ONLINE APPENDIX

Targeting, Screening, and Retention: Evidence from the Supplemental Nutrition Assistance Program in California

A   Enrollment durations

Appendix Figure 1 provides additional evidence that individuals exit SNAP in the month a report is due. I plot the share of cases that remain enrolled through each month after initial enrollment up to 24 months. Again, I consider these patterns before and after the 2013 reform. In either case, after 2013, roughly 40 percent of SNAP recipients exit by six months, and almost 65 percent exit by 12 months. Notably, the share of individuals who exit by six months is fairly similar before and after the 2013 reform. Indeed, the share of cases that exited at three months before the reform appear to now remain enrolled up to six months.

Appendix Figure 2 summarizes differences in exit rates for each enrollment duration.[1] Conditional on remaining enrolled for six months, when the first semi-annual report is due, the average household has a more than one-in-five chance of exiting the program in that month. The likelihood of exiting at month 12 is 18.8 percent. Conditional on remaining enrolled until month 18 and month 24, the probability of exiting are both approximately 10 percent.

Appendix Figure 3 identifies the share of cases who exit SNAP at three, six, or twelve months after enrolling by each month since 2005, providing additional evidence that the 2013 reform increased the share of cases that remain enrolled through six months and decreased the share who exited after only three. The severe drop off in the share of cases that enrolled in late 2019 and exited at 6 months is due to the temporary pause on recertifications after the onset of the Covid-19 pandemic. We observe a corresponding jump in the share of cases that exited at 12 months; the cases that would have exited at 6 months stayed enrolled until recertifications restarted at the end of the year.

Appendix Figure 3 identifies the share of cases who exit SNAP at three, six, or twelve months after enrolling by each month since 2005, providing additional evidence that the 2013 reform increased the share of cases that remain enrolled through six months and decreased the share who exited after only three.

Appendix Figure 4 reports the share of individuals who exited SNAP at some point between 2014 and 2020, but returned to the program within six different timelines. From 2014 onward, on average, 10 and 18 percent of individuals who exited SNAP re-enrolled within one and three months, respectively.

B   Unearned income

I use SNAP Quality Control files (produced for USDA and made publicly available by Mathematica), as well as San Francisco case records, to study whether my inability to observe unearned income – like child support payments, Social Security benefits, and unemployment insurance – in my CDSS data risks my over-

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[1]To identify the per-month hazard rates, I estimate a logistic regression, in which the dependent variable is an indicator for exit and independent variables are vector of dummies α, representing each enrollment period ($d = 1, \ldots, D$), as well as controls for month and year ϕ, county θ, and household type η fixed effects. I cluster standard errors at the person-spell level. Estimating these hazard rates is computationally intensive, so I use a five percent sample of all spells. I restrict to cases that began after 2013 so as to focus on enrollment patterns under current reporting policy. I convert the estimated coefficients from this regression into the predicted probability of exit for each covariate, including each level of d. These are the estimates reported in Appendix Figure 2.

stating the share of exiting households that are eligible for SNAP. The SNAP QC data are based on surveys of randomly selected households enrolled in SNAP; these surveys are administered to ensure that states and counties are providing enrolled households with appropriate benefit amounts and not delivering assistance to ineligible households. The files contain highly detailed data on all household members' economic circumstances and demographic characteristics between FY 2013 and FY 2018. The San Francisco data includes case-level information on earned and unearned income, household composition, and benefits amounts every month between June 2016 and June 2019 (inclusive) for all cases active in those months. I use these data to document the total unearned income for each case.

Most enrolled households receive unearned income. In both datasets, approximately 60 percent of households report receiving some form of unearned income. The average amount received among all households is similar in both datasets: about $400 each month. If I condition on receiving any unearned income, the average increases to $600 for households in the SNAP QC data and $800 in the San Francisco data.

As expected, the likelihood of receiving unearned income, and the amount of unearned income that they receive, varies significantly by household type. For example, households with seniors (65+) are much more likely to report receiving unearned income and have higher average unearned income. Only 30 percent of households with earned income receive any unearned income. The average monthly unearned income among households with both earned and unearned income is about $500.

In Appendix Figure 7, I present the distribution of unearned income for four household types: those with and without seniors, and those with some or no earned income. Few households report receiving unearned income above $2,500 in a month. Both data sources exhibit similar patterns. In both, the share of households with monthly unearned income above $1,000 is small. Only households with seniors tend to have unearned income above $1,000. And for households with earned income, the share receiving significant unearned income is low. Households with earned income that approaches their eligibility thresholds are unlikely to receive unearned income, and households receiving significant unearned income generally do not have earned income. Households with the highest unearned income still report receiving amounts that suggest they would be eligible for SNAP. Together, this evidence suggests that even if I could observe each household's unearned income, most households would remain income eligible.

I pursue one final exercise to make this point clear. I identify the average total unearned income for each of 128 different household types in each year. I group households according to monthly earned income (four bins of $0, $0 to $1,000, $1,000 to $2,000, and $2,000+), number of adults (0, 1, 2, 3+), number of children (0, 1, 2, 3+), and the presence of seniors. I group cases observed in the full SNAP data into the same household types. I assign the average unearned income data observed in the SNAP QC files to the corresponding household types in the SNAP data. I add each households' earned income to this simulated average unearned income, and re-calculate whether they appear income ineligible. This results in a negligible change in the average eligibility rate among leavers.

Though I find that average reported unearned income among SNAP recipients is low, suggesting it might not affect my measure of how many exiting households are still eligible for SNAP, I am unable to observe unearned income after a household leaves the program in either the SF case data or the SNAP QC files. Both only contain information for households while they're enrolled. It's possible that households leave SNAP due to an anticipated or unobserved increase in unearned income.

I study the relevance of this using the Survey of Income and Program Participation (SIPP), a nationally representative panel survey of several thousand households interviewed every few months over a three to four year period. Respondents are asked to recall their individual- and household-level earned income and

unearned income, as well as the income support programs in which they're enrolled, for the month they're surveyed as well as the three previous months. I use the 1996, 2001, 2004, and 2008 panels of the SIPP, spanning 1996 through 2013. I estimate the same model as in Section 4.3. Here, I study how reported earnings and unearned income changes each month relative to when households report first enrolling in SNAP. I restrict to households that ever enrolled in SNAP. I exclude households that are already enrolled in SNAP in the first month of their respective panel, since I cannot be sure how long they have been enrolled. I also exclude households that drop out of the survey but then return. Among the remaining households, I identify the first month that a household reports enrolling in SNAP, and I identify their total household earned and unearned income for 8 months before and 16 after that month. I then regress the amount of earned and unearned income on dummies for month relative to that initial enrollment month, controlling for household type, state, and year fixed effects. I interact these month dummies with indicators for spell length. I plot the coefficients, which identify the relative change in earnings relative to the start of enrollment, for each month in the figures below.

Changes in reported earned income exhibit a similar pattern to those in the administrative data; enrollment starts when earnings fall, and earnings recovers at different rates depending on how long the household remains enrolled. However, I find no such pattern for unearned income. On average, neither initial enrollment nor program exit correspond with a change in unearned income. Reported unearned income remains fairly constant among these households before, during and after SNAP enrollment.

My inability to observe unearned income for households enrolled in SNAP does not risk my significantly overstating SNAP eligibility among those who exit. Average unearned income is low for households with earnings, meaning add households' true unearned income to their earnings is unlikely to push many into ineligibility. The average amount of unearned income received by households without earnings would still qualify most for the program, and households who leave SNAP do not exhibit significant changes in unearned income.

C   Food insecurity in the Current Population Survey

I impute predicted food insecurity using the Current Population Survey (CPS) December Food Security Supplement (FSS). This survey, administered every December alongside the monthly CPS, gathers information on a range of food security-related questions for more than 50,000 households each year. USDA uses their responses to identify whether the household is food insecure. I measure likelihood of food insecurity for different household types and demographic characteristics. I then create predicted measures of food insecurity for all possible combinations of variables observable in both the CPS and our CDSS data, and assign these rates to our SNAP households.

C.1   Measuring food insecurity

I collect individual-level data from the December CPS as well as the Food Security Supplement for the years 2005 to 2021 (the most recent year for which this data is available). The monthly CPS includes a range of detailed demographic data on all individuals residing in households included in the survey, including age, race, sex, education level, employment status and marital status for all individuals. All households included in the basic CPS for the month of December are eligible to be included for the Food Security Supplement. There is an initial screening for households with incomes in excess of 185 percent of the Federal Poverty

Line. For households above this threshold, if they do not respond affirmatively to any questions that suggest possible food insecurity, they are removed from the Food Security Supplement sample. On average, approximately 80 percent of households are administered the full FSS panel of questions each December.

In order to construct a measure of food insecurity, the FSS asks households a range of questions regarding residents' access to food, including their ability to pay for food and whether individuals had to restrict meal sizes or substitute types of foods due to financial constraints. Using responses to these individual questions, a measure of food insecurity is then constructed ranging from "not food insecure" to "very food insecure." Appendix Table 2 presents the distribution of households included in our sample across this food security measure. Households that are food insecure are categorized as having either "low" or "very low" food security. Both low and very low food security households experienced periods of time during the past year where they were forced to reduce the quality or variety of their diets; very low food security households additionally experienced reduced quantities of food intake at some point during the year.

Using the measure reported above, I classify all households as either (1) not food insecure if they report being food secure or (2) food insecure if they report being either low food security or very low food security. In Appendix Table 3 below, I present summary statistics for this binary food insecurity measure by demographic and household composition characteristics.

