Monthly Financial Insecurity Estimates using the Household Pulse Survey

Brian Glassman and Ani Silwal
Poverty Statistics Branch
Social, Economic, and Housing Statistics Division
U.S. Census Bureau[1]

SEHSD Working Paper FY-2023-03

Abstract

During the COVID-19 pandemic it has become increasingly important to be able to measure and release estimates measuring the economic well-being of the population on a timely and frequent basis. The Census Bureau releases its annual estimates of poverty from the Current Population Survey Annual Social and Economic Supplement (CPS ASEC) and the American Community Survey (ACS) in the fall, which measures well-being during the previous year. Given the current demand for current and frequent statistics, there are two deficiencies with the current situation. First, annual poverty rates are not able to capture significant month-to-month change in economic conditions. Second, although the CPS ASEC and ACS estimates are processed and released relatively quickly, there is still a 9-month lag from the reference period; the 2022 results will be released in September 2023. The Household Pulse Survey (HPS) alleviates both of these issues by releasing data on a bi-weekly basis and only a few weeks after data collection. We create a new monthly insecurity estimate based on how difficult it is for respondents to pay usual household expenses. We plot this over time in order to view the month-to-month change in insecurity from April 2020 through June 2022. We also compare our insecurity measure to replicates of a monthly official poverty measure and monthly Supplemental Poverty Measure produced by other researchers. These three rates are a suite of well-being measures that can potentially be produced and released on a monthly basis.

[1] This paper is released to inform interested parties of ongoing research and to encourage discussion of work in progress. Any views expressed are those of the author and not necessarily of the U.S. Census Bureau. The Census Bureau reviewed this data product for unauthorized disclosure of confidential information and has approved the disclosure avoidance practices applied to this release. CBDRB-FY23-SEHSD003-007.

I. Introduction

The COVID-19 pandemic and subsequent lockdowns led to unprecedented disruption to the economy and had a massive effect on the well-being of people throughout the country. Traditionally, economic well-being is measured by poverty measures released by the Census Bureau. The official poverty measure (OPM) and supplemental poverty measure (SPM) are released each fall and measure well-being during the previous year. For example, the fall 2022 release examined poverty during 2021. Therefore, estimates for 2022 will not be available until the fall of 2023. Furthermore, annual estimates of poverty do not show important month-to-month differences in well-being. For these reasons, there has been increased interest in finding more timely and frequent estimates of well-being.

We use a unique dataset to address these concerns and define a new measure of financial insecurity based on a household's difficulty paying usual household expenses.[2] The data comes from the Household Pulse Survey (HPS), an experimental recently developed survey conducted by the U.S. Census Bureau and other agencies.[3] The survey was conducted at a high frequency (weekly/bi-weekly/monthly) and released 2-4 weeks after collection during the pandemic. Our analysis covers a little over two years of the pandemic, beginning April 2020 and ending June 2022.

We also compare our measure to two monthly poverty measures: the OPM and the SPM based on methods developed by Parolin et al (2022).[4] The OPM is a traditional poverty measure comparing a family's or individual's income to a set of thresholds while the SPM is an alternative poverty measure, which uses a broader definition of income than the one used in the OPM.[5]

There are two interrelated purposes for this paper. The first is to create and analyze a new financial insecurity measure from the HPS which will allow us to release a well-being estimate on a monthly basis a short time after the data is collected. The second is to use this new measure to help validate newly created monthly poverty measures which are being developed and explored at the Census Bureau. These three measures are a suite of rates that can inform us about the monthly change in both income poverty and subjective financial insecurity. They measure different and important things and can and should be used in conjunction with one another.

The paper is organized as follows. In Section 2, we provide details about the HPS, the data we use for the monthly OPM and SPM, and our definition of financial insecurity. In Section 3, we summarize our estimates of monthly insecurity and compare them with the monthly income poverty measures overall and by demographic variables in common in the two datasets. In Section 4, we regress the three measures on the demographic variables and in Section 5 we make some comparisons to pre-pandemic poverty and insecurity rates. Section 6 concludes.

---

[2] We don't use a measure of income poverty due to the nature of the income question in the HPS. It is categorical and it asks about the previous calendar year's household income.

[3] The estimates in this paper (which may be shown in text, figures, and tables) are based on responses from a sample of the population and may differ from actual values because of sampling variability or other factors. As a result, apparent differences between the estimates for two or more groups may not be statistically significant. All comparative statements have undergone statistical testing and are significant at the 90 percent confidence level unless otherwise noted. Standard errors were calculated using replicate weights.

[4] Han et al. (2020) propose an alternative methodology to update the poverty rate at a monthly frequency by combining data from basic monthly CPS and CPS ASEC. We do not compare our results with theirs since their study updates the annual poverty rate (with a rolling 12-month reference period) unlike the monthly reference period that we examine in this study.

[5] The SPM extends the income definition used in the OPM by taking into account non-cash benefits, such as nutritional and energy assistance programs, tax credits such as the Earned Income Tax Credit (EITC), and geographic differences in housing costs, and subtracting necessary expenses such as work-related expenses, medical expenses, and income and payroll taxes paid.

Data & Methodology

Household Pulse Survey

The U.S. Census Bureau, in collaboration with various federal agencies, created an experimental online survey, the Household Pulse Survey (HPS) in April of 2020 to provide real-time effects of the COVID-19 pandemic on peoples' lives.[6] The HPS is the only publicly available household level survey compiled and released in the U.S. during the pandemic at such a high frequency. It includes more than 3.5 million household respondents and public use data files are released 2 to 4 weeks after data is collected. The HPS is representative of the household population aged 18 years and over, at the state and national level as well as for the 15 largest Metropolitan Statistical Areas. We combine the weekly or bi-weekly data to create monthly cross-sectional data and present our analysis from April 2020 to June 2022.[7]

Two major advantages of the HPS are its timeliness and frequency. The HPS included 21 waves in 2020, 19 waves in 2021, and 6 waves in the first half of 2022. The data is released about 2-4 weeks after collection and included approximately 78,000 respondents per wave.

