The SNAP Online Purchasing Pilot's Impact on Food Sufficiency During the Covid-19 Pandemic

Kyle Jones[1], Andrea Leschewski[2*], Grace Melo[3], Jordan Jones[4]

[1]PhD Student, Gatton College of Business and Economics, University of Kentucky, Lexington, KY. Kyle.Jone@uky.edu

[2]Assistant Professor, Ness School of Management and Economics, South Dakota State University, Brookings, SD. Andrea.Leschewski@sdstate.edu. (Corresponding Author).

[3] Accountability, Climate, Equity, and Scholarship (ACES) Faculty Fellow, Department of Agricultural Economics, Texas A&M, College Station, TX. gmelo@tamu.edu

[4] Research Economist, Economic Research Service, U.S. Department of Agriculture, Kansas City, MO. Jordan.Jones2@usda.gov.

*Corresponding author

[Preliminary Manuscript – Please Do Not Cite]

Selected Paper prepared for presentation at the 2022 Agricultural and Applied Economics Association Annual Meeting, Anaheim, CA, July 31-August 2, 2022

This research was supported by USDA-NIFA Hatch project 1014886.

No financial disclosures were reported by the authors of this paper.

ABSTRACT

In 2020, the SNAP Online Purchasing Pilot (OPP) was rapidly expanded to help address pandemic-induced barriers to food access among SNAP households. Exploiting variation in OPP implementation across states, we use a difference-in-difference framework to investigate the impact of the OPP on the food sufficiency of low-income households during the early stage of the COVID-19 pandemic. Results obtained using data from the Household Pulse Survey indicate SNAP OPP improved food sufficiency among low-income households during the pandemic.

INTRODUCTION

In response to the COVID-19 pandemic in the United States, the U.S. Department of Agriculture (USDA) expanded its nutrition assistance programs in several ways. One such expansion was the state-level rollout of the Supplemental Nutrition Assistance Program (SNAP) Online Purchasing Pilot (OPP) (Toossi et al., 2021). The expansion of the OPP differs from other food and nutrition policy responses in that its implementation began prior to the pandemic. The pilot was initially mandated by the 2014 Farm Bill (PL 113-79) and was intended to test the feasibility of allowing online SNAP benefit redemption for groceries. The USDA Food and Nutrition Service (FNS) selected eight pilot states and several retailers to participate, with a staggered rollout across pilot states occurring from 2019 to 2020 (USDA, 2022a; USDA, 2019). Midway through the rollout, the COVID-19 pandemic began. To help address pandemic-induced food barriers faced by SNAP households (such as suspended public transportation, concerns over viral exposure, social distancing rules, and shelter-in-place orders), FNS quickly expanded the OPP to additional states. By the end of October 2020, 45 states and the District of Columbia were participating in the OPP (Toossi et al., 2021).

Given the disproportionate adverse effects of the COVID-19 pandemic on low-income

households, it is imperative to understand the effectiveness of food and nutrition assistance policy responses in reducing food hardship. The impact of policy responses remaining in the post-pandemic period, such as the OPP, are of particular interest. Emerging literature evaluates the effectiveness of USDA pandemic policy responses. To date, studies have analyzed the effect of SNAP emergency allotments on household food insecurity (Fang et al., 2022), nutrition assistance program waivers on program participation and benefit redemption (Morris et al., 2022; Toossi et al., 2021; Vasan et al., 2021; Whaley & Anderson, 2021), and Pandemic Electronic Benefit Transfer (P-EBT) on childhood food hardship (Bauer et al., 2021; Bauer et al., 2020). The impact of the SNAP OPP expansion on household food hardship, however, has yet to be studied. Before the COVID-19 pandemic, food and nutrition assistance program administrators were considering online redemption as means to increase both participation and benefit redemption (Toossi et al., 2021; Herring, 2021). Hence, understanding how food sufficiency among low-income households was affected following the SNAP OPP expansion is critical.

The objective of this study, therefore, is to investigate how the rapid rollout of the SNAP OPP impacted the food sufficiency of low-income households in the early stage of the COVID-19 pandemic. By allowing online benefit redemptions, the OPP may have improved food sufficiency by mitigating barriers to food access. As a new policy, there is little evidence available on the pilot's impact. This study will provide critical, initial insight to policymakers on SNAP OPP's ability to reduce food hardship among low-income households and inform potential program modifications as the OPP continues to develop.

Using data from the Household Pulse Survey (HPS), we estimate the impact of the SNAP OPP on the food sufficiency of households who are income-eligible for SNAP during the critical early-pandemic period from April 2020 through July 2020 (Phase 1 of the HPS). During this

period, the majority of states adopted the OPP and families experienced significant income shocks and barriers to in-person food access due to lockdown measures, fear of contagion, and other factors (Toossi et al., 2021). Using a difference-in-difference model, we take advantage of the staggered implementation of the SNAP OPP to identify this impact.

