut with school closures. More than 35,000 feeding sites served meals to children nationwide, with flexible meal times and parent food-pickups.

In addition to using SNAP to purchase food at retail stores or farmer’s markets, individuals who are facing food insufficiency might access other resources including family and friends, food pantries or food banks, schools or other programs aimed at children; home delivered services like Meals on Wheels; churches, synagogues, temples, mosques or other religious organizations, shelters or soup kitchens, and other community programs. The pandemic has forced many of these food assistance programs to adjust their operations to accommodate social distancing and other safety protocols. According to Feeding America, the national network of food banks, food donation shortages, fewer volunteers, and the rise in food insecure individuals and households, has led to immense challenges among food assistance programs. Additionally, the individuals most susceptible to serious complications associated with COVID-19 are also those most often affected by food insecurity, including older adults, people of color, and people with chronic diseases, exacerbating their potential for food insecurity.

As the COVID-19 pandemic is rapidly unfolding, it is important to use up-to-date information to assess its impact on food sufficiency for disadvantaged populations. Using newly available survey data, this paper provides estimates of food sufficiency, sources of free food access, and barriers to accessing free food for working-age individuals with and without disabilities in the US, which could limit which stores they are able to access. Accessibility for people with mobility disabilities is also a major concern. Some grocery stores have ill-placed products, a lack of accessible entrances and parking, and crowds. Disability-accessible food stores are most commonly major chains and less commonly convenience stores; major chain food stores are less likely to be available in impoverished urban neighborhoods, thus disadvantaging persons with disabilities who live in these areas. The COVID-19 pandemic has exacerbated these inequities, as disruptions in the supply chain led to food shortages and increased prices, further limiting access for disadvantaged populations.

Methods

Data

Data for this study was collected using standard, replicable survey practices. A survey of adults ages 18 to 64 who resided in the
US and were members of a Qualtrics nonprobability Internet panel were recruited by Qualtrics and its partners using a variety of methods, including web intercept, targeted email lists, panel member referral, and social media. Incentives for respondents, decided and allocated by Qualtrics and its partners, included cash payments, free downloads, and/or membership points. Informed consent to participate was obtained in accordance with requirements of the (University of New Hampshire Institutional Review Board) Institutional Review Board. The median time to complete the survey was 9 min 15 s.

Between September 2 and September 18, 2020 (a 17-day period), the survey was accessed by 37,592 panel members. Of those, 13,277 responses were retained and comprise the analytic sample for this study. Among those that did not meet the inclusion criteria, 1818 were screened out for failing to provide informed consent to participate; 10,665 were excluded for inattentive responding (speeding or failing to correctly answer one or two attention-checking items); and 11,832 were excluded because they were over quota on one or more categories.

Quotas were established by the researchers in order to ensure representation from key demographic and socioeconomic subgroups for this national convenience sample. The quotas were based on prevalence statistics from the 2018 1-year American Community Survey. Table A1 in the Appendix shows a summary of variables’ sociodemographic characteristics, and the quota variables are labeled as such. They include gender, age category, race and ethnicity, socioeconomic status (above or below the federal poverty level), and geographic region of the US (Table A1).

Measures

Disability was measured using the following six questions: Are you deaf or do you have serious difficulty hearing? Are you blind or do you have difficulty seeing, even when wearing glasses? Do you have serious difficulty walking or climbing stairs? Because of a physical, mental, or emotional condition, do you have serious difficulty concentrating, remembering, or making decisions? Do you have difficulty dressing or bathing? Because of a physical, mental, or emotional condition, do you have difficulty doing errands alone such as visiting a doctor’s office or shopping? Persons responding affirmatively to any one of these questions were considered to have a disability. These questions align with the six questions used across many U.S. nationally representative household surveys to measure disability.

Healthy food access prior to COVID (before March 2020) and within the last seven days (within September 2020) was measured using the USDA food sufficiency screener to align with the measure used in the HPS. The screener asks respondents to indicate their agreement with one of the following four statements over the given time period: I had enough of the kinds of food I wanted to eat; I had enough, but not always the kinds of food I wanted to eat; Sometimes I did not have enough to eat; and, Often I did not have enough to eat.” The first mention of the screener in the survey was prefaced with the following: “Getting enough food can be a problem for some people. Before March 2020, which of these statements best describes your experience.”