The HPS, however, also has some limitations. The first limitation is that the sampling frame is limited to households with a known email address or cell phone number (which is how respondents were contacted for the survey). A second limitation is, unlike other household surveys, the HPS has detailed information on the respondent but limited information about other household members. A third limitation is that the HPS is a relatively new and evolving survey which means that some questions change over time. Therefore, changes in responses over time should be viewed with caution. A fourth limitation is a low response rate, about 7.5% on average, throughout the survey. The response patterns differed across key demographic groups, but the Census Bureau's weighting strategy helped to mitigate some of this nonresponse bias (Peterson and Toribio, 2021).[8] A final limitation is item non-response. While most demographic questions were answered, five percent of respondents, on average, did not answer the main question of interest in this paper.

There are a variety of methods in the literature to adjust for missing responses. The simplest method would be to drop all respondents with missing responses. We find that individuals with missing responses were more likely to be younger, male, have children in the household, be non-white, be Hispanic, and have lower educational attainment (see Table A1 in the Appendix). Hence dropping these individuals altogether would lead to a biased sample.

In this paper, we impute a respondent's answer to the main question of interest by estimating an ordered logit model using multiple imputation. The explanatory variables are age groups, sex, presence of children in the household, race and Hispanic origin, education, state of residence, and month of survey. Apart from non-response, the question of interest was not added until the fourth month (August 2020) of the survey. In order to capture well-being from the beginning of the COVID-19 pandemic, answers to the question of interest were also imputed for all respondents in April, May, and June 2020.

---

[6] For more information on the Household Pulse Survey, see https://www.census.gov/programs-surveys/household-pulse-survey/technical-documentation.html.

[7] Starting in September 2022 and onward, the HPS is collected and released on a monthly basis.

[8] While the Census Bureau adjusted weights in the Pulse Survey to account for non-response, weighting mitigates rather than eliminates non-response bias. See 2020_HPS_NR_Bias_Report-final.pdf (census.gov) for more information on non-response bias in the HPS.

The main question of interest from the HPS that we use to measure financial insecurity is as follows:

In the last 7 days, how difficult has it been for your household to pay for usual household expenses, including but not limited to food, rent or mortgage, car payments, medical expenses, student loans, and so on? Select only one answer.

1) Not at all difficult

2) A little difficult

3) Somewhat difficult

4) Very difficult

We define someone as financially insecure if they answer that it has been very difficult for them to pay household expenses. In Table 1, the percent of the population in each category is displayed by year. In each year, over 50 percent of respondents reported at least a little difficulty paying household expenses. However, the percent reporting a somewhat or very difficult time paying expenses decreased from 2020 to 2021 and increased from 2021 to 2022.

Table 1: Difficulty with Household Expenses by Year

	2020		2021		2022	
Difficulty	Est.	Std Err.	Est.	Std Err.	Est.	Std Err.
Not at all	43.45	0.07	45.74	0.08	40.25	0.15
A little	23.66	0.07	24.21	0.08	25.62	0.15
Somewhat	18.51	0.06	17.58	0.06	19.35	0.13
Very	14.38	0.06	12.47	0.06	14.79	0.14

Note: All estimates are different from zero at the 90 percent confidence level.
Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46.

Monthly OPM

The data for both the OPM and SPM comes from the Current Population Survey (CPS) and the Annual Social and Economic Supplement to the CPS (CPS ASEC).[9] The data comes from months April 2020 through June 2022 of the CPS and from the 2021 and 2022 CPS ASEC.

We follow methodology proposed by Parolin et al. (2022) to estimate the OPM for a monthly reference period. This methodology combines the CPS ASEC and basic monthly CPS to compute monthly poverty rates by exploiting the fact that these surveys have a common set of variables that are correlated with poverty status. This methodology entails first converting the various components of family income in the most recent CPS ASEC into a monthly measure for the month in which the poverty imputation is being conducted.[10]

[9] For more information on the CPS and the CPS ASEC, see https://www.census.gov/programs-surveys/cps/technical-documentation/complete.html.

[10] The OPM assumes family as the demographic unit for computing the poverty rate. Although our methodology maintains this demographic unit to measure poverty, we include covariates that are aggregated at the household level in the poverty imputation model. This is mostly done for convenience since we use the same methodology to impute the SPM rates. We do not expect any substantial bias in our estimates as a result of this modeling decision. The components of income include earnings (from wage, business, and farm), unemployment compensation, workers' compensation, social security, supplemental security income, public

This conversion typically involves dividing the annual income components by 12. Exceptions to this include wage earnings, business income, and farm income, all of which are adjusted downward conditional on the employment situation of the household at the time of the survey.[11] The income components are aggregated for each family before comparing it with their relevant poverty thresholds to determine their poverty status.

We then build a model of the poverty status using data from CPS ASEC for imputing the poverty status of individuals in basic monthly CPS. A key assumption of this methodology is that the model of poverty status built using CPS ASEC data also applies to the basic monthly CPS data for the relevant month. The imputation model includes the following variables that are available in both CPS ASEC and basic monthly CPS: race, Hispanic origin, sex, age, education, children present in the household, region of residence. Han et al. (2020) present an alternative method to update the poverty rate every month by relying more heavily on basic monthly CPS than we do. Their methodology, however, only updates the annual measure of poverty every month and has a rolling reference period of 12 months unlike a one-month reference period used in this paper. Appendix Figure 1 presents a comparison of results from our method with that of Han et al. (2020).[12]

Monthly SPM

We also follow Parolin et al. (2022) to compute the SPM rate every month by combining data from basic monthly CPS and CPS ASEC. Similar to the methodology for OPM, the dataset is arranged at the individual level, although the SPM resources are computed at the SPM unit level. This method first involves converting annual SPM resources from the most recent CPS ASEC into a monthly measure for the month in which the SPM imputation is being conducted. This involves a series of assumptions about intra-annual allocation of taxes, non-cash income, and expenditures on several items included in the SPM resource measure. We do not make explicit adjustments for the policies such as economic impact payments, expanded unemployment benefits, and expanded child tax credits that were introduced during the pandemic.[13] We then build a model of the (SPM) poverty status in CPS ASEC, which is used to impute the poverty status of individuals in basic monthly CPS.[14] We compute the standard error of the poverty estimate by following the methodology described in Lachenbruch (2010).