The current study contributes to the literature on food insecurity and food assistance in three ways. First, this study provides the first estimates of the impact of the SNAP OPP on the food sufficiency of households who are income-eligible for SNAP using nationally representative data. Second, differential impacts for households with and without children are examined. Third, this study analyzes whether the OPP's impact on food sufficiency varies with the level of COVID-19 severity in a household's state of residence to account for heterogeneity in aversion to in-person shopping that could influence program use. Overall, study results provide evidence that OPP improved food sufficiency among low-income households during the early stage of the COVID-19 pandemic. Heterogeneity in OPP implementation and usage and the mechanisms of how this program influences household food hardship warrant further exploration.

The remainder of this paper is structured as follows. First, food and nutrition policy responses to the COVID-19 pandemic during 2020 are summarized. The data and economic approach employed to assess the differential impacts of the SNAP OPP are then outlined. Results and conclusions are forthcoming.

POLICY RESPONSES TO THE COVID-19 PANDEMIC

The COVID-19 pandemic onset led to an unprecedented decline in economic activity and a spike in unemployment, with disproportionate impacts on low-income households in the United States.

Rising food prices further reduced the purchasing power of the poor (Paslakis et al., 2020). The overall prevalence of food insecurity in 2020 did not increase from 2019—possibly due to expansions in food and nutrition assistance—though studies find an increase in food insufficiency during the early pandemic relative to the Great Recession (Coleman-Jensen et al., 2021; Ziliak 2021). Food access may play a role. Especially during the early pandemic, unprecedented barriers to food access emerged, including stay-at-home orders, school and facility closures, concern over contagion in public spaces, food supply chain disruptions, and transportation disruptions. In particular, low-income households with children lost access to free and reduced-price meals at school and experienced decreased nutrient intake due to school and child-care center closures (Keith-Jennings et al., 2021; Adams et al., 2020). Online grocery purchasing was one way to address these barriers, but at the time of the pandemic's onset, very few low-income households relying on nutrition assistance were able to use their benefits online.

USDA Response to the COVID-19 Pandemic

The USDA typically administers 15 food and nutrition programs which serve as a safety net to help reduce food and nutrition insecurity among low-income American households. These programs include SNAP, the Special Supplemental Nutrition Assistance Program for Women, Infants and Children (WIC), the National School Lunch Program (NSLP), and the School Breakfast Program (SBP). During the pandemic, the programs' ability to address food and nutrition insecurity was challenged by school closures, shelter-in-place orders, social distancing requirements, increasing unemployment, higher food prices, and supply chain disruptions (Toossi et al., 2021). The USDA responded with a suite of food and nutrition policy changes, including additional benefits for redemption, waivers for administrative flexibility, implementation of new programs, and expansion of existing programs (Aussenberg & Billings,

2022; Toossi et al., 2021). Accordingly, USDA spending on food and nutrition assistance reached a historic high of $122.1 billion in fiscal year 2020, up 30 percent from the previous year (Toossi et al., 2021).

The SNAP Online Purchasing Pilot (OPP)

One such policy response was to rapidly expand the SNAP Online Purchasing Pilot (OPP) beyond its original scope. The OPP was originally established by the 2014 Farm Bill (PL 113-79) to trial the online redemption of SNAP benefits before eventual nationwide adoption, required later by the 2018 Farm Bill (PL 115-334). Like in-store redemption of SNAP benefits, benefits redeemed online can only be used for non-prepared, food-at-home purchases at authorized retailers. Benefits cannot be spent on tips or fees associated with online grocery pickup or delivery. FNS selected eight initial pilot states (AL, IA, MD, NE, NJ, NY, OR, WA) and eight initial retailers (Amazon, Dash's Market, Fresh Direct, Hy-Vee Inc., Safeway, ShopRite, Walmart Stores Inc., and Wright's Markets Inc.), with a staggered rollout initially planned for 2019 to 2020 (USDA, 2022a; USDA, 2019). The OPP began in New York in April 2019, followed by Washington in January 2020, and Alabama, Oregon, and Iowa in March 2020. Several studies conducted prior to the onset of the pandemic suggest that utilization of online purchasing among SNAP participants would be limited due to low interest or perceived benefit, distrust or lack of control over the process, concerns over quality and higher cost, and/or not reaching low-access food deserts (Martinez et al., 2018; Rogus et al., 2020; Cohen et al., 2020; Brandt et al., 2019).