C.2 Likelihood of food insecurity

Using the individual level data described above, I restrict the sample to individuals with non-missing values for age, race, and sex. With this sample, I estimate logit regression specified below.

$$\Pr(Y_i = 1) = \beta_0 + \beta_1 \text{Race}_i + \beta_2(\text{Sex}_i \times \text{Age}_i \times \text{Adults}_i \times \text{Children}_i) + \theta_y + \varepsilon_i$$

I discretize age into four bins: 0-17, 18-34, 35-60, and 60 and older. The number of adults is a dummy variable for whether there's one or more than one adult in the household. The number of children is a factor variable indicating whether there are 0, 1, or 2 or more children residing in a given household. *Race* is a factor variable with five levels corresponding to whether a given observation identifies as white, black, Hispanic, Asian or Pacific Islander, or Native American. θ captures average differences in food insecurity rates across years across all individuals. Since the CPS is designed to be representative at both the state and national level, I estimate variations of the model above for both the US as a whole and California specifically. Finally, I make use of the earnings data reported in the Outgoing Rotation Group (ORG) sub-sample to construct a measure of household monthly earned income and include a binned version of this measure in the specifications described above. In specifications making using of earnings data from the ORG sub-sample of households, income is banned in $500 increments, with levels included for both ORG households reporting zero dollars in earned income and households that were not included in the ORG.

Using the estimated coefficients from this model, I identify the predicted level of food insecurity for all combinations of these variables. Not all such combinations of demographic characteristics are present in the observed data, so prior to generating predicted values I expand our data set such that all possible demographic combinations are included and then I generate the predicted values.

Appendix Table 3 reports summary statistics for each of these measures as well as a detailed description of the sample that is included in each specification. Appendix Figure 9 below displays the distribution of predicted food insecurity by race, and number of adults and number of children in the CPS household.

Appendix Figure 1: Survival rates for SNAP recipients up to 24 months after enrollment
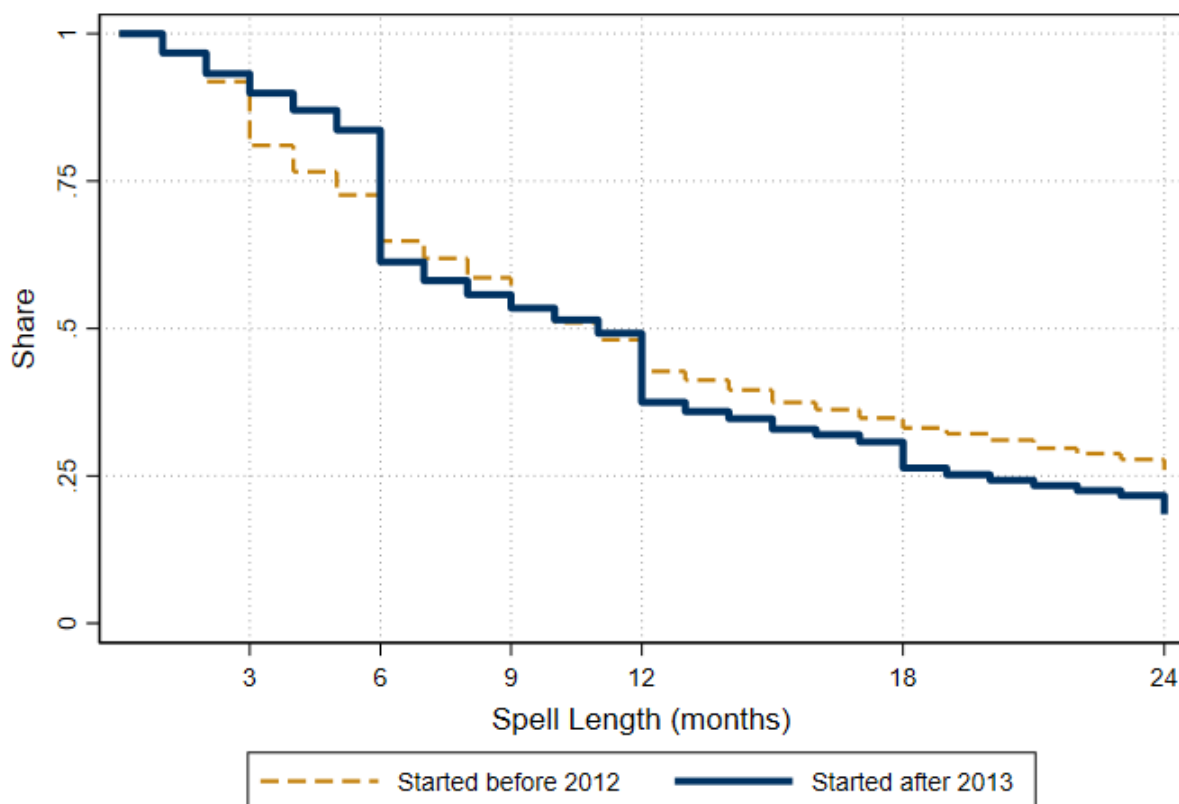
Notes. Appendix Figure 1 illustrates the share of recipients who remain enrolled in SNAP each month after their enrollment begins, up to 24 months. Again, I consider these patterns before and after the 2013 reform. The largest drops in participation occur in reporting months. Since 2013, around 40 percent of households leave SNAP within six months after enrolling. The difference in retention rates between the pre- and post-reform periods suggest that individuals will generally remain enrolled in SNAP until they are required to recertify. Filling in one month gaps in participation does not dramatically change these results, suggesting that low retention is neither a data issue nor a function of short breaks in enrollment.

Appendix Figure 2: Hazard rates of program exit by enrollment duration
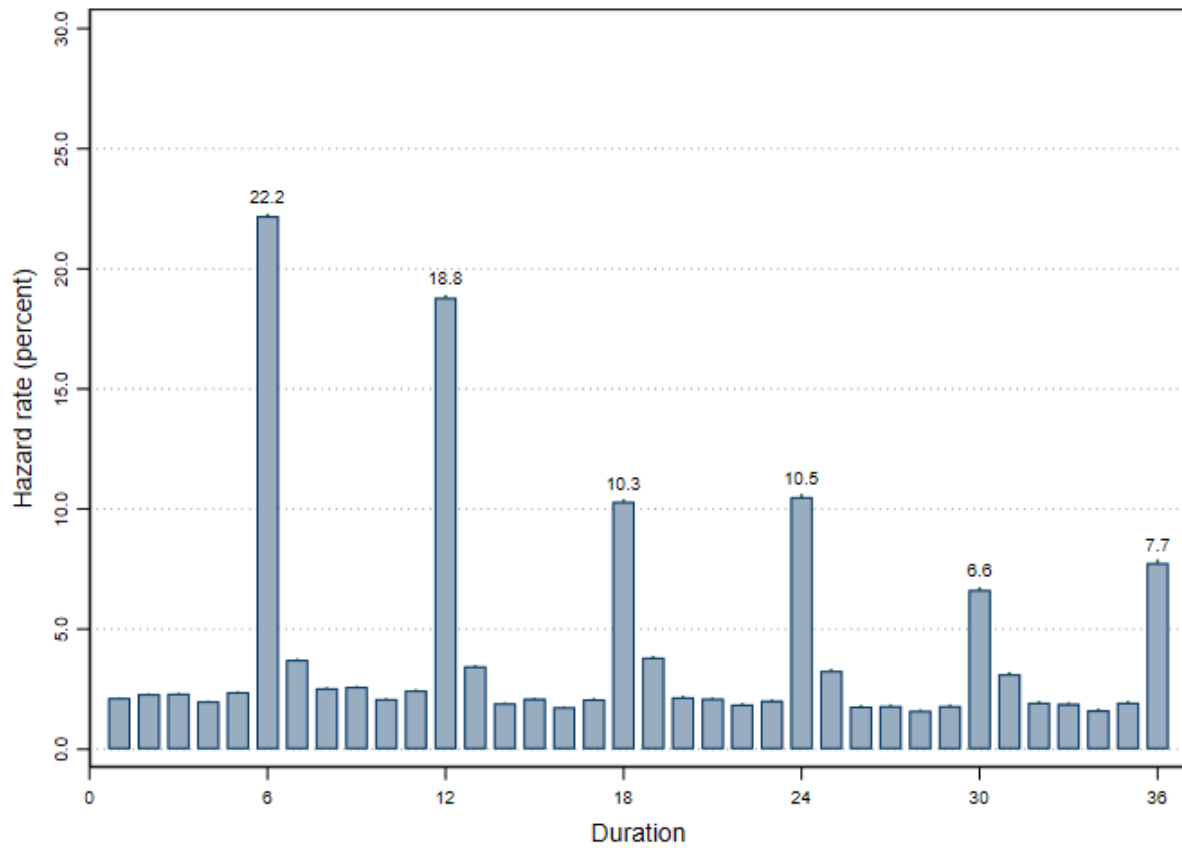
Notes. Appendix Figure 2 reports the hazard rates by enrollment month, or the likelihood that any given person will leave SNAP in that month conditional on remaining enrolled up to that month. Refer to Appendix A for more information about the estimation procedure.