An important caveat to keep in mind is that the three measures considered in this paper are not fully comparable; while the OPM and SPM are available for people of all ages, the HPS only has detailed information on people 18 years and older. Therefore, for the OPM and SPM, we only include poverty rates for people aged 18 years and older to make them comparable with the HPS.[15] Table 2 presents differences in the sample

---

assistance, veterans' payments, survivor benefits, pension or retirement income, interest, dividends, rents, royalties, income from estates, trusts, educational assistance, alimony, child support, assistance from outside the household, other miscellaneous sources.

[11] This differs from Parolin et al. (2022) in that we do not include expanded unemployment benefits introduced during the COVID-19 pandemic. This exclusion likely overstates the monthly poverty rate during the months during which these benefits were available.

[12] We conduct the comparison only for the population that is 18 years and older since HPS is only representative for this universe. Our replication of Han et al. (2020) is based on code posted on the Brookings website by the authors in June 2020. See results in Appendix Figure 1. The results diverge at the beginning of the pandemic because Han et al. (2020) suspect that the Economic Impact Payments (EIP) made as a part of the CARES Act 2020 were erroneously included in the responses. Although tax credits such as the EIP are not meant to be included in the income measure for the official poverty measure, but it is likely that CPS respondents included them in the family income.

[13] The consequence of not including major policy responses to the pandemic is that the monthly poverty rates we estimate may be higher than otherwise. Parolin et al. (2022) present poverty rates with and without these adjustments. Addressing this issue as a follow-up to this paper would provide important insights.

[14] We generate 10 imputations of the poverty rate using the linear probability model. The relevant Stata command is *mi impute chained regress*. The ten imputations are used to compute the mean probability of being poor for each individual.

[15] No group quarters are included.

means between the HPS and basic monthly CPS samples used in this analysis. Although estimates show the large degree of similarity between the two surveys, there are a few notable exceptions. We see fewer people living in households with children in basic monthly CPS (32.7%) compared to that in the HPS (38.8%). We also see a larger fraction of the sample with college education in basic monthly CPS (34.9%) compared to that in the HPS (30.5%).[16]

Table 2: Demographic Characteristics from the HPS and Basic Monthly CPS

	HPS		CPS	
	Share of population	Std. Err.	Share of population	Std. Err.
Age 18-64	78.4	0.01	78.0	0.03
Age 65 and older	21.6	0.01	22.0	0.03
Male	48.5	0.01	48.4	0.04
Female	51.5	0.01	51.6	0.04
No Children in the household	61.2	0.07	67.3	0.04
Children in household	38.8	0.07	32.7	0.04
Non-Hispanic White	62.6	0.01	62.3	0.04
Non-Hispanic Black	11.4	0.01	12.0	0.03
Non-Hispanic Asian	5.2	0.02	6.2	0.02
Non-Hispanic Other Races	3.7	0.02	2.6	0.01
Hispanic	17.0	0.01	16.9	0.03
No High school degree	8.3	0.03	9.4	0.02
High school degree	30.7	0.03	28.9	0.03
Some college	30.4	Z	26.9	0.03
College degree	30.5	Z	34.9	0.04
Northeast	17.2	Z	17.3	0.03
South	38.3	Z	38.2	0.04
Midwest	20.6	Z	20.7	0.03
West	23.9	Z	23.8	0.03

Note: All estimates are different from zero at the 90 percent confidence level.
Z rounds to zero.
Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data for April 2020-June 2022.

[16] These notable differences may simply be artifacts of the differences in the sampling strategy and the weighting methodology used in the respective surveys.

II. Monthly Results[17]

A. Overall

The poverty or insecurity rate in each figure is measured at the family level for the OPM, SPM unit for the SPM, and at the household level for the HPS.[18] While financial insecurity is asked about the household, our use of HPS person weights is weighting the respondent's answer such that it is an individual-level indicator. Similar to poverty being a family level measure but reported as an individual level indicator. However, when we examine poverty and insecurity by demographics, we would expect less stability out of the HPS due to our basing this on the respondent's demographics rather than each individual's demographics in the CPS.

In Figure 1, national monthly results are shown for the OPM, the SPM, and the HPS from April 2020 through June 2022. The SPM rate was higher than the OPM rate for each month, while the other relationships among the three rates was more variable.[19]

Rates of financial insecurity from the HPS rate fall within 1.2 percentage points of OPM poverty rates from April to September 2020 and from April to September 2021. This does not continue in 2022, however, as instead, the HPS and the SPM are either not significantly different from each other or within one percentage point from April to June 2022 and both rates are higher than the OPM. More specifically, the HPS rate is higher than the OPM rate for all months except for April 2020 and April through August 2021.[20]

Conversely, the SPM rate is higher than the HPS for nearly all months. The only exceptions are December 2020, when the two rates are not significantly different, and March through June 2022 when the HPS is greater than or not significantly different from the SPM.