Midway through the initial rollout, the COVID-19 pandemic began, and a public health emergency was declared. FNS worked with states and retailers to quickly expand the SNAP OPP

Table 1. State implementation of the SNAP Online Purchasing Pilot by week of the Household Pulse Survey (Phase 1)

HPS Week	Dates	State OPP Implementation		Cumulative State OPP Implementation	
		#	%	#	%
Pre-Phase 1	4/18/19 - 4/22/20	7	14%	7	14%
Week 1	4/23/20 - 5/5/20	5	10%	12	24%
Week 2	5/7/20 - 5/12/20	2	4%	14	28%
Week 3	5/14/20 - 5/19/20	3	6%	17	34%
Week 4	5/21/20 - 5/26/20	1	2%	18	36%
Week 5	5/28/20 - 6/2/20	13	26%	31	62%
Week 6	6/4/20 - 6/9/20	5	10%	36	72%
Week 7	6/11/20 - 6/16/20	0	0%	36	72%
Week 8	6/18/20 - 6/23/20	0	0%	36	72%
Week 9	6/25/20 - 6/30/20	2	4%	38	76%
Week 10	7/2/20 - 7/7/20	1	2%	39	78%
Week 11	7/9/20 - 7/14/20	0	0%	39	78%
Week 12	7/16/20 - 7/21/20	0	0%	39	78%
Post-Phase 1	7/22/20 - 3/22/22	10	20%	49	98%

Note, State OPP implementation indicates the number or percentage of states implementing the OPP for the first time in the designated days in each HPS Phase 1 "week." States with OPP implementation between HPS weeks are included in the week immediately preceding their implementation date.

SNAP, Supplemental Nutrition Assistance Program; HPS, Household Pulse Survey; OPP, Online Purchasing Pilot

beyond its initial scope. Detailed in table 1, 5 more states began the OPP in April 2020, 16 began in May, 13 began in June, and 1 began in July. Initial retailer participation was relatively low in

2020—only 7 participated in September 2020—but in all states but two both Walmart and Amazon were available to SNAP and P-EBT recipients at the time of the program's implementation (George and Tomer, 2022b). These two retailers' combined online reach during this time period is not precisely known, but only about 7 percent of U.S. residents did not live in any of the grocery delivery areas of Walmart, Amazon, Instacart, or Uber Eats in 2021 (George and Tomer, 2022a). More retailers joined following the rollout in 2020, and by August 2021, 81 were authorized to accept SNAP benefits online (George and Tomer, 2022b).

During the early pandemic period, online purchasing using SNAP and P-EBT benefits (which were issued through the same EBT systems as SNAP and could be similarly redeemed online in participating states) expanded rapidly. In February 2020, recipients redeemed $2.9 million of these benefits online. By September 2020, $196.3 million were redeemed online, representing 2.4 percent of all SNAP and P-EBT benefits redeemed in that month (Jones, 2021). By the end of October 2020, most participating states had communicated information about OPP in some form, with 79 percent relaying information about authorized online retailers and 66 percent providing program information on the OPP at least once (Dunn et al, 2021). Utilization of online purchasing continued to grow following the initial rollout period, and online SNAP and P-EBT redemptions reached nearly $600 million by July 2021 (George and Tomer, 2022b).

While the OPP rollout is not itself an expansion in benefits, it does represent a potential expansion in the utility of benefits through improvement of food access, especially for those low-income SNAP recipients standing to benefit the most from online grocery purchasing, such as households with greater time, mobility, or transportation constraints. In the early stages of the pandemic, the expansion of the OPP may have helped recipients overcome additional barriers to food access and food security, including social distancing requirements, shelter-in-place orders,

concerns over contracting the virus through in-person shopping, reduced store hours, new time constraints such as those related to childcare, and changes to public transportation. The OPP rollout also occurred alongside other benefit expansions, which may have amplified its impacts on food access and security.

Additional USDA Food and Nutrition Policy Responses

The USDA complemented OPP expansion in 2020 with additional program modifications to address food and nutrition insecurity during the pandemic. Under the Families First Coronavirus Response Act (FFCRA), emergency allotments were provided to allow states to increase SNAP benefits to the maximum allotment for those households not already receiving the maximum. Most states began issuing emergency allotments on a monthly basis in March or April 2020. (Toossi et al., 2021). Work-related time limits on SNAP receipt by able-bodied adults without dependents were suspended, and various waivers allowing flexibility in SNAP administration were extended to states, including adjustments to interview, recertification, and reporting requirements.

The FFCRA also established P-EBT to mitigate the effect of school closures on child food security. P-EBT provides households with students with emergency nutrition benefits on an EBT card equal to the value of the free or reduced price school meals they missed due to school closures. States were approved to issue P-EBT for the spring 2020 semester and began doing so in varying distribution schedules from April through August 2020. Notably, P-EBT benefits were redeemable online in those states participating in the OPP.