For those who responded that they did not have enough to eat or not what they wanted to eat, the survey then asked them to indicate the frequency (never, rarely, sometimes or often) of the following reasons: 1) Couldn’t afford to buy more food; 2) Couldn’t get out to buy food; 3) Afraid to go or didn’t want to go out; 4) Couldn’t get delivery; 5) Stores didn’t have food I wanted. For our analyses, we recoded these responses into binary variables, where a ‘never’ response was assigned a value of zero and any other response was assigned a value of one, so that we could focus on issues that arose at least once.

Information about where respondents received free groceries or meals within the past seven days was also collected. Options included: 1) Through the school or other program aimed at children; 2) food pantry or food bank; 3) home delivered services like Meals on Wheels; 4) church, synagogue, temple, mosque, or other religious organization; 5) shelter or soup kitchen; 6) other community program; 7) family, friends or neighbors. For each source, responses included never, rarely, sometimes, and often. We recoded these responses into binary (yes/no) variables where a value of one was assigned to persons who rarely, sometimes, or often received free food from a particular source so that we could focus our analyses on sources that were used at least once. Persons who said they never received free food from a specific source were assigned a value of zero.

For those who used food programs or food pantries in the last seven days, further information was collected about any problems faced in using these programs (never, rarely, sometimes, often). Problem options included: 1) Concern about paperwork I need to share to enroll in food programs; 2) Concern that I won’t qualify for a food program; 3) Not wanting to rely on food programs because I value personal independence; 4) No transportation to the food program office or pantry; 5) Long lines or long wait times at the food program office or pantry; 6) Fewer food deliveries or reduced hours because of COVID-19; 7) Poor quality of food from the food program or food pantry; 8) Difficulty preparing the food I get from the food program or pantry; 9) Worried others will find out I use these programs. We again recoded these responses into binary (yes/no) variables where a value of one was assigned to persons who rarely, sometimes, or often cited a particular concern and a value of zero was assigned to those who never experienced a particular concern.

We also collected information about how confident individuals were that they would be able to afford the kinds of food they needed for the next four weeks. Possible responses included: very, moderately, somewhat, or, not at all.

Sociodemographic information was collected, including age, gender, ethnicity, race, level of education, income, employment status, use of SNAP benefits, and geographic residence. Age was measured as an interval variable. Gender was measured categorically as man, woman, non-binary, transgender, or other. We reco-
ded this into male, female, other. Ethnicity was measured as Hispanic or Spanish origin or not. Race was measured as White, Black (African American), American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, other, or unknown. As respondents could choose more than one race, we recoded these into discrete categories to focus on the most prevalent responses: White only, Black only, Other.

Education level was measured categorically as “less than high school” up to “graduate degree”. We recoded these variables into four categories: Less than high school (HS), HS/GED, Some college, or Bachelor’s or more. Income, defined as total household income before taxes and other deductions, was included as a categorical variable with the following options: Less than $15,000, $15,000-$29,999, $30,000-$44,999, $45,000-$59,999, $60,000-$74,999, $75,999-$99,999, $100,000 or more. We measured employment as whether a person was currently working at a job for pay, including self-employment. Public benefit receipt was collected as well, providing an opportunity to gather information about SNAP receipt. Region of country was captured, based on state of residence. These were collapsed into four Census regions: Northeast, South, Midwest, and West.

Analytical plan

We first calculated descriptive statistics of demographics, food sufficiency, source of free food access, and concerns with accessing free food by disability status, testing differences among categorical
variables using Chi square, differences among interval level variables using t-tests, and differences in proportions pre-COVID and during the pandemic using z-tests, with alpha set to 0.05. We then used logistic regressions to estimate the odds of 1) being food sufficient, controlling for disability status as well as age, gender, race, ethnicity, employment, income, region of the country, and SNAP receipt; 2) accessing free food in the past seven days, controlling for a similar set of covariates as noted above; and 3) concerns with free food access, controlling for similar covariates as noted above. Marginal effects and adjusted odds ratios are included with the results.

Results

Table 1 presents descriptive statistics by disability status. Twenty-nine percent of our working-age sample had a disability. The mean age was 41 years. Fifty-one percent of the sample were women, 72% were White, 18% were Hispanic, and 46% had a Bachelor’s degree or higher. Sixty-six percent were currently employed. The largest proportion (42%) of our sample resided in the South. Nearly 12% were receiving SNAP benefits. Adults with disabilities were slightly younger than those without disabilities (40 years old compared to 41 years old, \( p < .001 \)). Higher proportions of adults with disabilities were female (55% compared to 50%, \( p < .001 \)) and Hispanic (21% compared to 16% for those without disabilities, \( p < .001 \)). People with disabilities had lower levels of education, employment, and household incomes than others (all \( p < .001 \)). Nearly 20% of working-age adults with disabilities and nine percent of those without disabilities were receiving SNAP (\( p < .001 \)).