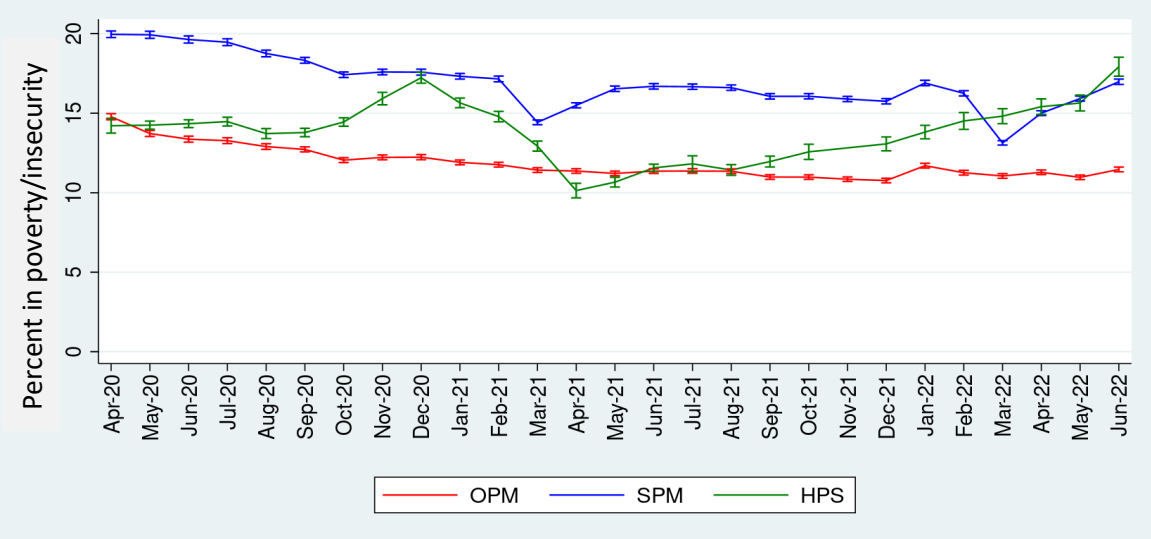
[17] No data was released in November 2021 for the HPS. All figures show a line connecting the HPS estimate for October 2021 to the HPS estimate for December 2021.

[18] SPM units are units include the official family definition plus any co-resident unrelated children under age 15, foster children under age 22, and unmarried partners and their relatives) or unrelated individuals (who are not otherwise included in the family definition).

[19] See Appendix table A2 for monthly poverty rates and standard errors.

[20] The HPS rate and OPM rate are not significantly different in June through August 2021.

Figure 1: Poverty/Insecurity Rates by Month



Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data for April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

Another important difference occurs when comparing the three rates at the beginning and end of the time-period of study. From April 2020 to June 2022, the OPM and the SPM rates each decreased by approximately three percentage points while the HPS rate increased by nearly four percentage points.[21]

It is notable that the average monthly SPM rate for 2021 of 16.2% is higher than the annual SPM rate for 2021 of 7.8% (Creamer et al., 2022).[22] This is likely due to three reasons. First, we do not explicitly model policies such as the American Rescue Plan Act (2021) that were implemented in response to the pandemic.[23] These policies are likely to have improved the financial situation of families, and thus lowered the incidence of poverty. Second, we allocate various taxes and benefits (such as the Earned Income Tax Credits and school lunch benefits) only to the relevant months rather than being distributing them evenly throughout the year. As a result, more families that are poor in months without those benefits compared to the full calendar year. Finally, it is more likely for people to be in poverty for an individual month than for an entire year.

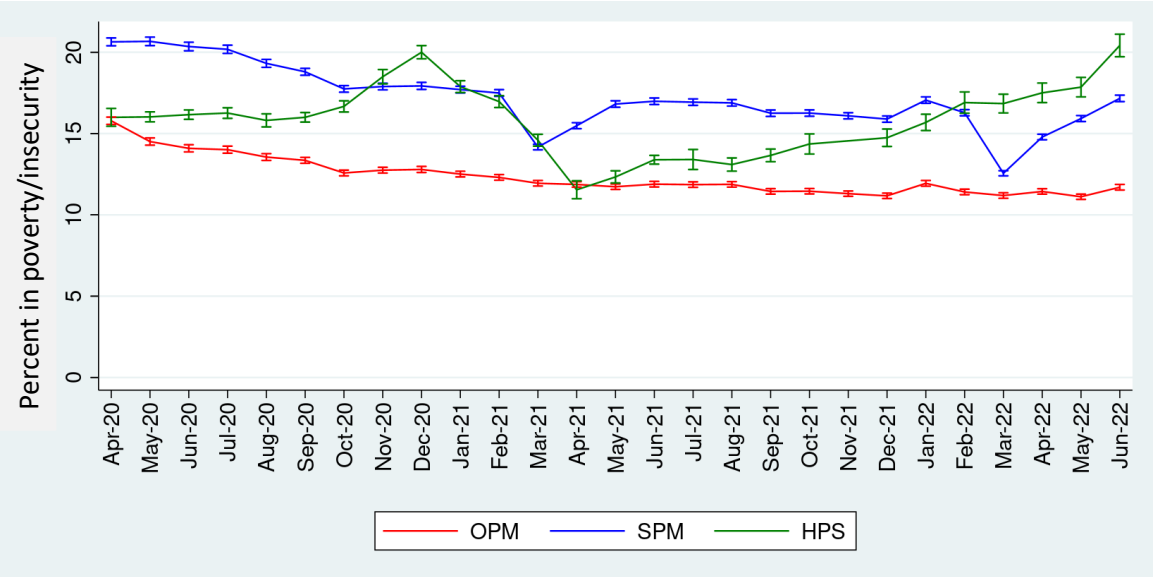
B. Age group

The CPS and HPS samples were both separated by the age of the respondent. The SPM measure shows higher monthly poverty rates than the OPM for all months and the HPS measure shows higher monthly insecurity rates than the OPM for most months for adults aged 18 to 64 (Figure 2).[24]

[21] The decrease in the OPM rate and the SPM rate were not significantly different from each other.
[22] This average was computed by taking the average of the 12 monthly values of the poverty rate for 2021. We cannot conduct this comparison for 2020 and 2022 in our study since we do not analyze all of months those years in this paper.
[23] While these programs were not included in this paper, the Census Bureau is working on modeling these programs for future SPM monthly estimates.
[24] The HPS and OPM were not significantly different in April 2020 and April 2021.