Under FFCRA, the USDA also issued child nutrition program waivers to allow flexibilities in NSLP and SBP administration. Child nutrition program flexibilities provided by the waivers include the ability to provide meals in non-congregate settings, the timing of meal

distribution, and the types of food distributed (Aussenberg & Billings, 2022; USDA, 2022b). Modifications to WIC authorized by FFCRA include benefit increases and waivers allowing remote benefit issuance, remote program enrollment, and flexibility in the items included in WIC food packages (Aussenberg & Billings 2022).

Impact of USDA COVID-19 Policy Responses

A small, but growing literature examines the impact of the nutrition assistance policy responses on food hardship during the pandemic. Fang et al. (2022) find that SNAP emergency allotments did little to reduce food insecurity. Many households with the highest risk for food insecurity already received the maximum SNAP allotment and thus did not benefit from the initial expansion.

Three recent studies consider the impact of WIC waivers granted during the pandemic. Whaley and Anderson (2021) find the WIC physical presence waiver in Los Angeles County increased program certification and recertification rates by 27% and 24% from pre-pandemic levels. Similarly, Morris et al. (2022) find the physical presence waiver increased WIC certification rates in Washington state by 5% relative to 2019. Morris et al. (2022) also examined the WIC food package substitution waiver, finding that food benefit redemption increased after expansion of the WIC food list in April 2020. In a nationwide analysis of the WIC Remote Benefit Issuance Waiver, Vasan et al. (2021) find WIC Remote Benefit Issuance Waivers facilitated WIC participation during the pandemic. Results suggest states offering offline EBT reloading systems experienced decreases in WIC participation during the pandemic relative to states with online benefit issuance systems.

Initial analyses of P-EBT and child nutrition program waivers indicate these efforts eased

food hardship among school-aged children and their families during the pandemic. Bauer et al. (2020) find P-EBT lifted at least 2.7-3.9 million children out of hunger during the 2019-2020 school year. Estimates from the 2020-2021 school year indicate P-EBT reduced food insufficiency among SNAP households by 28% and reduced the share of households with children experiencing very low food security by 17% (Bauer et al., 2021). In addition to P-EBT, Toossi et al. (2021) finds child nutrition program waivers were critical in addressing children's food needs during the pandemic. During the 2019-2020 school year, waivers allowed for a nearly 800% expansion in the number of meals served by the Summer Food Service Program to compensate for disruptions to NSLP and SBP caused by school closures.

DATA

We use public-use data from the Household Pulse Survey (HPS) conducted on a near-weekly basis throughout the COVID-19 pandemic. The HPS is administered by the Census Bureau and was designed in partnership with 15 federal agencies to be a "short-turnaround instrument that provides valuable data to aid in the pandemic recovery" (US Census, 2022). Data was collected and released in multiple phases, consisting of several survey weeks each, beginning April 23, 2020. The HPS sample is nationally representative, and each survey week contains approximately 86,000 households on average. Some survey questions were added or dropped between phases. Since the aim of the survey is to understand how the pandemic and governmental responses to the pandemic have impacted households, the HPS contains many retrospective questions pertaining to employment, consumption, and health outcomes collected throughout the pandemic. However, its length as a pulse survey is limited, so it does not collect as much information as other major surveys.

We use the responses to questions on food purchases and consumption in the past seven days to understand the food sufficiency of respondent households. We focus on Phase 1, which spans 12 weeks from 23 April 2020 to 21 July 2020, as the majority of states implemented the SNAP OPP during this time period. Phase 1 uses a three-week repeated panel structure, but we do not incorporate the panel nature of the data as doing so greatly reduces the sample size. The HPS collects demographic characteristics for survey respondents like race, ethnicity, gender, educational attainment, and marital status as well as household characteristics like number of household members and children, income, and housing ownership or rentership.

We supplement the HPS data with additional datasets that account for state-level trends and policy controls. Weekly percent changes in COVID-19 cases and deaths were calculated using data aggregated from CDC, state and local-level public health agencies (USAFacts, 2022). We further include state-level controls for shelter-in-place orders along with COVID-19 cases and deaths to determine whether different risk levels when shopping in-person influence program use and therefore our results (Courtemanche et al., 2020). If an individual is in a high COVID transmission state that participates in OPP, then they may pursue online purchasing to avoid risking their health. We include data on the influence of shelter-in-place orders by manually investigating the executive orders pertaining to shelter-in-place and including their timing in our analysis. All shelter-in-place orders conclude by July 2020. The timing of initial FNS approval of state P-EBT plans is accounted for using publicly available data from USDA Food and Nutrition Service (FNS) for the 2019-2020 school year (USDA, 2022c).