Table 2 provides more detailed food sufficiency information by disability status, pre-COVID and during the pandemic. Fifty-nine percent of working-age persons with disabilities had enough of the kinds of food they wanted to eat prior to the pandemic, significantly lower than the 75% of those without disabilities (\( p < .001 \)). Our bivariate analyses find significant differences between people with and without disabilities in terms of food sufficiency in September 2020: 52% of people with disabilities and 73% of those without disabilities had enough of the kinds of food they wanted to eat in the last seven days (\( p < .001 \)).

Among those who did not have enough of the kinds of food they wanted to eat, higher proportions of persons with disabilities cited affordability, not getting out, and fear of going out as reasons for not being able to get the kinds of food they wanted to eat, compared to persons without disabilities (all \( p < .001 \)). People with disabilities were significantly less likely to note delivery issues, however (73% compared to 80% for those without disabilities, \( p < .001 \)).

Higher proportions of working-age persons with disabilities received free food or meals in the past seven days (59%) compared to persons without disabilities (41%) (\( p < .001 \)). Forty-one percent of working-age individuals with disabilities were very confident that they would be able to afford food in the next four weeks, compared to 64% of working-age persons without disabilities (\( p < .001 \)).

Fig. 1 presents adjusted predicted probabilities of food sufficiency for working-age individuals with and without disabilities. These predicted probabilities are based on logistic regressions (not shown) which estimated being food sufficient, controlling for age, gender, race, ethnicity, income, employment, SNAP, and region. When adjusting for these characteristics, 65% of people with disabilities and 78% of those without disabilities were food sufficient prior to the pandemic. These percentages were significantly lower by September 2020 for both groups, at 57% (a drop of 8% points) for people with disabilities (all \( p < .001 \)). People with disabilities were significantly less likely to see delivery issues, however (73% compared to 80% for those without disabilities, \( p < .001 \)). People with disabilities had lower levels of food sufficiency in September 2020: 52% of people with disabilities and 73% of those without disabilities had enough of the kinds of food they wanted to eat prior to the pandemic, significantly lower than the 75% of those without disabilities (all \( p < .001 \)).

Table 3 shows the results of logistic regression analyses which estimated whether individuals used free food resources in the previous seven days, for the full sample and for subsets of those with and without disabilities. Model 1 includes the full sample and controls for disability status, age, gender, race, ethnicity, income, employment, region, and SNAP receipt. With the controls, working-age people with disabilities had significantly higher odds of using free food resources in the past week than others (OR: 2.03, \( p < .001 \)). Older adults had significantly lower odds of receiving free food than younger age groups (OR: 0.950, \( p < .001 \)). People who were African American only, Hispanic, or employed had increased odds of receiving free food than those who were other races, non-Hispanic, or unemployed, respectively. Those who were female or other genders had reduced odds of using free food resources than male respondents. People who received SNAP benefits had

### Table 1

|                | All          | Disability | No disability | Sig.  |
|----------------|--------------|------------|---------------|-------|
| N              | 13,277       | 3880       | 9.39%         |       |
| Disability     | 29.22        | 29.22      | 29.22         |       |
| Age (mean, s.d.) | 40.53       | 39.74      | 40.86         | ***   |
| Gender         | 0.117        | 0.222      | 0.137         |       |
| Male           | 47.96        | 43.25      | 49.90         | ***   |
| Female         | 51.20        | 54.48      | 49.86         |       |
| Other          | 0.83         | 2.27       | 0.23          |       |
| Race           | 72.00        | 71.44      | 72.24         |       |
| White only     |              | 17.33      | 16.25         | ***   |
| Black only     |              | 13.17      | 13.34         |       |
| Asian only     |              | 14.82      | 15.80         | 14.42 |
| Other          |              | 0.83       | 0.23          |       |
| Ethnicity      |              | 17.68      | 16.25         | ***   |
| Hispanic       |              | 82.32      | 78.87         | 83.75 |
| of Spanish     |              |            |               |       |
| origin         |              |            |               |       |
| Education      |              | 1.94       | 3.35          | 1.35  |
| Less than HS   |              | 18.20      | 23.56         | 15.98 |
| HS/GED         |              | 34.38      | 40.13         | 32.00 |
| Some college   |              | 45.49      | 32.96         | 50.67 |
| Bachelor’s     |              |            |               |       |
| degree         |              |            |               |       |
| Employed       |              | 65.62      | 62.40         | 71.09 |
| Currently      |              | 34.38      | 37.60         | 28.91 |
| working for    |              |            |               |       |
| pay            |              |            |               |       |
| Not            |              | 19.30      | 18.47         | 19.64 |
| Region         |              | 21.90      | 22.43         | 21.68 |
| Northeast      |              | 41.47      | 42.90         | 40.89 |
| Midwest        |              | 17.33      | 16.20         | 17.79 |
| South          |              |            |               |       |
| Total household income |        |
| Less than $15K | 6.28         | 10.80      | 4.42          | ***   |
| $15K-$29,999   | 8.84         | 13.04      | 7.11          |       |
| $30K-$44,999   | 17.01        | 19.25      | 16.08         |       |
| $45K-$59,999   | 15.13        | 15.54      | 14.97         |       |
| $60K-$74,999   | 12.14        | 11.73      | 12.31         |       |
| $75K-$99,999   | 14.45        | 12.16      | 15.39         |       |
| $100,000 or    | 25.24        | 16.08      | 29.02         |       |
| more           |              |            |               |       |
| SNAP           | 11.80        | 19.66      | 8.56          | ***   |