The SPM rate and the HPS rate have interesting seasonal differences. The dip in the SPM rate every March (and in April, to a smaller degree) is largely due to the assumption that EITC refunds are allocated to the month of tax filing rather than being evenly allocated throughout the year. The SPM rate was higher than the HPS rate from April to October in both 2020 and 2021, though this is not the case in 2022. The SPM rate was also higher than the HPS rate in February 2021, December 2021, and January 2022. Conversely, the HPS rate was higher than the SPM rate in November and December 2020 and March 2021, and from March 2022 through June 2022.[25]

Figure 2: Monthly Poverty/Insecurity Rates for Adults Aged 18 to 64



Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

In Figure 3, there is a different story for people aged 65 and over. The SPM rate is higher than the OPM and HPS rates for all months and, unlike for adults aged 18 to 64, the OPM rate is higher than the HPS rate for all months. The SPM being higher than the OPM is consistent with differences in the annual measures and is likely driven by differences in thresholds and medical expenses which are deducted from resources in the SPM but not in the OPM.

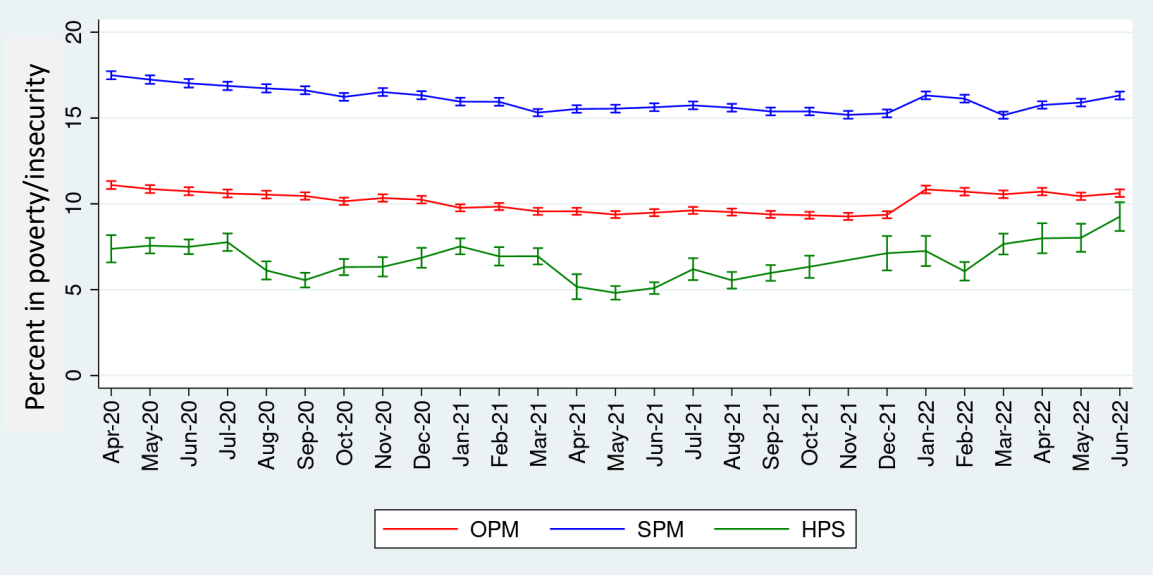
There are a number of possible explanations for these differences in the relationships among the poverty/insecurity rates between Figures 2 and 3. First, the HPS rate is based on reported financial insecurity while the OPM and SPM rates are based on income. This especially matters for people aged 65 and over because they are significantly less likely to have a mortgage or rental payment. Nearly 47 percent of respondents aged 65 and over own a home with no mortgage payments compared to 17 percent of respondents under age 65. Also, approximately 14 percent of respondents aged 65 and over were renters while 33 percent of respondents under age 65 were renters.

[25] The HPS and SPM were not significantly different in January 2021 and February 2022.

Second, the method of data collection used for the HPS, namely cellphone and email, skews to significantly higher income and education. Income is a categorical variable in the HPS; the four lowest categories were up weighted while the four highest categories were down weighted in the standard HPS weighting scheme. According to the 2019 American Community Survey 1-year data, 28.6 percent of people aged 65 and over have a college degree in 2019. In the HPS, approximately 56 percent of respondents aged 65 and over (unweighted) had at least a college degree, compared to 29 percent after the weight adjustment.

Third, older people are less likely to report hardships on surveys than younger people.[26] This does not mean that older people actually experience less hardship, but that the subjective measure of financial hardship or well-being differs by different age groups.

Figure 3: Monthly Poverty/Insecurity Rates for Adults Aged 65 and Over



Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

Due to the stark differences between Figures 2 and 3, we include Figure 4 which shows the difference in rates between the age groups over time. There are two major differences in the rates shown in Figure 4.