Unlike later phases of the HPS, Phase 1 did not collect reported SNAP participation. Therefore, our sample of interest includes households who are income-eligible for SNAP, defined as those with income 130% or below the 2020 Federal Poverty Level (FPL)—the federal

gross income limit for SNAP eligibility (hereinafter low-income households). The HPS collects information on household income in the form of 8 income ranges. We impute households' income as a percentage of FPL by taking the midpoint of the income range and dividing by the FPL corresponding to the household's size (US DHHS, 2020).

Phase 1 of the HPS does not collect information about other more proximate outcomes of the rollout of the OPP, such as household redemption of SNAP or P-EBT benefits online or shopping for groceries online. We therefore cannot directly investigate the role of these probable mechanisms through which the OPP might improve household food access or food sufficiency.

Table 2 shows summary statistics for the 116,480 households in the analysis sample, weighted by the survey household sample weights. In the sample, 75.5% are from households who are food sufficient, measured as having enough food in the past 7 days ("Enough of the kinds of food (I/we) wanted to eat" or "Enough, but not always the kinds of food (I/we) wanted to eat"). 60% of sample households are headed by women and 65.8% are white. Over 57% are from households with a high school degree or less with 69% having less than $25,000 in annual household income. 32.3% of household heads are currently married with an average of 3.3 adults and 1.05 children in the household. The majority of sample households are renters (53.3%).

EMPIRICAL MODEL

We estimate the impact of the SNAP OPP expansion on food sufficiency among low-income households during the early stage of the COVID-19 pandemic by exploiting policy variation across week and state using the following two-way fixed-effects difference-in-differences method:

$$FoodSuf_{isw} = \alpha_0 + \alpha_1 OPP_{sw} + X_{isw}'\beta + \gamma_s + \delta_w + \varepsilon_{isw}$$

Table 2. Sample Summary Statistics (N=116,480)

	Obs.	Mean	Std. Dev.	Min	Max
Food Sufficiency	116,480	0.75	0.43	0	1
Female	116,480	0.60	0.49	0	1
White	116,480	0.66	0.47	0	1
Black	116,480	0.20	0.40	0	1
Asian	116,480	0.05	0.22	0	1
Other Race	116,480	0.09	0.29	0	1
Hispanic	116,480	0.22	0.41	0	1
Less than HS	116,480	0.05	0.22	0	1
Some HS	116,480	0.11	0.32	0	1
HS Degree	116,480	0.41	0.49	0	1
Some College	116,480	0.23	0.42	0	1
Assoc. Degree	116,480	0.08	0.28	0	1
Bach. Degree	116,480	0.07	0.26	0	1
Grad. Degree	116,480	0.03	0.18	0	1
Married	116,215	0.32	0.47	0	1
Widowed	116,215	0.06	0.24	0	1
Divorced	116,215	0.18	0.38	0	1
Separated	116,215	0.04	0.21	0	1
Never Married	116,215	0.39	0.49	0	1
Less than $25k	116,480	0.69	0.46	0	1
$25k to $35k	116,480	0.21	0.41	0	1
$35k to $50k	116,480	0.07	0.26	0	1
$50k to $75k	116,480	0.03	0.17	0	1
Num. in HH	116,480	4.35	2.60	1	10
Kids in HH	116,480	1.05	1.39	0	5
Adults in HH	116,480	3.30	2.32	1	10
Employed	116,369	0.36	0.48	0	1
Own Free & Clear	116,043	0.19	0.39	0	1
Own w/ Mortgage	116,043	0.24	0.43	0	1
Renter	116,043	0.53	0.50	0	1
No Housing Payment	116,043	0.04	0.20	0	1

Obs., Observations; Std. Dev., Standard Deviation; Min, Minimum; Max, Maximum; HS, High School; Assoc., Associate's; Bach., Bachelor's; Grad, Graduate; HH, Household

Here, $FoodSuf_{isw}$ is an indicator for food sufficiency with 1 indicating having enough food to eat in the past seven days in household *i*, state *s*, and survey week *w*. Specifically, $FoodSuf_{isw}$ is

equal to 1 if a household reports having "Enough of the kinds of food (I/we) wanted to eat" or "Enough, but not always the kinds of food (I/we) wanted to eat", and it is equal to 0 if a household reports having "Sometimes not enough to eat" or "Often not enough to eat." OPP_{sw} is an indicator for the household being in a state *s* in which the OPP is in operation seven days prior to the beginning of collection week *w* or earlier. This term can be thought of as the difference-in-differences interaction term in the canonical difference-in-differences method. Because we lack a way to incorporate information on SNAP participation or household online redemption of benefits, our estimate of α_1 represents an intention-to-treat (ITT) effect.