Source: Authors’ calculations: * \( p < .05 \), ** \( p < .01 \), *** \( p < .001 \).
increased odds of receiving free food (OR: 1.71, p < .001). Regionally, the utilization of free food resources was highest in the Northeast (all p < .001).

Model 2 includes only people with disabilities, and Model 3 includes only people without disabilities. With a few exceptions, the results were largely the same as reported for Model 1. For people with disabilities, ethnicity was no longer associated with receiving free food. For people without disabilities, being employed in the past week was no longer associated with receiving free food.

Table 4 presents the source of free meals for those who received free food in the past week as well as problems in accessing free food by disability status. Forty-six percent of working-age persons received free food (59% of those with disabilities and 41% of those without disabilities) (p < .001). Among working-age persons, 40% received food through the school or another program aimed at children, 44% from a food pantry or food bank, 35% from home delivered services such as Meals on Wheels, 39% from religious institutions, 30% from shelters or soup kitchens, 36% from other community programs, and 84% from family, friends, or neighbors. Persons with disabilities were significantly more likely than those without to receive free food from food pantries or food banks (48%, 41%, respectively, p < .001), shelters or soup kitchens (32%, 28%,

| Source: Authors’ calculations, * p < .05, ** p < .01, *** p < .001. |

![Fig. 1. Adjusted food sufficiency estimates for working-age individuals in the U.S.](image-url)
respectively, \( p < .01 \), other community programs (38% and 35%, respectively, \( p < .01 \)), and family, friends, or neighbors (86% and 83%, respectively, \( p < .01 \)).

Many concerns were noted among those who had received free food in the past week. Forty-two percent of respondents noted problems with paperwork, 49% were concerned about qualifying for the food assistance, 58% did not want to rely on free food, 42% were worried that others would find out that they used free food programs, and 47% faced long lines and wait times. Forty-two percent of respondents noted problems with transportation, 47% faced long lines and wait times, 49% noted fewer deliveries or reduced hours due to COVID-19, 49% were concerned about paperwork, 49% were worried that others would find out I use theseprograms, and 45% noted family, friends, or neighbors (86% and 83%, respectively, \( p < .01 \)).

Table 5 shows adjusted odds ratios, predicting problems or concerns with using free food resources for working-age persons with disabilities. Models control for age, gender, race, ethnicity, income, and region. Holding all else constant, people with disabilities had significantly higher odds of experiencing each problem, compared to those without disabilities (all \( p < .001 \)).

**Discussion**

The pandemic is impacting working-age individuals with disabilities in the US, reducing their food sufficiency. Adjusted results show that 57% of working-age persons with disabilities were food sufficient during the pandemic, compared to 73% of working-age persons without disabilities. Our unadjusted results of the proportion of working-age individuals with disabilities who were food sufficient during the pandemic (52%) are lower than the 79% reported by Gaffney et al.2 for persons with disabilities, although they used a more restrictive measure of disability (e.g., ‘not working due to disability’).