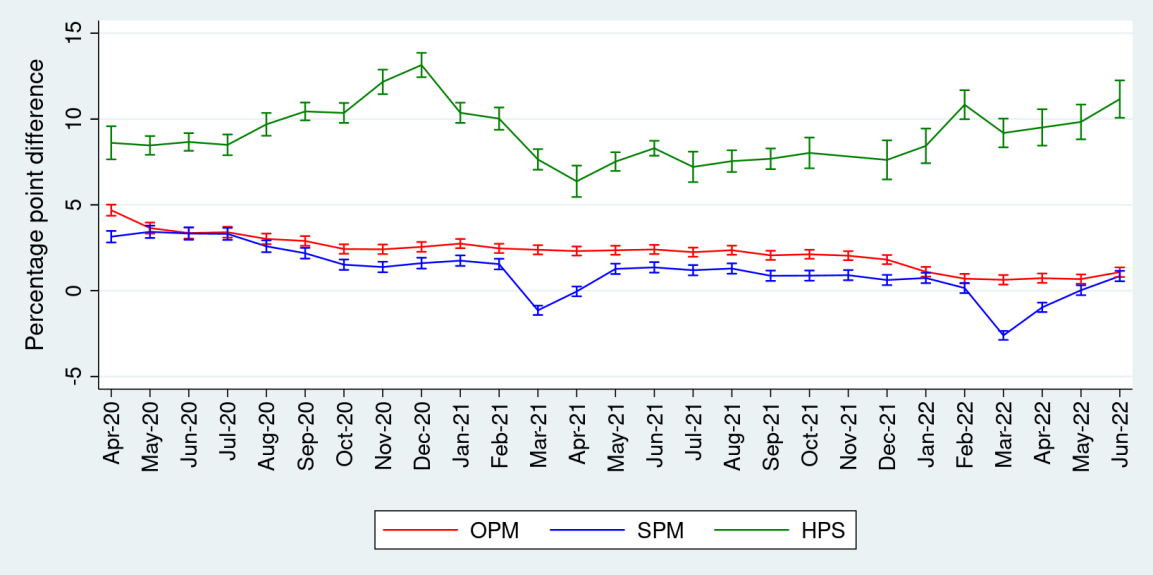
First, the HPS rate and the OPM rate are higher for people aged 18 to 64 than for people aged 65 and over for each month, while the same is not true for the SPM. While the SPM rates were higher for the younger age group for most months, the older age group had higher SPM rates in March 2021 and March and April 2022 due to the EITC payments added to income in these months.[27]

Second, the OPM and SPM rates were significantly more stable over time than the HPS rate. Between April 2020 and June 2022, the difference in rates between people aged 18 to 64 and people aged 65 and over

[26] See Analyses of Hardship and Subjective Poverty Amongst Older Australians (unimelb.edu.au) for an overview of the literature on age-based hardship reporting.
[27] The SPM rates were not significantly different in April 2021 and February and May 2022.

was between 0.6 percent and 4.7 percent for the OPM, -2.6 percent and 3.4 percent for the SPM, and 6.4 percent and 13.1 percent for the HPS.

Figure 4: Difference in Poverty/Insecurity Rates Between Age Groups (Age 18 to 64 less Age 65 and Older)



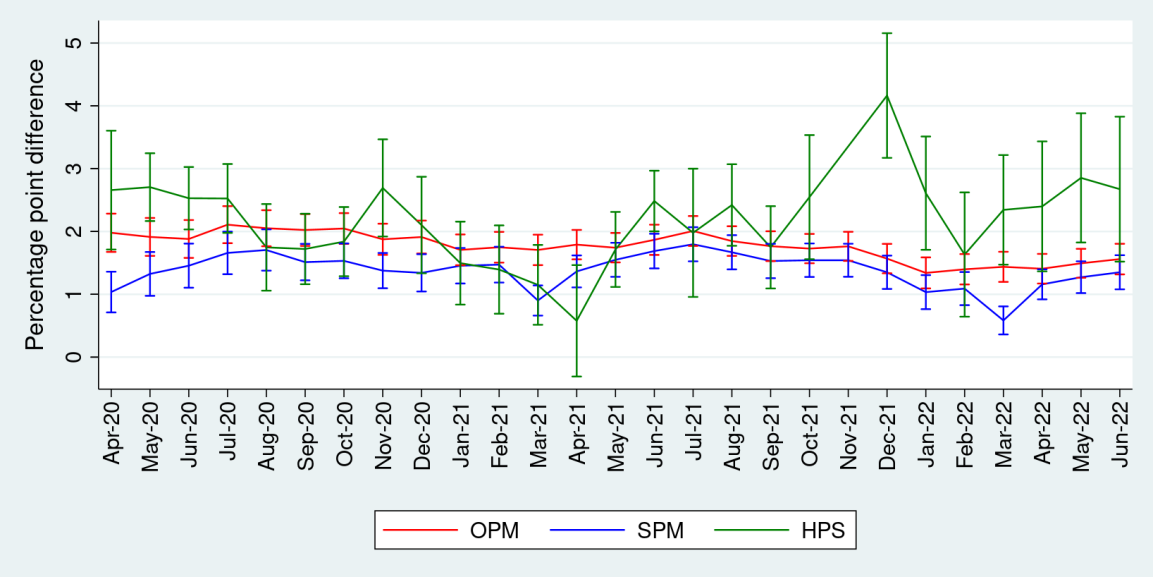
Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

C. Sex

The differences in the three poverty/insecurity rates for males and females did not add anything to the story already shown in Figure 1. The more interesting result was the difference in poverty/insecurity rates by sex(Figure 5). It is important to note that in the HPS, we only know the sex of the respondent. The respondent's answers are weighted in such a way to account for this. Conversely, for the OPM and SPM, we know the sex of all people in the household.

What is noticeable in this figure is the larger month-to-month variation in the sex difference in the HPS compared to that in the OPM or the SPM. This is likely due to differences in sample construction as HPS only includes a single person in the analysis, while OPM and SPM include all individuals in the household in the analysis. We see more stability by sex in the OPM and SPM because most households have both males and females. The difference in poverty/insecurity rates by sex ranged from 1.34 to 2.11 percentage points in the OPM, from 0.90 to 1.80 percentage points in the SPM, and from 0.58 to 4.16 percentage points in the HPS. Furthermore, standard deviations of the differences in poverty/insecurity rates were calculated as a means of measuring the volatility. The sex differences in HPS rates were the most volatile (0.70 percent), followed by the SPM (0.27 percent) and the OPM (0.22 percent).