Appendix Figure 3: Share of new cases who exit at three, six and twelve months after enrolling, Feb 2005 - Jan 2021
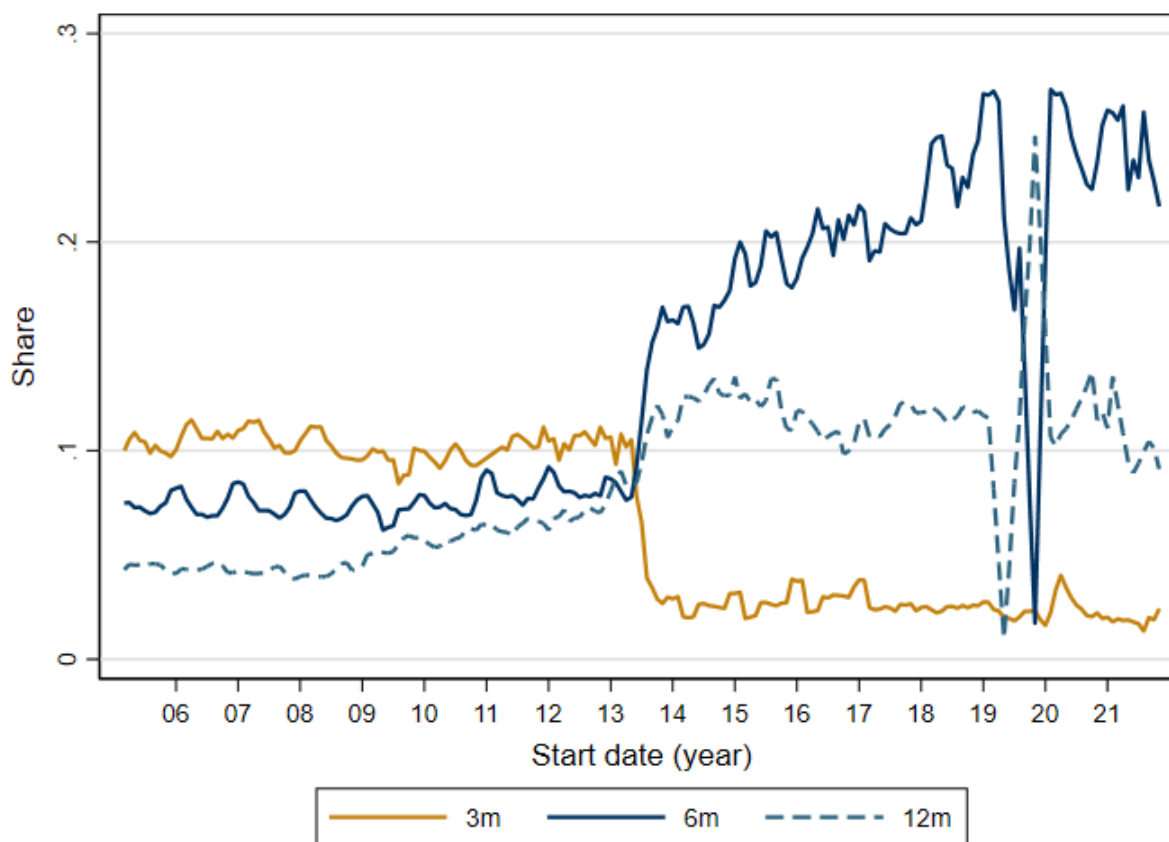
Notes. Appendix Figure 3 illustrates the rolling three-month average of the individuals who will exit in the 3rd, 6th, or 12th month after they enroll, over the first month of their enrollment. The transition to semi-annual reporting in 2013 resulted in many fewer cases leaving after three months, and many more leaving at six. The share leaving at twelve months also grew. As the economy improved since 2013, the share of cases exiting at six months also trended upward.

Appendix Figure 4: Share of cases that reenter SNAP by five different timelines over exit dates
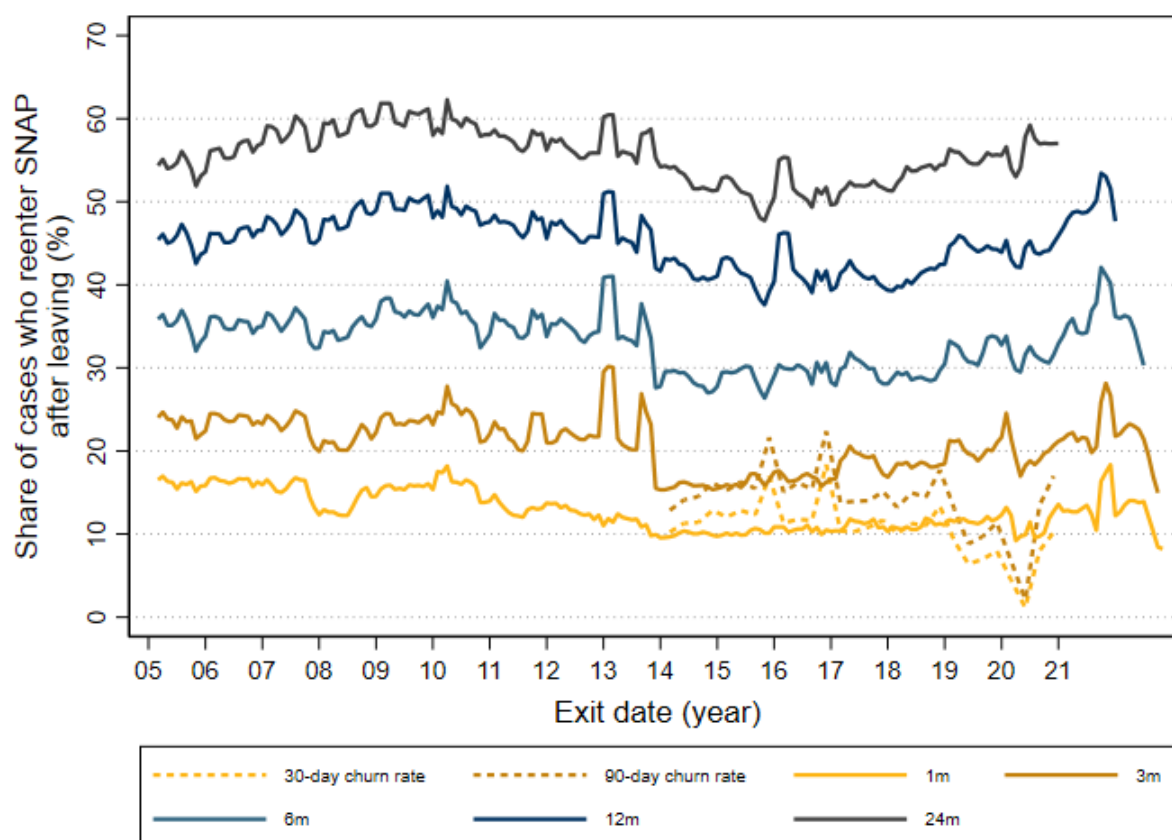
Notes. Appendix Figure 4 plots the share of cases ending in each month who re-enroll within each of the identified timelines. I calculate these reentry measures in three steps. First, I count the number of instances in which an individual re-enrolls in SNAP within 1, 3, 6, 12, 18 or 24 months after exiting. Next, I count the number of enrollment spells that ended with enough time such that I can observe reentry within the relevant timeline. I measure the share of reentries within each timeline by dividing the first count by the second. For clarity, the trend lines reported here represent the three-month moving average over each year-month. There is a mechanical relationship among these trends: a one-month reentry also qualifies as reentry within 24 months, meaning that spikes and dips will reverberate upward.

Appendix Figure 5: Distribution of total enrollment lengths by enrollees' age
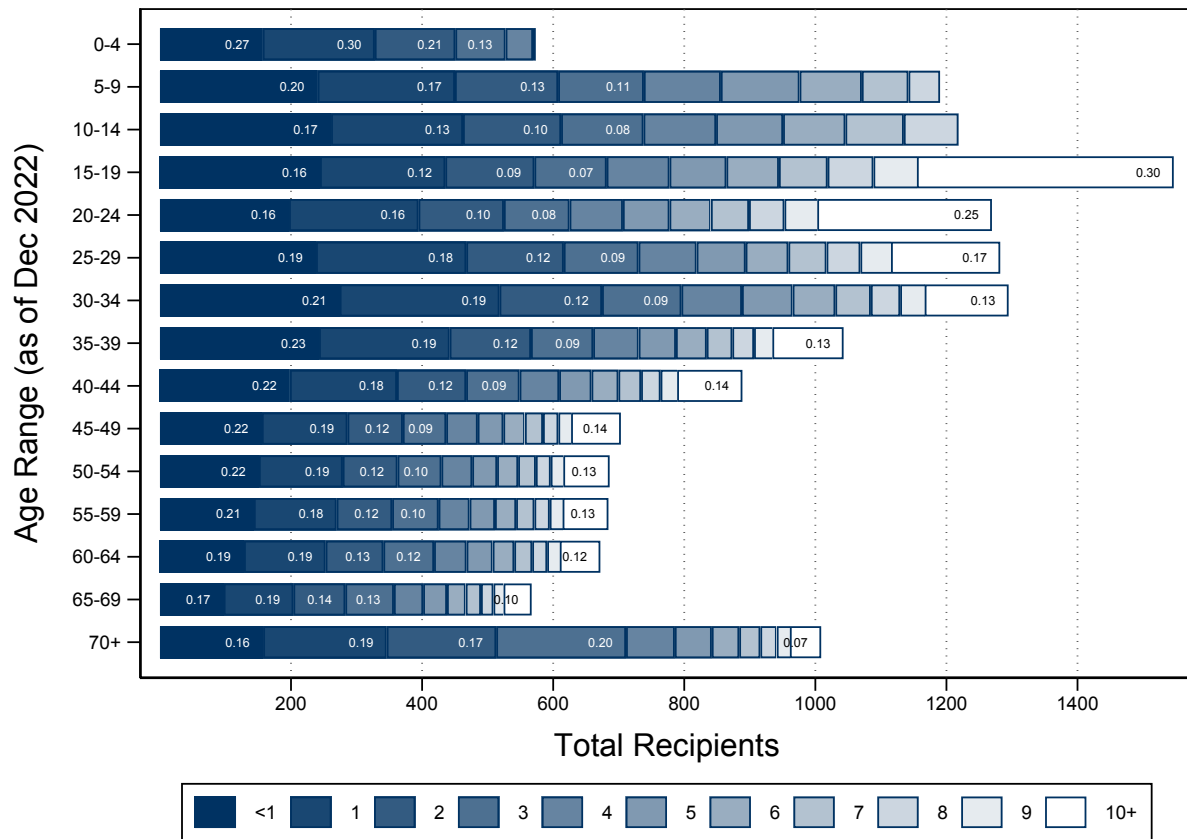
Notes. Appendix Figure 5 summarizes distribution of total enrollment durations by enrollees' age as of December 2022. Total enrollment durations are measured by summing the total months enrolled between January 2005 and March 2023, and then collapsing that number to total number of years. I then count the number of unique recipients enrolled for less than a year up to 18 years by specified age bins. The shares reported within bars represent the share of total recipients within each age bin that were enrolled for less than a year, at least one year, at least two years, and so on.