### Table 3

|                      | Model 1 (Full sample) | Model 2 (Dis.) | Model 3 (No dis.) |
|----------------------|-----------------------|----------------|------------------|
|                      | OR  s.e.  Sig.        | OR  s.e.  Sig. | OR  s.e.  Sig.   |
| Disability           |                       |                |                  |
| Income (Ref. group = $<15,000 per year) | 2.026 0.089 *** |                |                  |
| $15K-$29,999         | 0.947 0.097           | 0.786 0.119    | 1.057 0.148      |
| $30K-$44,999         | 0.578 0.054 ***       | 0.525 0.074 ***| 0.603 0.076 ***  |
| $45K-$59,999         | 0.597 0.057 ***       | 0.524 0.078 ***| 0.637 0.082 ***  |
| $60K-$74,999         | 0.473 0.047 ***       | 0.438 0.069 ***| 0.500 0.066 ***  |
| $75K-$99,999         | 0.482 0.047 ***       | 0.42 0.067 *** | 0.512 0.066 ***  |
| $100K or more        | 0.566 0.053 ***       | 0.641 0.101 ** | 0.567 0.071 ***  |
| Age                  | 0.950 0.002 ***       | 0.958 0.003 ***| 0.947 0.002 ***  |
| Gender (Ref. group = Male) | 0.587 0.024 ***       | 0.578 0.045 ***| 0.591 0.029 ***  |
| Female               | 0.598 0.137 *         | 0.587 0.154 *  | 1.076 0.500      |
| Race (Ref. group = White only) |                  |                |                  |
| Black only           | 1.463 0.086 ***       | 1.730 0.198 ***| 1.375 0.094 ***  |
| Other                | 1.061 0.060           | 1.150 0.121    | 1.043 0.070      |
| Hispanic             | 1.206 0.066 **        | 1.055 0.104    | 1.279 0.083 ***  |
| Employed             | 1.195 0.052 ***       | 1.537 0.116 ***| 1.072 0.057      |
| Region (Ref. group = Northeast) |                |                |                  |
| South                | 0.739 0.044 ***       | 0.801 0.090 *  | 0.709 0.049 ***  |
| Midwest              | 0.731 0.046 ***       | 0.815 0.096    | 0.700 0.052 ***  |
| West                 | 0.763 0.043 ***       | 0.813 0.087    | 0.740 0.049 ***  |
| SNAP                 | 1.712 0.106 ***       | 1.621 0.154 ***| 1.793 0.147 ***  |
| Constant             | 11.891 1.502 ***      | 14.968 3.280 ***| 14.291 2.248 *** |
| Observations         | 13,119 3815           |                | 9.304           |

Source: Authors’ calculations, * \( p < .05 \), ** \( p < .01 \), *** \( p < .001 \).
to a non-coronavirus illness or disability) and a different time frame (April—May 2020). The findings we present show that the drops in the adjusted proportion of persons who were food sufficient from the pre-COVID period to September 2020 are larger, in terms of percentage point differences, for persons with disabilities (an eight-percentage point drop for persons with disabilities compared to a five-percentage point drop for persons without disabilities). We cannot state, however, that the rate of change was disproportionately larger for persons with disabilities. Future studies can perhaps explore this finding in more detail. At the household level, specific information about magnitude of earned income losses, household size, and receipt of public disability benefits (a relatively stable source of income which would not be impacted by the pandemic) could be used to improve upon the analyses presented here. Furthermore, the timing and content of the various federal stimulus packages which were rolled out during the pandemic could be examined to understand how these policy initiatives might have impacted the food sufficiency of persons with and without disabilities differently.

Of note, however, is that the adjusted proportion of working-age persons with disabilities who were food sufficient in September 2020 (73%) remained higher than the adjusted proportion of working-age individuals with disabilities who were food sufficient prior to the pandemic (65%). These findings confirm prior research, which has generally suggested that persons with disabilities are at increased risk of food insecurity, while also showing the impact that the pandemic is having on food sufficiency for working-age Americans with disabilities.

The primary reasons cited for not having enough or the kinds of food individuals wanted to eat included affordability, inability to get out (for example, did not have transportation or for health reasons) and being afraid to go out or not wanting to go out to buy food. Issues surrounding affordability likely reflect both individual-level constraints in income as well as increases in prices for food. Indeed, working-age people with disabilities have seen disproportionate impacts on their levels of employment, and the pandemic has resulted in large monthly increases in the cost of buying food to prepare at home since March 2020. People with disabilities experience higher associated costs of living and are more likely to live in poverty than others, evidence that this population is normally facing a greater level of financial stress than people without disabilities. The additional economic impact of the pandemic will likely affect food sufficiency for this population for some time.

An inability to get out to purchase food due to a lack of transportation or health concerns as well as not wanting to go out point to the impact of isolation on this population's ability to access necessary food during the pandemic. However, in September 2020, 55% of working age persons with disabilities had received free food in the past seven days from a variety of sources. The broad utilization of these sources for persons with disabilities did not fully alleviate food sufficiency concerns, suggesting perhaps that additional resources are needed.