X_{isw} is a vector of controls which are broken-down into household-level and state-level controls. The household-level controls include indicators for race and ethnicity groups, respondent's educational attainment, marital status, household income levels, homeownership or rentership status, and status of housing payment along with continuous controls for the number of adults and the number of children in the household. State-level controls include indicators for state *s* having a shelter-in-place order active, state *s* receiving initial approval for (P-EBT), and percent changes in COVID-19 cases and deaths across the last seven days for week *w*. γ_s are state fixed effects, and δ_w are week fixed effects. Standard errors are clustered at the state level due to appropriate clustering at the highest level of treatment aggregation and the regressions are weighted using the sampling weights (Angrist and Pischke, 2009; Solon et al., 2015). The coefficient of interest is α_1, which estimates the impact of the policy on treated household's food sufficiency; a positive estimate indicates the SNAP OPP increases food sufficiency for the household.

The difference-in-differences method relies on the identifying assumption that treated states have similar trends to control households in the absence of treatment (Angrist and Pischke,

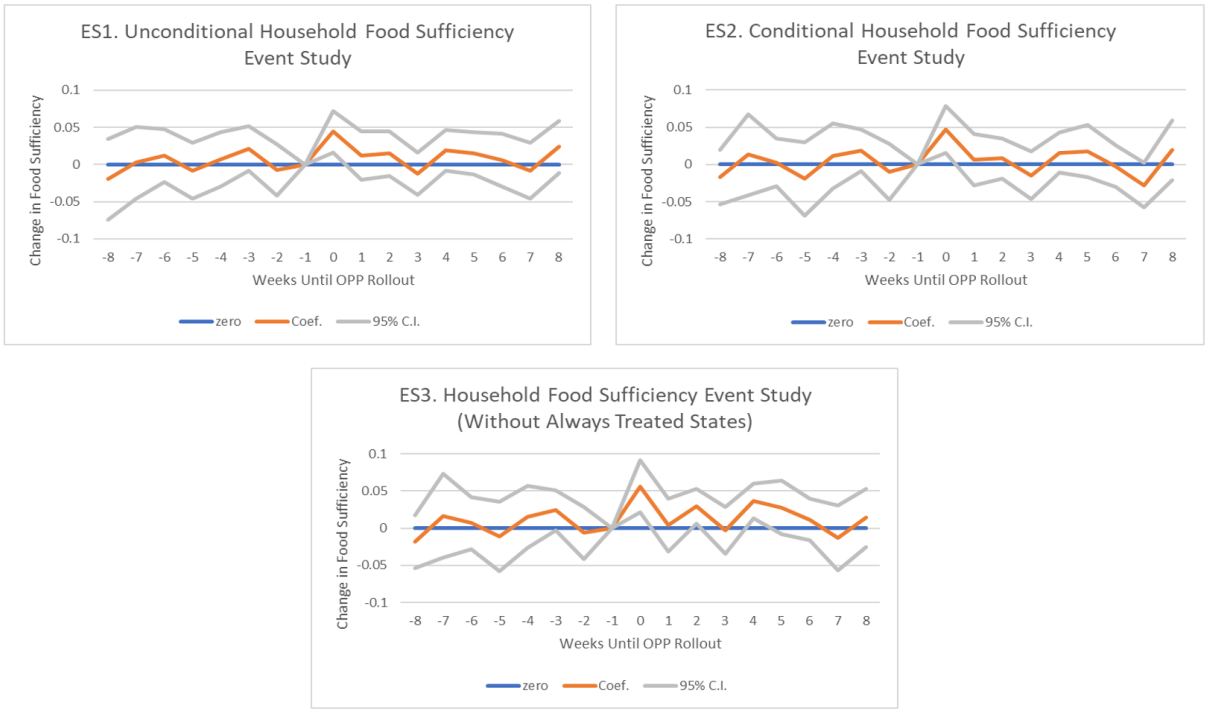

Figure 1. Household Food Sufficiency Event Studies (N=116,480)

2009). In the context of this study, we would need common trends in food sufficiency between control and treated households in the absence of treatment. Since we do not have true counterfactuals over the whole period, we rely on a pre-trend analysis to evaluate the identifying assumption. After the conditional event study (ES2), shown in figure 1, the pre-treatment periods are not showing much of a trend while there is a discrete jump after treatment, so common trends appear to be occurring in the absence of treatment.[1]

While this event study shows no worrisome pre-trends, the treatment does not seem particularly significant outside of immediate effects. The after-treatment effects seem more significant and stable when the always treated group is removed from the event study (ES3).[2]

[1] ES1 shows the unconditional household food sufficiency event study.
[2] This may mean that there is attenuation coming from including this group.