Figure 5: Difference Between Female and Male Poverty/Insecurity Rates (Females less Males)



Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

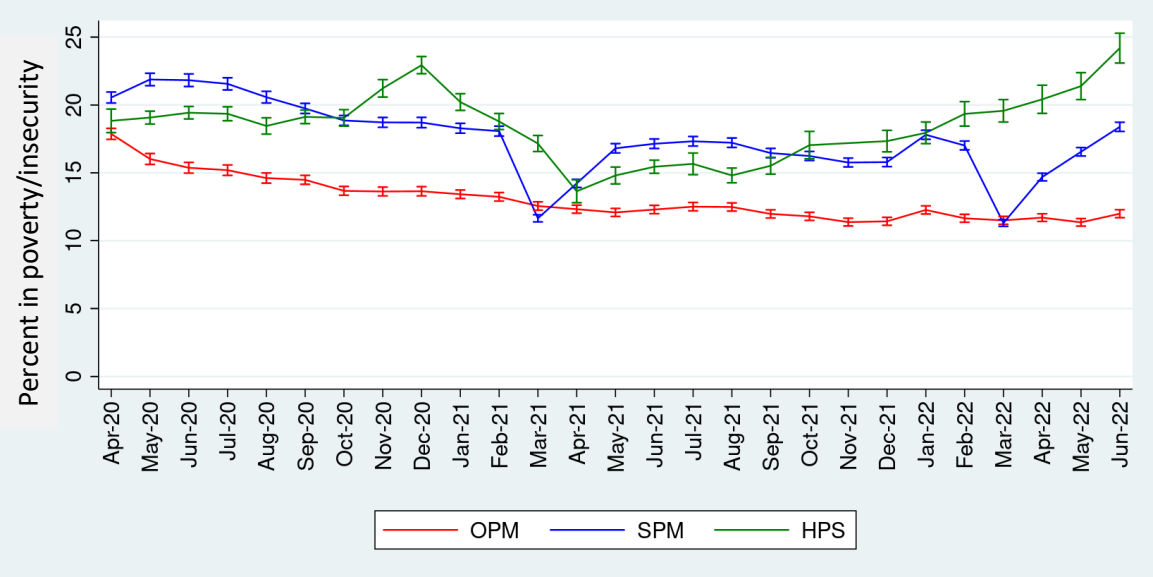
D. Presence of children in the household

There is little information about people in the respondent's household in the HPS. What we do know is if there are children present in the household, though we do not know if those children are related to the respondent. We use this variable in the two surveys to look at poverty/insecurity rates of respondents living in households with children (Figure 6) and households without children (Figure 7).

In both figures the SPM rate is higher than the OPM rate for all months with only two exceptions (the SPM rate is lower than the OPM rate in March 2021 and the SPM rate is not significantly different from the OPM rate in March 2022). The HPS rate, on the other hand, fluctuates around the SPM rate in Figure 6 and around the OPM rate in Figure 7.

More specifically for households with children, the HPS rate is higher than the OPM rate for all months. The HPS rate fluctuates around the SPM rate: the HPS rate is lower than the SPM rate from April to August 2020, higher than the SPM rate from November 2020 to March 2021, lower than the SPM rate from May to September 2021, and higher than the SPM rate in December 2021 and from February to June 2022.

Figure 6: Monthly Poverty/Insecurity Rates for Households with Children

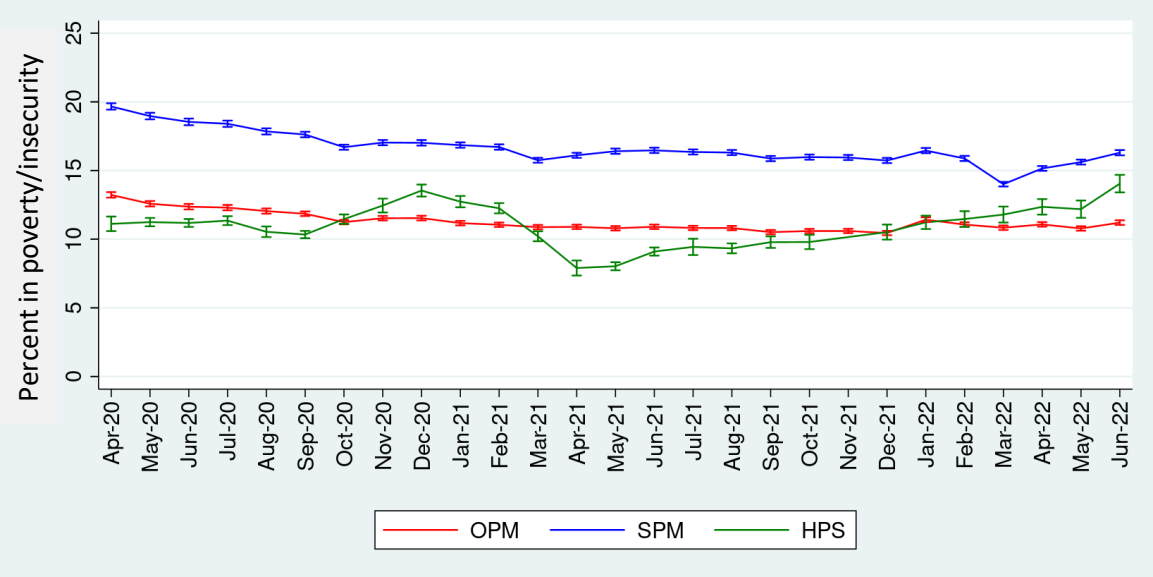


Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

Conversely, for households without children, the HPS rate is lower than the SPM rate for all months and the HPS rate fluctuates around the OPM rate. More specifically, the HPS rate is lower than the OPM rate from April to September 2020, higher than the OPM rate from November 2020 to February 2021, lower than the OPM rate from March to October 2021, and higher than the OPM rate from March to June 2022.[28]

[28] The two rates are not significantly different in October 2020 and from December 2021 to February 2022.