Persons with disabilities were significantly more likely than those without disabilities to have received food from food pantries or food banks, shelters or soup kitchens, other community programs, and family, friends, or neighbors. Given the concerns raised above about getting out into the community to access food, programs which provide free food via delivery options would be best able to ameliorate this concern for persons with disabilities. About 35% of our survey respondents, with and without disabilities, received free food from Meals on Wheels or other home-delivered options. About 40% received free food through the school or other programs aimed at children, suggesting that perhaps providing additional food to children to bring home could be another approach to consider. Many community-based nutrition assistance programs have adapted during the pandemic to offer alternative methods of providing food while also adjusting to increased demand.

Working-age people with disabilities were significantly more likely than others to experience concerns with using free food resources, including problems with paperwork, concerns about qualifying for assistance, not wanting to rely on free food, lack of transportation, long lines and wait times, fewer deliveries, or reduced hours due to COVID-19, difficulty preparing food received, and worry that others would learn that they used free food programs. Some of these barriers to food access for persons with disabilities have been noted by other researchers as common concerns. For example, Huang et al. noted that location, adequate space, ease of entry, helpful employees, and the availability of amenities such as restrooms were the greatest determinants of food access for people age 50 and older who had mobility limitations. Difficulty with food preparation and grocery shopping have been identified as barriers to food access for individuals with physical disabilities. Social stigma related to food insecurity has also been indicative of food access barriers. Food assistance programs and grocery stores should acknowledge the environmental barriers to food access among persons with disabilities and adjust their practices. Additionally, disability advocacy groups might consider focusing their advocacy efforts to food access difficulties experienced among persons with disabilities.

The social stigma associated with using free food resources is an area in need of further research. Our results suggest that large proportions of people with disabilities, even more so than people without disabilities, either do not want to rely on food programs or are worried that others will find out that they use such programs. Future research should explore this issue in more detail, perhaps through qualitative research, to understand whether these concerns are substantially impacting food sufficiency for persons with disabilities and if so, the best way to counter this concern.

Our food sufficiency results for the general population differ slightly from those of the HPS. In September 2020, 53% of U.S.

Table 5

| Disability                          | AOR | s.e. | Sig. |
|------------------------------------|-----|------|------|
| Concern about paperwork            | 1.585 | 0.091 | ***  |
| Concern that I wouldn't qualify    | 1.794 | 0.100 | ***  |
| Not wanting to rely on food programs/pantries | 1.801 | 0.103 | ***  |
| No transportation to food program/pantry | 1.761 | 0.101 | ***  |
| Long lines, wait times            | 1.762 | 0.099 | ***  |
| Fewer deliveries or reduced hours due to COVID | 1.690 | 0.096 | ***  |
| Difficulty preparing food I get from the food program/pantry | 1.804 | 0.102 | ***  |
| Worried others will find out I use these programs | 1.854 | 0.107 | ***  |

Source: Authors’ calculations. ***p < .001, AOR = adjusted odds ratio, Models control for: age, income, gender, race, ethnicity, & region.
households were food sufficient in the past 7 days, according to the HPS. We found that 67% of our working-age sample were food sufficient during September 2020. Our rates for the general population may be higher than Census estimates because our survey only included working-aged people, instead of households of all ages, or they may reflect differences in our sample frame which might arise from using an online panel even when quotas for certain characteristics are met.

In addition, while our disability prevalence estimate of 29% is higher than standard Census estimates for the same age group (10%), it is similar to the disability prevalence estimate found for working-age individuals in another nationally representative survey, the 2019 Behavioral Risk Factor Surveillance Survey (28%, author calculations). Future research can explore in more detail the possible survey methodology differences which might explain these disparate estimates. Starting in the spring of 2021, the HPS will include the same six disability questions we used in our survey, offering on-going opportunities to explore the intersection of disability and food sufficiency with monthly data.

Several limitations of this study must be noted. First, responses for levels of food sufficiency ‘before March 2020’ likely suffer from recall bias which may impact the accuracy of our estimates of changes in food sufficiency from the period before the pandemic to September 2020. Second, our measure of disability may include a combination of persons with recent onset of disability as well as persons who had a disability prior to the COVID-19 pandemic. While this may have a small impact on the validity of our estimates of changes in food sufficiency, this will not impact our point estimates of accessing free food and concerns with accessing free food. Third, it is possible that more than one person per household responded to the survey which may have affected the accuracy of our results. Fourth, this study relied on a nonprobability sampling frame, which introduces selection bias and suggests caution should be used when making inferences to the general population. For example, people with higher educational attainment are more likely to have computers and use the internet, therefore they may be more likely to respond to an online survey. Although we established quotas on several sociodemographic variables to mitigate sources of bias, such corrections are not as reliable as probability-based sampling methods.