Modeling Choices[3]

The Census Bureau initially set up the HPS as a repeated panel that collects responses for three weeks from each household. However, the repeat response rate was very low in Phase 1, and Census simply collected the successive phases as repeated cross-sections. Because of the low response rate, our analyses treat the weeks in Phase 1 as repeated cross-sections.

Our difference-in-differences design requires consideration of the timing of the treatment—the operation of the OPP in a state—in relation to the outcome—respondents' recollection of food sufficiency over the seven days prior to interview date, which falls on an unknown day within the date range of the corresponding HPS week. In our regressions, we consider the OPP as being in place when the date of OPP implementation is at least seven days before the first day of the week's collection period. This approach ensures the OPP is in operation over the seven days of respondents' food sufficiency recall regardless of when any given respondent is actually interviewed within a HPS week. We treat approval of a state's P-EBT plan similarly in our main model's controls.

RESULTS

Results are forthcoming.

DISCUSSION AND CONCLUSIONS

Discussion and conclusions are forthcoming.

[3] We use a linear model with a binary dependent variable, known as a linear probability model, for ease of computation and interpretation of the results. While a nonlinear model may have a better fit than a linear model, interpreting the results is more feasible and the fit would matter less for the marginal effects. (Angrist and Pischke, 2009)

REFERENCES

Adams, Elizabeth L., Laura J. Caccavale, Danyel Smith, and Melanie K. Bean. 2020. "Food insecurity, the home food environment, and parent feeding practices in the era of COVID-19." *Obesity* 28(11):2056-63.

Angrist, Joshua, and Jörn-Steffen Pischke. 2009. *Mostly Harmless Econometrics*. Princeton and Oxford: Princeton University Press.

Aussenberg, Randy A., and Kara C. Billings. 2022. *USDA Nutrition Assistance Programs: Response to the COVID-19 Pandemic*. R46681. Washington, DC: Congressional Research Service.

Bauer, Lauren, Abigail Pitts, Krista Ruffini, and Diane Whitmore Schanzenbach. 2020. *The Effect of Pandemic EBT on Measures of Food Hardship.* Washington, DC: Brookings Institution, The Hamilton Project.

Bauer, Lauren, Krista Ruffini, and Diane Whitmore Schanzenbach. 2021. *An Update on the Effect of Pandemic EBT on Measures of Food Hardship*. Washington, DC: Brookings Institution, The Hamilton Project.

Brandt, Eric J., David M. Silvestri, Jerold R. Mande, Margaret L. Holland, and Joseph S. Ross. 2019. "Availability of grocery delivery to food deserts in states participating in the Online Purchase Pilot." *Journal of American Medicine Network Open* 2(12):e1916444.

Cloyne, James, Clodomiro Ferreira, and Paolo Surico. 2020. "Monetary policy when households have debt: new evidence on the transmission mechanism." *The Review of Economic Studies* 87(1): 102-29.

Cohen, Nevin, Katherine T. Fraser, Chloe Arnow, Michelle Mulcahy, and Christophe Hille. 2020. "Online grocery shopping by NYC public housing residents using Supplemental

Nutrition Assistance Program (SNAP) benefits: a service ecosystems perspective." *Sustainability* 12(11): 4694.

Coleman-Jensen, Alisha, Matthew P. Rabbitt, Christian A. Gregory, Anita Singh. 2021. *Household Food Security in the United States in 2020*. ERR-298. Washington, DC: United States Department of Agriculture, Economic Research Service.

Courtemanche, Charles, Joseph Garuccio, Anh Le, Joshua Pinkston, and Aaron Yelowitz. 2020. "Strong social distancing measures in the United States reduced the COVID-19 growth rate." *Health Affairs* 39(7): 1237-46.

Cunningham, Scott. 2021. "Twoway Fixed Effects with Differential Timing." In *Causal Inference: The Mixtape*, 461-508. New Haven and London: Yale University Press.

Dunn, Caroline G., Calli Bianchi, Sheila Fleischhacker, and Sara N. Bleich. 2021. "Nationwide Assessment of SNAP Online Purchasing Pilot State Communication Efforts During the COVID-19 Pandemic." *Journal of Nutrition Education and Behavior* (53)11:931-37.

Fang, Di, Michael R. Thomsen, Rodolfo M. Nayga, and Wei Yang. 2022. "Food insecurity during the COVID-19 pandemic: evidence from a survey of low-income Americans." *Food Security* 14(1): 165-83.

George, Caroline, and Adie Tomer. 2022a. *Delivering to deserts: New data reveals the geography of digital access to food in the U.S.* Washington, DC: Brookings Institution, Brookings Metro.

George, Caroline, and Adie Tomer. 2022b. *The potential—and pitfalls—of the digitalization of America's food system*. Washington, DC: Brookings Institution, Brookings Metro.