Appendix Figure 6: Average quarterly earnings and SNAP eligibility before, during, and after SNAP enrollment by spell length without restriction on whether cases return to SNAP

(a) Average earnings

(b) Eligibility
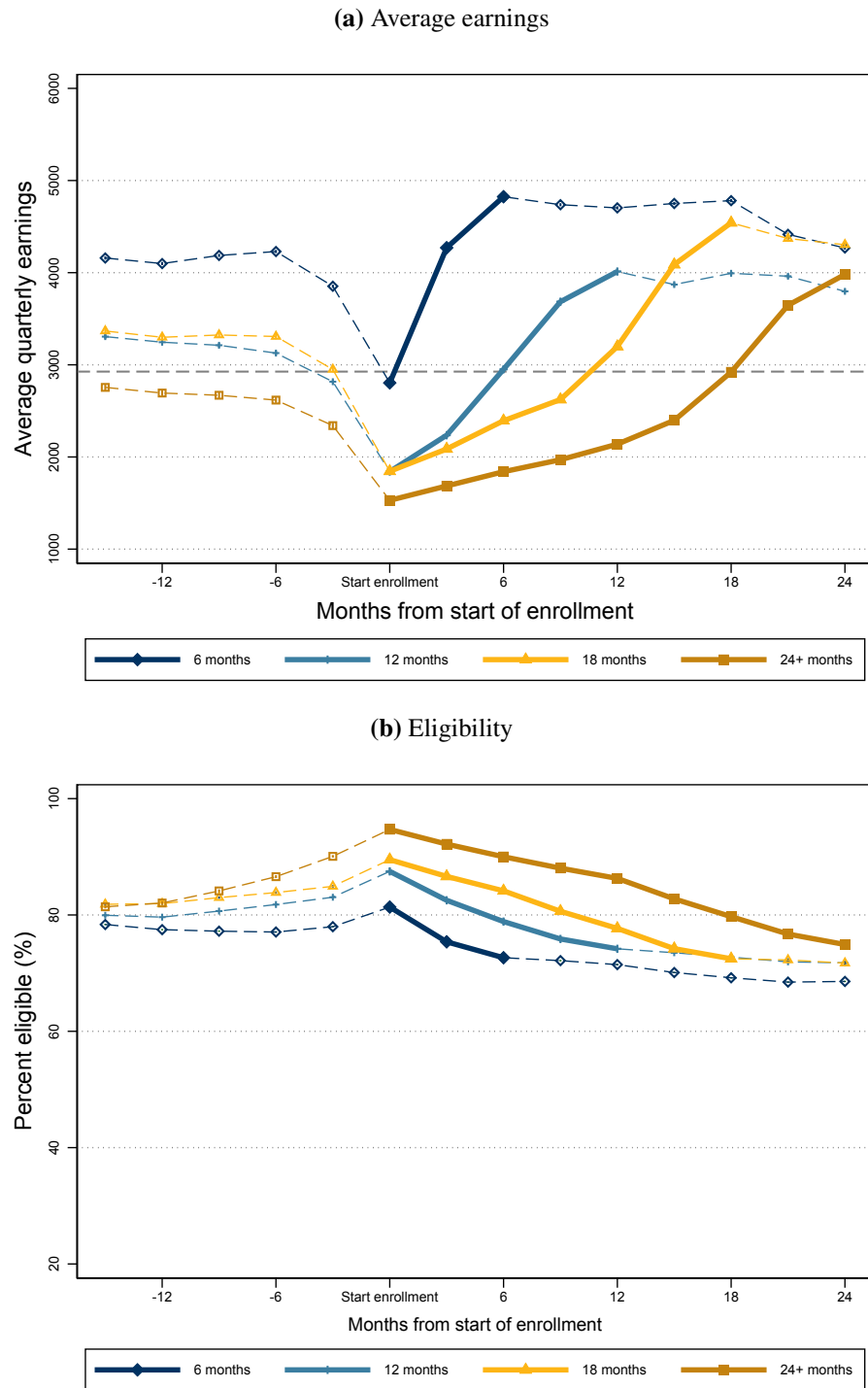
Notes. Appendix Figure 6 is the counterpart to Figures 6 and 7. These figures are the results from the same analysis, except that I do not exclude cases that returned to SNAP within 12 months of exiting, as I do in the main analysis.

Appendix Figure 7: Distribution of unearned income among households enrolled in SNAP

(a) SF cases (2016-2019)
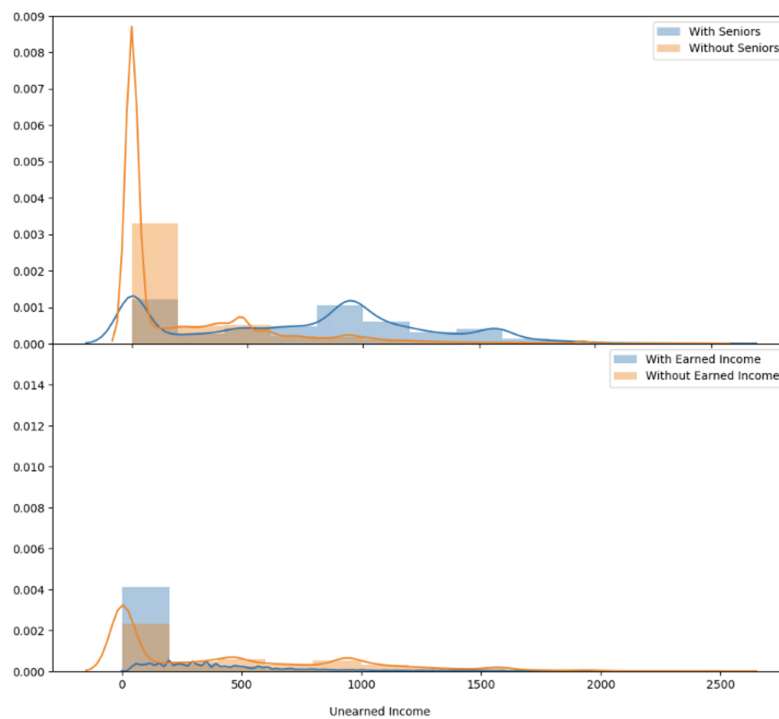
(b) SNAP QC cases (FY2013-FY2018)
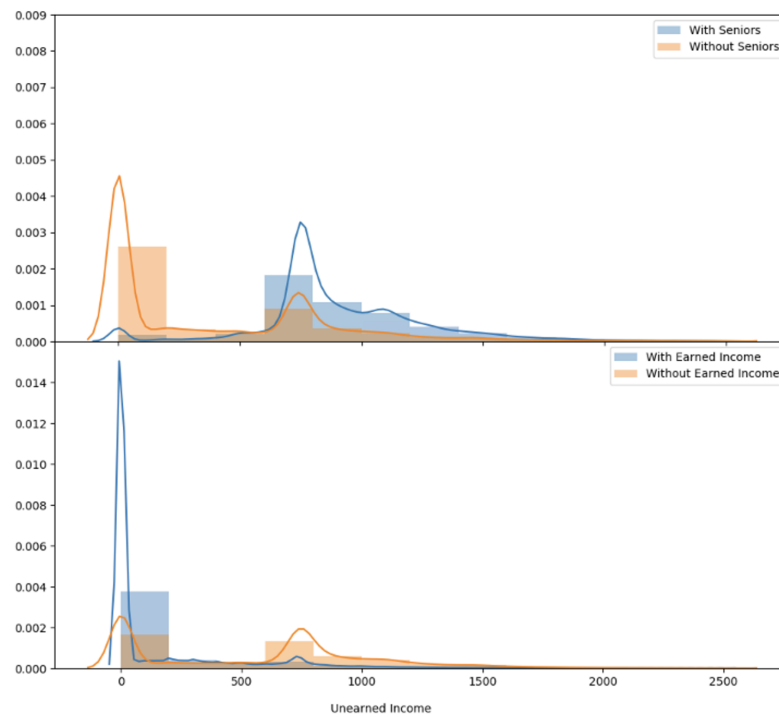
Notes. Appendix Figure 7 summarizes the distribution of unearned income among all SF SNAP cases and SNAP QC cases between 2016 and 2019 and FY 2013 and FY 2018, respectively, separated by households with and without seniors and households with and without earned income.