An additional limitation of our study is that information on barriers to utilizing free food resources was not collected from individuals who did not receive free food. We are unable to tell whether barriers were so great that they precluded people from using these free food resources altogether. In addition, as the level of measurement was the individual, the survey lacked household information such as individuals’ marital status or the number of persons residing in the household. Such information would have provided a better understanding of food sufficiency at the family and household levels. Lastly, all data were self-reported by participants, raising potential for self-report bias.

Conclusion

As the COVID-19 pandemic has decreased food sufficiency and increased the utilization of free food resources among working-age individuals with disabilities in the U.S., programs which provide nutrition assistance must ensure that the needs of this population are fully addressed.

Presentation

Preliminary results were presented at the Virtual Release of the Annual Disability Statistics Compendium held on February 11, 2021.

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Disclaimer

The contents of this article do not necessarily represent the views or policies of HHS, ACL, NIDILRR, HRSA, and you should not assume endorsement by the Federal Government or AUCD.

Conflicts of interest

None.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dhjo.2021.101153.

References

1. Coleman-Jensen A, Rabbot MP, Gregory CA, Singh A. Household Food Security in the United States in 2019. ERR-275. U.S. Department of Agriculture, Economic Research Service; 2020.
2. Brown KE. Domestic Food Assistance: Multiple Programs Benefit Millions of Americans but Additional Action Is Needed to Address Potential Overlap and Inefficiencies. Washington, DC: U.S. Government Accountability Office; 2015. Available https://www.gao.gov/assets/680/670313.pdf.
3. Carlson S, Keith-Jennings B, Llobrera J. Policy Brief: More Adequate SNAP Benefits Would Help Millions of Participants Better Afford Food. Washington, DC: Center on Budget and Policy Priorities; 2019. Available https://www.cbpp.org/sites/default/files/atoms/files/7-30-19a2.pdf.
4. Yaktine AL, Murphy SP. Aligning nutrition assistance programs with the Dietary Guidelines for Americans. Nutr Rev. 2013;71(9):622–630. https://doi.org/10.1111/j.1743-0843.2013.01246.x.
5. Center on Budget and Policy Priorities (CBPP). Tracking the COVID-19 Recession's Effects on Food, Housing and Employment Hardships. Washington, DC: CBPP; 2020. Available https://www.cbpp.org/research/poverty-and-inequality/tracking-the-covid-19-recessions-effects-on-food-housing-and. Accessed November 30, 2020.
6. U.S. Census Bureau. Week 14 Household Pulse Survey: September 2 – September 14. Census.Gov; 2020. Retrieved November 14, 2020 from https://www.census.gov/data/tables/2020/demo/hhp/hhp14.html.
7. Aliak J. Food Hardship during the COVID-19 Pandemic and Great Recession. Applied Economic Perspectives and Policy; 2020. https://doi.org/10.1002/aepp.13099. n/a(n/a).
8. Gundersen C, Hake M, Dewey A, Engelhard E. Food Insecurity during COVID-19. Applied Economic Perspectives And Policy. 2020. https://doi.org/10.1002/aepp.131100. n/o(n/o).
9. Gaffney AW, Himmelstein D, Bor D, McCormick D, Woolhandler S. Home sick with coronavirus symptoms: a national study. April-May 2020. J Gen Intern Med. 2020;35(11):1340–1342. https://doi.org/10.1007/s11606-020-06159-5.
10. Jones M, Hoque K, Wass V, Bacon N. Inequality and the economic cycle: disabled employees’ experience of work during the Great Recession in Britain. Br J Ind Relat. 2020. https://doi.org/10.1111/bjir.12577.
11. Kaye SH. The impact of the 2007-09 recession on workers with disabilities. Mon Labor Rev. 2010;30. October 2010.
12. Livermore G, Honeycutt D, Alang SM. Employment and economic outcomes of persons with mental illness and disability: the impact of the Great Recession in the
Brucker DL, Nord D. Food insecurity among young adults with intellectual and developmental disabilities in the United States: evidence from the National Health Interview Survey. *Am J Intellect Dev Disabil* 2016;121(6):520–532. https://doi.org/10.1016/j.ajidd.2016.04.003.

Brucker DL, Coleman-Jensen A. Food insecurity across the adult life span for persons with disabilities. *J Disabil Pol Stud*. 2017;28(2):109–118. https://doi.org/10.1177/1044207317710701.