Goodman-Bacon, Andrew. 2021. "Difference-in-differences with variation in treatment timing." *Journal of Econometrics* 225(2): 245-77.

Herring, Amy. 2021. *WIC Supports Online Ordering and Transactions in WIC*. Washington DC, United States Department of Agriculture, Food and Nutrition Service.

Jones, Jordan W. 2021. *COVID-19 Working Paper: Supplemental Nutrition Assistance Program and Pandemic Electronic Benefit Transfer Redemptions during the Coronavirus Pandemic.* AP-089. Kansas City MO: United States Department of Agriculture, Economic Research Service.

Keith-Jennings, Brynne, Catlin Nchako, and Joseph Llobrera. 2021. *Number of Families Struggling to Afford Food Rose Steeply in Pandemic and Remains High, Especially Among Children and Households of Color*. Washington DC: Center on Budget and Plicy Priorities.

Martinez, Olivia, Barbara Tagliaferro, Noemi Rodriguez, Jessica Athens, Courtney Abrams, and Brian Elbel. 2018. "EBT payment for online grocery orders: a mixed-methods study to understand its uptake among SNAP recipients and the barriers to and motivators for its use." *Journal of Nutrition Education and Behavior* 50(4): 396-402.

Morris Evelyn J., Emilee L. Quinn, Chelsea M. Rose, Marie Spiker, Jean O'Leary J, and Jennifer J. Otten. 2022. "Insights from Washington State's COVID-19 response: A mixed-methods evaluation of WIC remote services and expanded food options using the RE-AIM framework." *Journal of the Academy of Nutrition and Dietetics* (In Press - Available Online March 23, 2022).

Paslakis, Georgios, Gina Dimitropoulos, and Debra K. Katzman. 2021. "A call to action to address COVID-19–induced global food insecurity to prevent hunger, malnutrition, and eating pathology." *Nutrition Reviews* 79(1):114-16.

Rogus, Stephanie, Joanne F. Guthrie, Mihai Niculescu, and Lisa Mancino. 2020. "Online grocery shopping knowledge, attitudes, and behaviors among SNAP participants." *Journal of*

Nutrition Education and Behavior 52(5): 539-45.

Solon, Gary, Steven J. Haider, and Jeffrey Wooldridge. 2015. "What Are we weighting for?" *Journal of Human Resources* 50(2): 301-16.

Toossi, Saied, Jordan W. Jones, and Leslie Hodges. 2021. *The Food and Nutrition Assistance Landscape: Fiscal Year 2020 Annual Report*. EIB 227. Kansas City MO: United States Department of Agriculture, Economic Research Service.

United States Census Bureau. 2022. Measuring Household Experiences during the Coronavirus Pandemic. https://www.census.gov/data/experimental-data-products/household-pulse-survey.html (accessed May 6, 2022).

United States Department of Agriculture, Food and Nutrition Service. 2022a. Stores Accepting SNAP Online. https://www.fns.usda.gov/snap/online-purchasing-pilot (accessed May 6, 2022).

United States Department of Agriculture, Food and Nutrition Service. 2022b. FNS Responds to COVID-19. https://www.fns.usda.gov/coronavirus (accessed May 6, 2022).

United States Department of Agriculture, Food and Nutrition Service. 2022c. SY 2019-2020 P-EBT State Participation. https://www.fns.usda.gov/snap/sy-2019-2020-pebt-state-participation (accessed May 6, 2022).

United States Department of Agriculture, Food and Nutrition Service. 2019. USDA Launches SNAP Online Purchasing Pilot. Press Release No. FNS 0003.19. https://www.fns.usda.gov /pressrelease/2019/fns-000319 (accessed May 6, 2022).

United States Department of Health and Human Services, Office of the Secretary. 2020. "Annual update of the HHS Poverty Guidelines." *Federal Register* 85: 3,060-61.

USAFacts. 2022. US COVID-19 Cases and Deaths by State. https://usafacts.org/visualizations/

coronavirus-covid-19-spread-map/ (accessed May 6, 2022).

Vasan, Aditi, Chen C. Kenyon, Christina A. Roberto, Alexander G. Fiks, and Atheendar S. Venkataramani. 2021. “Association of remote vs in-person benefit delivery with WIC participation during the COVID-19 pandemic.” *JAMA* 326(15):1531-33.

Whaley, Shannon E., and Christopher E. Anderson. 2021. “The importance of federal waivers and technology in ensuring access to WIC during COVID-19.” *American Journal of Public Health* 111(6):1009-12.

Ziliak, James P. 2021. “Food hardship during the COVID-19 Pandemic and Great Recession.” *Applied Economic Perspectives and Policy* 43(1):132-52.