Appendix Figure 8: Income trends before and after SNAP enrollment, Survey of Income Program and Participation

(a) Earned income
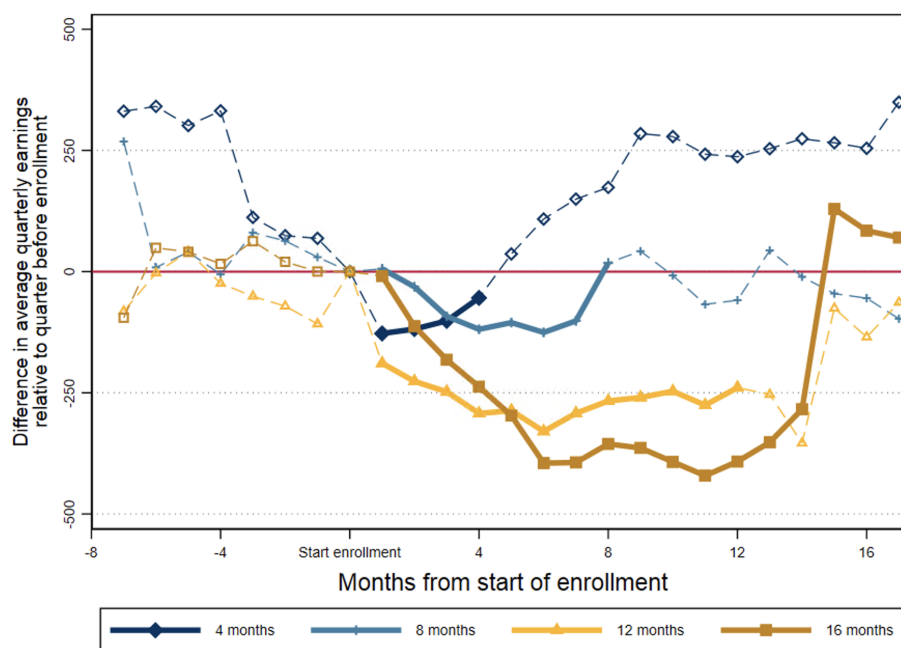
(b) Unearned income
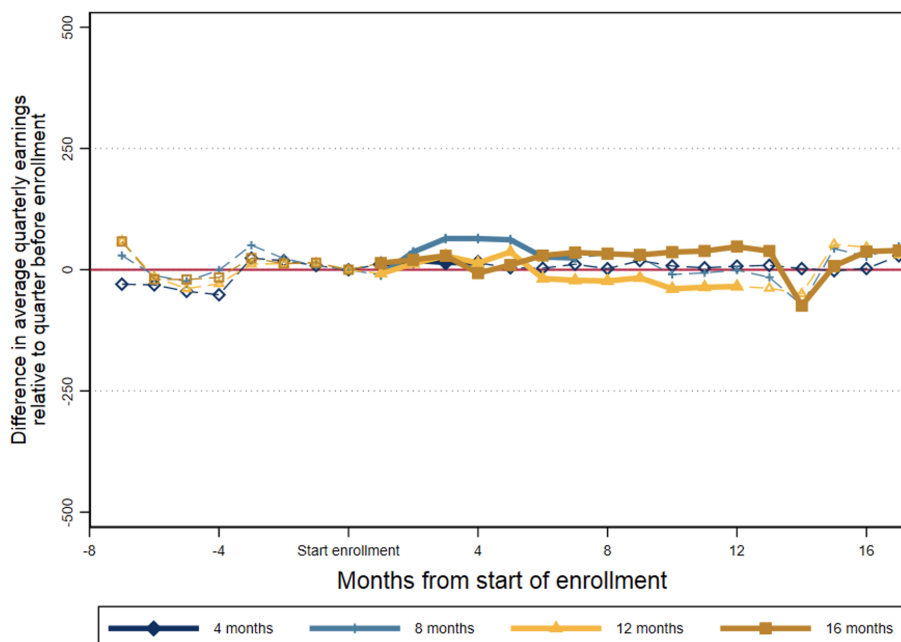
Notes. Appendix Figure 8 use the SIPP to estimate differences in income relative to the month before a SNAP enrollment begins, mirroring Figure 10 in the main paper. I identify each month relative to the first and last month of a continuous SNAP spell for SIPP households. I limit the analysis to households whose SNAP spells coincide with survey waves, and to the household's first SNAP enrollment. I regress total household earnings and total household unearned income on indicators for each month relative to the month preceding the start of the SNAP spell, an indicator for the length of the spell, and the interaction between the two. I also include household type, state, and year controls. Each figure plots the coefficient on the interaction term.

Appendix Figure 9: Distribution of predicted food insecurity measure by household type and race, Current Population Survey, 2005-2018

(a) Household type

(b) Race
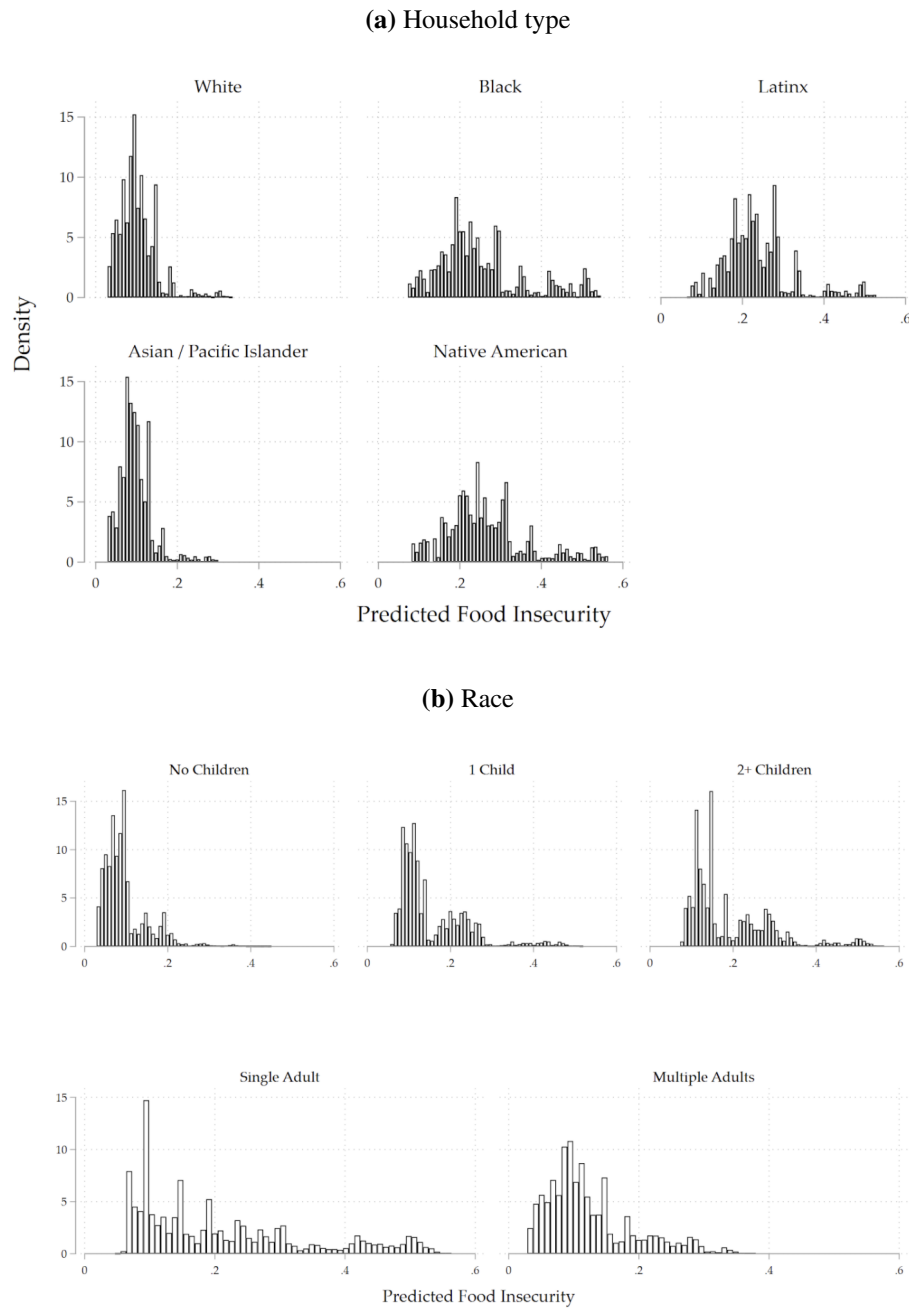
Notes. Appendix Figure 9 summarizes distribution of predicted food insecurity by household type and race from CPS. Data is from the December CPS (2005-2018). Sample includes all individuals in the CPS with nonmissing demographic characteristics who are included in the universe for the FSS food security measure.