Brucker DL, Nord D. Food insecurity among young adults with intellectual and developmental disabilities in the United States; evidence from the National Health Interview Survey. *Am J Intellect Dev Disabil.* 2016;121(6):520–532. https://doi.org/10.1016/j.ajidd.2016.04.003.

Coleman-Jensen A. Thirty Years after Enactment of the Americans with Disabilities Act, Disabilities Remain a Risk Factor for Food Insecurity. Washington, DC: USDA; 2020.

Heflin C, Altman CE, Rodriguez LL. Food insecurity and disability in the United States, 2010.1016/j.ijdhj.2018.09.006 Disability and Health Journal. 2019;12(2):220–226. Epub 2018 Oct 6.

Sonk R, Parish SL, Ghosh S, et al. Food insecurity in U.S. households that include children with disabilities. *Except Child.* 2016;83(1):42–57.

Chiu C, Brooks J, An R. Beyond food insecurity. *Br Food J.* 2016;118(11):2614–2631. https://doi.org/10.1108/BRJ-02-2016-0055.

Miewald Cl, McCann E. Foodscapes and the geographies of poverty: sustenance, strategy and politics in the urban neighborhood. *Antipode.* 2014;46(2):537–556. https://doi.org/10.1111/anti.12057.

Kessler Foundation and University of New Hampshire. National Trends in Disability Employment. Durham, NH: 2020. Available https://researchonsability.org/home/ntide.

Schwartz N, Buliung R, Wilson K. Disability and food access and insecurity: a scoping review of the literature. *Health Place.* 2019;57:107–121. https://doi.org/10.1016/j.healthplace.2019.03.011.

U.S. Bureau of Labor Statistics. *Consumer Price Index News Release.* 2021. https://www.bls.gov/news.release/cpi.htm. Accessed February 19, 2021.

Food Assistance. USA gov (n.d.) https://www.usa.gov/food-help. Accessed July 6, 2020.

USDA Increases Monthly SNAP Benefits by 40%. USDA-FNS. Retrieved November 14, 2020 https://www.fns.usda.gov/news-item/usda-022720; 2020.

March 8 CDC. Disability Impacts All of Us Infographic | CDC. Centers for Disease Control and Prevention; 2019. https://www.cdc.gov/nchdd/disabilityandhealth/infographic-disability-impacts-all.html.

The Impact of Coronavirus on Food Insecurity. Feeding America (n.d.), Retrieved July 19, 2020 https://www.feedingamerica.org/research/coronavirus-hunger-research.

U.S. Department of Health and Human Services. Implementation Guidance on Data Collection Standards for Race, Ethnicity, Sex, Primary Language, and Disability Status. Washington, DC: U. S. DHHS; 2011. Available https://aspe.hhs.gov/system/files/pdf/76331/index.pdf. Accessed October 12, 2020.

USDA. US Adult Food Security Survey Module: Three-Stage Design with Screeners. ERS; 2012a. September 2012.

USDA. US Household Food Security Survey Module: Six-Item Short Form. ERS; 2012b. September 2012.

Ward B, Myers A. America at a Glance: Unemployment Among People with Disabilities during the COVID-19 Recession. Missoula, MT: The University of Montana Rural Institute for Inclusive Communities; 2020. https://scholarworks.umt.edu/ruralinst/.

Mead D, Ransom K, Reed SB, Sager S. The Impact of the COVID-19 Pandemic on Food Price Indexes and Data Collection. Washington, DC: Bureau of Labor Statistics; 2020. Monthly Labor Review, August 2020 https://www.bls.gov/opub/mlr/2020/article/the-impact-of-the-covid-19-pandemic-on-food-price-indexes-and-data-collection.htm.

Mitra S, Palmer M, Kim H, Mont D, Groce N. Extra costs of living with a disability: a review and agenda for research. *Disability and Health Journal.* 2017;10:475–484. https://doi.org/10.1016/j.dhjo.2017.04.007.

Brucker, D.L., Mitra, S. Mitra, S., Chaitoo, N., & Mauro, J. More likely to be poor whatever the measure: working-age persons with disabilities in the United States. *Soc Sci Q,* 2017;98(1), 273-296. doi: 10.1111/sosq.12098. May 2015.

Huang D, Rosenberg DE, Simonovich SD, Belza B. Food access patterns and barriers among midlife and older adults with mobility disabilities. *Journal of Aging Research.* 2012;2090–2204. https://doi.org/10.1155/2012/231489.

Baker R, Brick M, Bates NA, et al. Summary report of the AAPOR task force on non-probability sampling. *Journal of Survey Statistics and Methodology.* 2013;1:90–143.