Appendix Table 1: Share of households that receive unearned income, and average unearned income amount, among SNAP cases in SF case records and SNAP QC records

	SF cases		SNAP QC	
	Share	Monthly average	Share	Monthly average
All households	.59	$790	.59	$776
Households with seniors	.80	$971	.91	$930
Households with children	.57	$686	.51	$673
Households with earned income	.28	$543	.32	$533

Notes. Appendix Table 1 reports the fraction of households in each dataset who report receive unearned income, and the mean monthly amount of unearned income among those households. For the Mathematica data, households are defined as received unearned income if they report receipt during the one month they're surveyed. For the SF data, households are defined as received unearned income if they report receipt in any month during their enrollment spell. The monthly average amount represents the mean unearned income amount received by households during the months in which they report receiving any unearned income. For the SF case data, in which we observe households for multiple months, I identify each household's average amount over months in which they report receiving any unearned income, and then calculate the average over all these household means.

Appendix Table 2: Share of households that receive unearned income, and average unearned income amount, among SNAP cases in SF case records and SNAP QC records

Household food insecurity scale	Number of individuals	Percent of sample
Food secure	1,254,490	86
Low food security	131,327	9
Very low food security	68,324	5

Notes. Appendix Table 2 identifies share of CPS sample identified as food secure, food insecure, and very food insecure. The sample is all individuals included in the universe of respondents for the CPS-FSS survey as indicated by the variable *fsstatus* (IPUMS variable) and with non-missing food security status level for survey years 2005-2013.

Appendix Table 3: Average levels of food insecurity by individual and household demographics

	Mean	SD
Race		
White	0.103	0.304
Black	0.253	0.435
Latinx	0.236	0.425
Asian/Pacific Islander	0.095	0.294
Native American	0.258	0.437
Number of Children		
0	0.096	0.294
1	0.153	0.360
2+	0.190	0.392
Number of Adults		
Single Adult	0.206	0.404
Multiple Adults	0.123	0.329
Age		
0-17	0.191	0.393
18-34	0.157	0.364
35-59	0.126	0.332
60+	0.074	0.262

Notes. Appendix Table 3 identifies share of each person type that is identified as being food insecure. The sample is all individuals included in the universe of respondents for the CPS-FSS survey as indicated by the variable *fsstatus* (IPUMS variable) and with non-missing food security status level for survey years 2005-2013.

Appendix Table 4: Share of persons continuously enrolled in SNAP for 1 to 17 years by enrollment year

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Total Enrollees (thousands)	1,088	1,163	1,304	1,561	1,874	1,956	1,980	2,058	2,122	1,986	1,985	1,916	1,841	1,784	2,250	2,424
Duration																
1	0.474	0.485	0.500	0.544	0.570	0.559	0.554	0.535	0.588	0.617	0.586	0.558	0.550	0.537	0.654	0.542
2	0.270	0.285	0.316	0.362	0.362	0.345	0.328	0.321	0.356	0.338	0.311	0.305	0.286	0.288	0.383	0.305
3	0.184	0.206	0.239	0.267	0.259	0.238	0.228	0.225	0.233	0.215	0.200	0.195	0.185	0.177	0.282	.
4	0.141	0.165	0.189	0.206	0.193	0.178	0.172	0.159	0.163	0.150	0.137	0.137	0.125	0.127	.	.
5	0.116	0.134	0.152	0.161	0.149	0.139	0.127	0.116	0.119	0.107	0.099	0.098	0.094	.	.	.
6	0.096	0.111	0.122	0.128	0.119	0.105	0.095	0.087	0.087	0.079	0.072	0.077	.	.	.	.
7	0.080	0.091	0.100	0.105	0.092	0.081	0.073	0.065	0.065	0.058	0.057	.	.	.	.	.
8	0.067	0.075	0.083	0.082	0.072	0.063	0.056	0.050	0.049	0.047	.	.	.	.	.	.
9	0.056	0.063	0.066	0.065	0.056	0.048	0.043	0.038	0.039	.	.	.	.	.	.	.
10	0.047	0.051	0.052	0.051	0.043	0.037	0.033	0.031	.	.	.	.	.	.	.	.
11	0.038	0.041	0.042	0.040	0.034	0.029	0.027	.	.	.	.	.	.	.	.	.
12	0.031	0.033	0.033	0.031	0.026	0.023	.	.	.	.	.	.	.	.	.	.
13	0.024	0.026	0.026	0.024	0.021	.	.	.	.	.	.	.	.	.	.	.
14	0.019	0.020	0.019	0.019	.	.	.	.	.	.	.	.	.	.	.	.
15	0.015	0.015	0.016	.	.	.	.	.	.	.	.	.	.	.	.	.
16	0.011	0.012	.	.	.	.	.	.	.	.	.	.	.	.	.	.
17	0.009	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Notes. Appendix Table 4 reports the number of persons that stayed continuously enrolled in SNAP in California for between 1 and 17 years by the year in which they first enrolled, between 2005 and 2021. These estimates exclude recipients enrolled as of January 2005.

Appendix Table 5: Estimate log-odd effect of eligibility status on likelihood of SNAP exit

Ineligible	0.000
	(.)
Eligible	-0.896***
	(0.005)
$\times$ Reporting month	
Ineligible $\times$ Reporting month	0.392***
	(0.008)
Eligible $\times$ Reporting month	0.000
	(.)
N	7,625,047
Persons	501,339
R^2	0.15
County	X
Year/Month	X
Demographics	X

Notes. Appendix Table 5 reports estimated log-odd effects of likely eligibility status on likelihood of exit from a version of Equation 1 in which z is an indicator for eligibility. I also control for county and date fixed effects, as well as demographic characteristics summarized in Appendix Table 14. Universe is a 5% sample of SNAP enrollment spells between 2014 and 2019, minus cases containing only seniors or children.

Appendix Table 6: Estimated marginal and average effect of eligibility status on likelihood of SNAP exit in reporting and non-reporting months

	Marginal effect		Average effect	
	Non-reporting month	Reporting month	Non-reporting month	Reporting month
Ineligible	.	.	0.053	0.324
	(.)	(.)	(0.000)	(0.001)
Eligible	-0.031	-0.207	0.022	0.117
	(0.000)	(0.001)	(0.000)	(0.000)
N	7,625,047	7,625,047	7,625,047	7,625,047
Persons	501,339	501,339	501,339	501,339
County	X	X	X	X
Year/Month	X	X	X	X
Demographics	X	X	X	X

Notes. Appendix Table 6 reports estimated average and marginal effects of likely eligibility status on likelihood of exit. Average effects are estimated by transforming log effects estimated by Equation 2 in which z is an indicator for eligibility. I also control for county and date fixed effects, as well as demographic characteristics summarized in Appendix Table 14. Universe is a 5% sample of SNAP enrollment spells between 2014 and 2019, minus cases containing only seniors or children.

Appendix Table 7: Estimate log-odd effect of benefit amount levels on likelihood of SNAP exit

	exit
$0-50	0.000
	(.)
$50-100	-0.286***
	(0.015)
$100-150	-0.431***
	(0.014)
$150-200	-0.515***
	(0.010)
$200-250	-0.822***
	(0.013)
$250-300	-0.731***
	(0.013)
$300-350	-0.847***
	(0.012)
$350-400	-0.572***
	(0.011)
$400-450	-0.803***
	(0.014)
$450-500	-0.727***
	(0.013)
$500-550	-0.559***
	(0.011)
$550-600	-0.866***
	(0.015)
$600-650	-0.702***
	(0.012)
$650-700	-0.902***
	(0.014)
$700+	-1.045***
	(0.011)
× Reporting month	
$0-50 \times$ Reporting month	0.689***
	(0.015)
$50-100 \times$ Reporting month	0.619***
	(0.020)
$100-150 \times$ Reporting month	0.470***
	(0.018)
$150-200 \times$ Reporting month	0.383***
	(0.010)
$200-250 \times$ Reporting month	0.670***
	(0.014)
$250-300 \times$ Reporting month	0.230***
	(0.015)
$300-350 \times$ Reporting month	0.449***
	(0.012)
$350-400 \times$ Reporting month	-0.040***
	(0.011)
$400-450 \times$ Reporting month	0.054**
	(0.017)
$450-500 \times$ Reporting month	-0.183***
	(0.016)
$500-550 \times$ Reporting month	-0.299***
	(0.012)
$550-600 \times$ Reporting month	-0.151***
	(0.019)
$600-650 \times$ Reporting month	-0.238***
	(0.014)
$650-700 \times$ Reporting month	0.039*
	(0.017)
$700+ \times$ Reporting month	0.000
	(.)
N	12544616
Persons	758,587
R^2	0.15
County	X
Year/Month	X
Demographics	X

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes. Appendix Table 7 reports estimates from Eq. 1 in which main predictor is benefit levels.
XX

Appendix Table 8: Estimated marginal and average effect of benefit amount levels on likelihood of SNAP exit in reporting and non-reporting months

	Marginal effect		Average effect	
	Non-reporting month	Reporting month	Non-reporting month	Reporting month
$0-50	0.000	0.000	0.047	0.380
	(.)	(.)	(0.000)	(0.002)
$50-100	-0.011	-0.080	0.036	0.300
	(0.001)	(0.004)	(0.000)	(0.003)
$100-150	-0.016	-0.138	0.031	0.243
	(0.001)	(0.003)	(0.000)	(0.002)
$150-200	-0.018	-0.168	0.029	0.213
	(0.000)	(0.002)	(0.000)	(0.001)
$200-250	-0.026	-0.171	0.021	0.209
	(0.000)	(0.003)	(0.000)	(0.001)
$250-300	-0.024	-0.223	0.023	0.157
	(0.000)	(0.003)	(0.000)	(0.001)
$300-350	-0.026	-0.209	0.021	0.171
	(0.000)	(0.003)	(0.000)	(0.001)
$350-400	-0.020	-0.237	0.027	0.143
	(0.000)	(0.002)	(0.000)	(0.001)
$400-450	-0.025	-0.253	0.022	0.127
	(0.000)	(0.003)	(0.000)	(0.001)
$450-500	-0.024	-0.270	0.023	0.110
	(0.000)	(0.003)	(0.000)	(0.001)
$500-550	-0.020	-0.265	0.027	0.116
	(0.000)	(0.002)	(0.000)	(0.001)
$550-600	-0.027	-0.280	0.020	0.100
	(0.000)	(0.003)	(0.000)	(0.001)
$600-650	-0.023	-0.273	0.024	0.107
	(0.000)	(0.003)	(0.000)	(0.001)
$650-700	-0.027	-0.265	0.020	0.115
	(0.000)	(0.003)	(0.000)	(0.001)
$700+	-0.030	-0.282	0.017	0.098
	(0.000)	(0.002)	(0.000)	(0.001)
N	12,544,616	12,544,616	12544616	12,544,616
Persons	758,587	758,587	758,587	758,587
County	X	X	X	X
Year/Month	X	X	X	X
Demographics	X	X	X	X

$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$

Notes. Appendix Table 8 reports estimates from Eq. 1, then transformed into percentage point effects relative to the baseline and an average effect for each value, in which main predictor is benefit levels.

Appendix Table 9: Estimate log-odd effect of earnings levels on likelihood of SNAP exit

	exit
$0	0.000
	(.)
$1-499	0.118***
	(0.008)
$500-1000	0.164***
	(0.009)
$1000-1500	0.273***
	(0.008)
$1500-2000	0.450***
	(0.008)
$2000-2500	0.648***
	(0.008)
$2500-3000	0.836***
	(0.009)
$3000-3500	1.018***
	(0.010)
$3500-4000	1.181***
	(0.011)
$4000-4500	1.348***
	(0.012)
$4500-5000	1.419***
	(0.015)
$5000+	1.650***
	(0.009)
× Reporting month	
$0 × Reporting month	-0.154***
	(0.013)
$1-499 × Reporting month	-0.309***
	(0.017)
$500-1000 × Reporting month	-0.174***
	(0.017)
$1000-1500 × Reporting month	-0.108***
	(0.016)
$1500-2000 × Reporting month	-0.065***
	(0.016)
$2000-2500 × Reporting month	-0.055***
	(0.016)
$2500-3000 × Reporting month	-0.045**
	(0.017)
$3000-3500 × Reporting month	-0.008
	(0.018)
$3500-4000 × Reporting month	-0.012
	(0.020)
$4000-4500 × Reporting month	-0.010
	(0.022)
$4500-5000 × Reporting month	0.024
	(0.025)
$5000+ × Reporting month	0.000
	(.)
N	12609915
Persons	764,091
R^2	0.16
County	X
Year/Month	X
Demographics	X

$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$

Notes. Appendix Table 9 reports estimates from Eq. 1 in which main predictor is earnings levels.

Appendix Table 10: Estimated marginal and average effect of earnings levels on likelihood of SNAP exit in reporting and non-reporting months

	Marginal effect		Average effect	
	Non-reporting month	Reporting month	Non-reporting month	Reporting month
$0	0.000	0.000	0.018	0.109
	(.)	(.)	(0.000)	(0.000)
$1-499	0.002	-0.004	0.020	0.105
	(0.000)	(0.001)	(0.000)	(0.001)
$500-1000	0.003	0.015	0.021	0.124
	(0.000)	(0.001)	(0.000)	(0.001)
$1000-1500	0.005	0.035	0.023	0.144
	(0.000)	(0.001)	(0.000)	(0.001)
$1500-2000	0.010	0.064	0.027	0.173
	(0.000)	(0.001)	(0.000)	(0.001)
$2000-2500	0.016	0.096	0.033	0.205
	(0.000)	(0.001)	(0.000)	(0.001)
$2500-3000	0.022	0.130	0.040	0.239
	(0.000)	(0.002)	(0.000)	(0.002)
$3000-3500	0.030	0.173	0.047	0.282
	(0.000)	(0.002)	(0.000)	(0.002)
$3500-4000	0.038	0.206	0.055	0.315
	(0.001)	(0.002)	(0.001)	(0.002)
$4000-4500	0.047	0.243	0.065	0.352
	(0.001)	(0.003)	(0.001)	(0.003)
$4500-5000	0.052	0.268	0.069	0.377
	(0.001)	(0.004)	(0.001)	(0.004)
$5000+	0.068	0.317	0.086	0.426
	(0.001)	(0.003)	(0.001)	(0.003)
N	12609915	12609915	12609915	12609915
Persons	764,091	764,091	764,091	764,091
County	X	X	X	X
Year/Month	X	X	X	X
Demographics	X	X	X	X

$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$

Notes. Appendix Table 10 reports estimates from Eq. 1, then transformed in percentage point effects relative to the baseline and an average effect for each value, in which main predictor is earnings levels.

Appendix Table 11: Estimate log-odd effect of pre-enrollment earnings on likelihood of SNAP exit

exit	
$0	0.000
	(.)
$1-499	-0.010
	(0.009)
$500-1000	0.005
	(0.010)
$1000-1500	0.016
	(0.010)
$1500-2000	0.055***
	(0.010)
$2000-2500	0.107***
	(0.011)
$2500-3000	0.187***
	(0.013)
$3000-3500	0.270***
	(0.016)
$3500-4000	0.343***
	(0.020)
$4000-4500	0.386***
	(0.024)
$4500-5000	0.429***
	(0.029)
$5000+	0.519***
	(0.017)
× Reporting month	
$0 × Reporting month	-0.181***
	(0.025)
$1-499 × Reporting month	0.006
	(0.028)
$500-1000 × Reporting month	0.039
	(0.028)
$1000-1500 × Reporting month	0.088**
	(0.028)
$1500-2000 × Reporting month	0.104***
	(0.028)
$2000-2500 × Reporting month	0.102***
	(0.029)
$2500-3000 × Reporting month	0.080**
	(0.031)
$3000-3500 × Reporting month	0.068*
	(0.033)
$3500-4000 × Reporting month	0.052
	(0.037)
$4000-4500 × Reporting month	0.015
	(0.042)
$4500-5000 × Reporting month	0.024
	(0.049)
$5000+ × Reporting month	0.000
	(.)
N	12,609,915
Persons	764,091
R^2	0.14
County	X
Year/Month	X
Demographics	X

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes. Appendix Table 11 reports estimates from Eq. 1 in which main predictor is earnings levels four quarters before enrollment starts.

Appendix Table 12: Estimated marginal and average effect of pre-enrollment earnings on likelihood of SNAP exit in reporting and non-reporting months

	Marginal effect		Average effect	
	Non-reporting month	Reporting month	Non-reporting month	Reporting month
$0	0.000	0.000	0.024	0.139
	(.)	(.)	(0.000)	(0.000)
$1-499	-0.000	0.022	0.024	0.162
	(0.000)	(0.001)	(0.000)	(0.001)
$500-1000	0.000	0.029	0.024	0.168
	(0.000)	(0.001)	(0.000)	(0.001)
$1000-1500	0.000	0.038	0.024	0.177
	(0.000)	(0.001)	(0.000)	(0.001)
$1500-2000	0.001	0.046	0.025	0.185
	(0.000)	(0.001)	(0.000)	(0.001)
$2000-2500	0.003	0.054	0.027	0.193
	(0.000)	(0.002)	(0.000)	(0.002)
$2500-3000	0.005	0.063	0.029	0.202
	(0.000)	(0.002)	(0.000)	(0.002)
$3000-3500	0.007	0.074	0.031	0.213
	(0.000)	(0.003)	(0.000)	(0.003)
$3500-4000	0.009	0.084	0.034	0.223
	(0.001)	(0.004)	(0.001)	(0.004)
$4000-4500	0.011	0.085	0.035	0.224
	(0.001)	(0.004)	(0.001)	(0.004)
$4500-5000	0.012	0.094	0.036	0.233
	(0.001)	(0.006)	(0.001)	(0.006)
$5000+	0.016	0.106	0.040	0.245
	(0.001)	(0.004)	(0.001)	(0.003)
N	12,609,915	12,609,915	12,609,915	12,609,915
Persons	764,091	764,091	764,091	764,091
County	X	X	X	X
Year/Month	X	X	X	X
Demographics	X	X	X	X

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Notes. ?? reports estimates from Eq. 1, then transformed in percentage point effects relative to the baseline and an average effect for each value, in which main predictor is earnings levels four quarters before enrollment starts.

Appendix Table 13: Estimated log-odd effects of demographic characteristics on likelihood of exiting SNAP

exit	Without earnings	With earnings
Race		
White	0.000	0.000
	(.)	(.)
Black	0.030***	-0.047***
	(0.005)	(0.005)
Latinx	0.028***	-0.002
	(0.006)	(0.007)
East Asian/PI	-0.123***	-0.092***
	(0.010)	(0.012)
SE Asian	-0.133***	-0.159***
	(0.010)	(0.013)
AIAN	0.033	0.033
	(0.022)	(0.024)
Other	0.038***	-0.005
	(0.006)	(0.007)
Household Type		
Children only	-0.191***	
	(0.008)	
Adult(s) only	0.000	0.000
	(.)	(.)
Single parent	0.036***	-0.092***
	(0.005)	(0.005)
2+ adults with children	0.290***	-0.144***
	(0.005)	(0.006)
Senior(s) only	-0.624***	
	(0.008)	
Senior(s) with children	0.014	
	(0.026)	
Language		
English	0.000	0.000
	(.)	(.)
Non-English	-0.054***	0.039***
	(0.005)	(0.006)
CalWORKs Receipt		
Not received CalWORKs	0.000	0.000
	(.)	(.)
Received CalWORKs	-0.002	0.021***
	(0.004)	(0.004)
Race × Reporting month		
White	-0.221***	0.034***
	(0.042)	(0.009)
Black	-0.178***	0.086***
	(0.042)	(0.009)
Latinx	-0.422***	-0.172***
	(0.042)	(0.011)
East Asian/PI	-0.040	0.150***
	(0.044)	(0.018)
SE Asian	-0.083	0.151***
	(0.044)	(0.018)
AIAN	-0.321***	-0.042
	(0.053)	(0.035)
Other	-0.274***	0.000
	(0.042)	(.)
Household Type × Reporting month		
Children only	0.500***	
	(0.041)	
Adult(s) only	0.967***	0.622***
	(0.040)	(0.007)
Single parent	0.361***	0.023**
	(0.040)	(0.007)
2+ adults with children	0.320***	0.000
	(0.040)	(.)
Senior(s) only	1.481***	
	(0.045)	
Senior(s) with children	0.000	
	(.)	
Language × Reporting month		
English	-0.014	0.063***
	(0.007)	(0.008)
Non-English	0.000	0.000
	(.)	(.)
CalWORKs Receipt × Reporting month		
Not received CalWORKs	0.127***	0.130***
	(0.005)	(0.006)
Received CalWORKs	0.000	0.000
	(.)	(.)
N	16399784	12699352
Persons	917,897	776,241
R^2	0.14	0.16
County	X	X
Year/Month	X	X

$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$

Notes. Appendix Table 14 reports estimates from Eq. 1 in which main predictor is a set of demographic characteristics.

Appendix Table 14: Estimated average and marginal effects of demographic characteristics on likelihood of exiting SNAP in reporting and non-reporting months

	Marginal effect w/o earnings		Average effect w/o earnings		Marginal effect w/ earnings		Average effect w/ earnings	
	Non-reporting month	Reporting month	Non-reporting month	Reporting month	Non-reporting month	Reporting month	Non-reporting month	Reporting month
Race								
White	0.000 (.)	0.000 (.)	0.022 (0.000)	0.140 (0.001)	0.000 (.)	0.000 (.)	0.024 (0.000)	0.147 (0.001)
Black	0.001 (0.000)	0.009 (0.001)	0.023 (0.000)	0.150 (0.000)	-0.001 (0.000)	0.001 (0.001)	0.023 (0.000)	0.147 (0.000)
Latinx	0.001 (0.000)	-0.020 (0.001)	0.023 (0.000)	0.121 (0.001)	-0.000 (0.000)	-0.024 (0.001)	0.024 (0.000)	0.122 (0.001)
East Asian/PI	-0.002 (0.000)	0.007 (0.001)	0.019 (0.000)	0.148 (0.001)	-0.002 (0.000)	0.003 (0.002)	0.022 (0.000)	0.149 (0.001)
SE Asian	-0.003 (0.000)	0.001 (0.001)	0.019 (0.000)	0.141 (0.001)	-0.003 (0.000)	-0.005 (0.001)	0.020 (0.000)	0.141 (0.001)
AIAN	0.001 (0.000)	-0.008 (0.003)	0.023 (0.000)	0.133 (0.003)	0.001 (0.001)	-0.005 (0.003)	0.025 (0.001)	0.141 (0.003)
Other	0.001 (0.000)	-0.002 (0.001)	0.023 (0.000)	0.139 (0.001)	-0.000 (0.000)	-0.005 (0.001)	0.024 (0.000)	0.142 (0.001)
Household type								
Children only	-0.004 (0.000)	-0.083 (0.001)	0.019 (0.000)	0.110 (0.001)				
Adult(s) only	0.000 (.)	0.000 (.)	0.023 (0.000)	0.193 (0.001)	0.000 (.)	0.000 (.)	0.025 (0.000)	0.213 (0.001)
Single parent	0.001 (0.000)	-0.074 (0.001)	0.024 (0.000)	0.119 (0.000)	-0.002 (0.000)	-0.093 (0.001)	0.023 (0.000)	0.119 (0.000)
2+ adults with children	0.008 (0.000)	-0.050 (0.001)	0.031 (0.000)	0.143 (0.001)	-0.003 (0.000)	-0.101 (0.001)	0.022 (0.000)	0.111 (0.000)
Senior(s) only	-0.011 (0.000)	-0.017 (0.003)	0.013 (0.000)	0.177 (0.003)				
Senior(s) with children	0.000 (0.001)	-0.109 (0.002)	0.023 (0.001)	0.085 (0.002)				
Language								
English	0.000 (.)	0.000 (.)	0.023 (0.000)	0.143 (0.000)	0.000 (.)	0.000 (.)	0.023 (0.000)	0.143 (0.000)
Non-English	-0.001 (0.000)	-0.005 (0.001)	0.021 (0.000)	0.138 (0.001)	0.001 (0.000)	-0.003 (0.001)	0.024 (0.000)	0.140 (0.001)
CalWORKs receipt								
Not received CalWORKs	0.000 (.)	0.000 (.)	0.022 (0.000)	0.149 (0.000)	0.000 (.)	0.000 (.)	0.023 (0.000)	0.149 (0.000)
Received CalWORKs	-0.000 (0.000)	-0.016 (0.000)	0.022 (0.000)	0.134 (0.000)	0.000 (0.000)	-0.013 (0.001)	0.023 (0.000)	0.136 (0.000)
N	16399784	16399784	16399784	16399784	12699352	12699352	12699352	12699352
Persons	917,897	917,897	917,897	917,897	776,241	776,241	776,241	776,241
County	X	X	X	X	X	X	X	X
Year/Month	X	X	X	X	X	X	X	X

$^{*}\,p < 0.05, ^{**}\,p < 0.01, ^{***}\,p < 0.001$

Notes. Appendix Table 14 reports estimates from Eq. 1, then transformed in percentage point effects relative to various baselines and an average effect for each value, in which main predictor is a set of demographic characteristics.

Appendix Table 15: Estimate log-odd effect of predicted food insecurity level on likelihood of SNAP exit

exit	
0.0-.05	0.000
	(.)
.05-.10	-0.700***
	(0.011)
.10-.15	-0.854***
	(0.011)
.15-.20	-1.215***
	(0.011)
.20-.25	-1.431***
	(0.012)
.25-.30	-1.490***
	(0.013)
.30-.35	-1.707***
	(0.014)
.35-.40	-1.878***
	(0.014)
$\times$ **Reporting month**	
0.0-.05 $\times$ Reporting month	0.709***
	(0.016)
.05-.10 $\times$ Reporting month	0.684***
	(0.013)
.10-.15 $\times$ Reporting month	0.531***
	(0.013)
.15-.20 $\times$ Reporting month	0.554***
	(0.012)
.20-.25 $\times$ Reporting month	0.341***
	(0.013)
.25-.30 $\times$ Reporting month	0.325***
	(0.015)
.30-.35 $\times$ Reporting month	0.270***
	(0.015)
.35-.40 $\times$ Reporting month	0.000
	(.)
N	9,169,968
Persons	589,771
R^2	0.15
County	X
Year/Month	X
Demographics	X

$^* p < 0.05$, $^{**} p < 0.01$, $^{***} p < 0.001$

Notes. Appendix Table 15 reports estimates from **??** in which main predictor is levels of imputed food insecurity, estimated via the process explained in Appendix C, including earnings levels.

Appendix Table 16: Estimated marginal and average effect of predicted food insecurity level on likelihood of SNAP exit in reporting and non-reporting months

	Marginal effect		Average effect	
	Non-reporting month	Reporting month	Non-reporting month	Reporting month
0.0-.05	0.000	0.000	0.084	0.448
	(.)	(.)	(0.001)	(0.003)
.05-.10	-0.040	-0.166	0.043	0.282
	(0.001)	(0.003)	(0.000)	(0.001)
.10-.15	-0.046	-0.224	0.037	0.224
	(0.001)	(0.003)	(0.000)	(0.001)
.15-.20	-0.057	-0.277	0.026	0.171
	(0.001)	(0.003)	(0.000)	(0.001)
.20-.25	-0.062	-0.330	0.021	0.118
	(0.001)	(0.003)	(0.000)	(0.001)
.25-.30	-0.063	-0.337	0.020	0.111
	(0.001)	(0.003)	(0.000)	(0.001)
.30-.35	-0.067	-0.361	0.016	0.087
	(0.001)	(0.003)	(0.000)	(0.001)
.35-.40	-0.070	-0.390	0.014	0.058
	(0.001)	(0.003)	(0.000)	(0.000)
N	9,169,968	9,169,968	9,169,968	9,169,968
Persons	589,771	589,771	589,771	589,771
County	X	X	X	X
Year/Month	X	X	X	X
Demographics	X	X	X	X

$^{*}\ p < 0.05,\ ^{**}\ p < 0.01,\ ^{***}\ p < 0.001$

Notes. Appendix Table 16 reports estimates from **??**, transformed in percentage point effects relative to the baseline and an average effect for each value, in which main predictor is levels of imputed food insecurity, estimated via the process explained in Appendix C, including earnings levels.