Figure 7: Monthly Poverty/Insecurity Rates for Households without Children

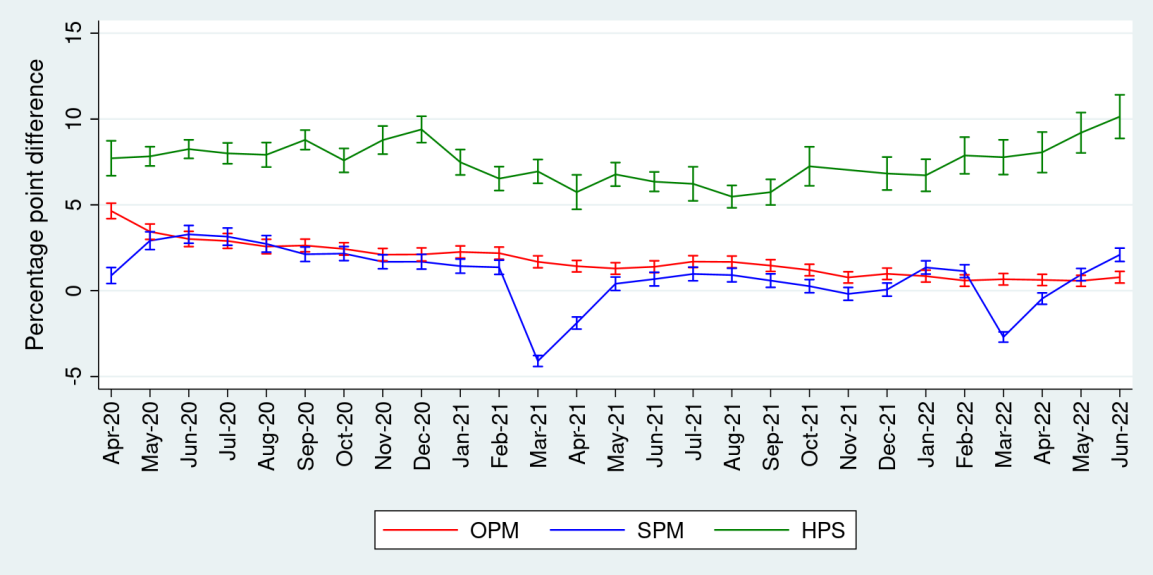


Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

What is not immediately clear from Figures 6 and 7, is that there are differences by poverty/insecurity rate between households with and without children (Figure 8). The differences are not large for the OPM and the SPM, other than the months that the EITC is assigned to households with children (March and April). Conversely, the difference for the HPS rate was higher than the OPM rate in April 2020 and the differences for the HPS rate are more than double the differences for the OPM and SPM rates for all other months.

This could partly be explained by different units of analysis: families for the OPM, SPM units for the SPM, and households for the HPS. It is also important to note that the HPS is a subjective measure of consumption while the OPM and SPM are objective measures of income. It's possible that the subjective feeling of expense difficulty is worse for households with children than for households without children, even if the income differences are smaller.

Figure 8: Difference in Poverty/Insecurity Rates for Households with and without Children (With Children minus without Children)



Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

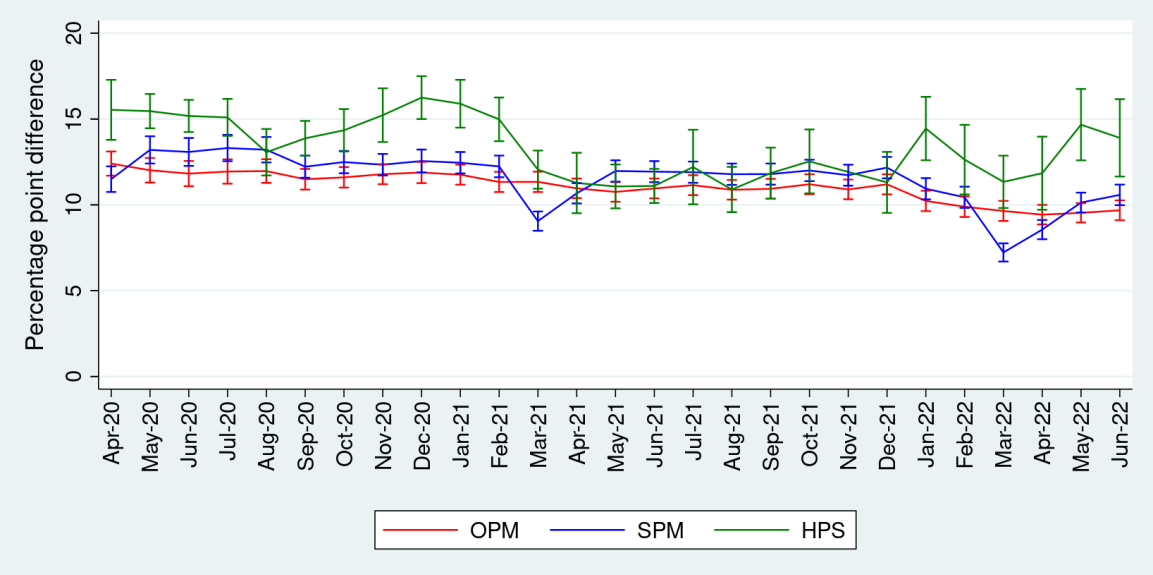
E. Race and Hispanic Origin

In Figures 9 through 11, the poverty/insecurity rate differences by race and Hispanic origin are shown as differences from the poverty/insecurity rate for non-Hispanic White individuals. In The HPS, we only know the race of the respondent, while in the CPS we know the race of each individual member of the household. As a result, we would expect the CPS measures to be more reliable, although all of the measures are weighted to represent the U.S. population.

First, the HPS rate is higher than the other two poverty rates for the non-Hispanic Black population for approximately 60 percent of the time-period.[29] These months encompass all of 2020, except for August of 2020, all of 2022, and the first few months of 2021.

[29] 16 out of 27 months for the OPM and 17 out of 27 months for the SPM.

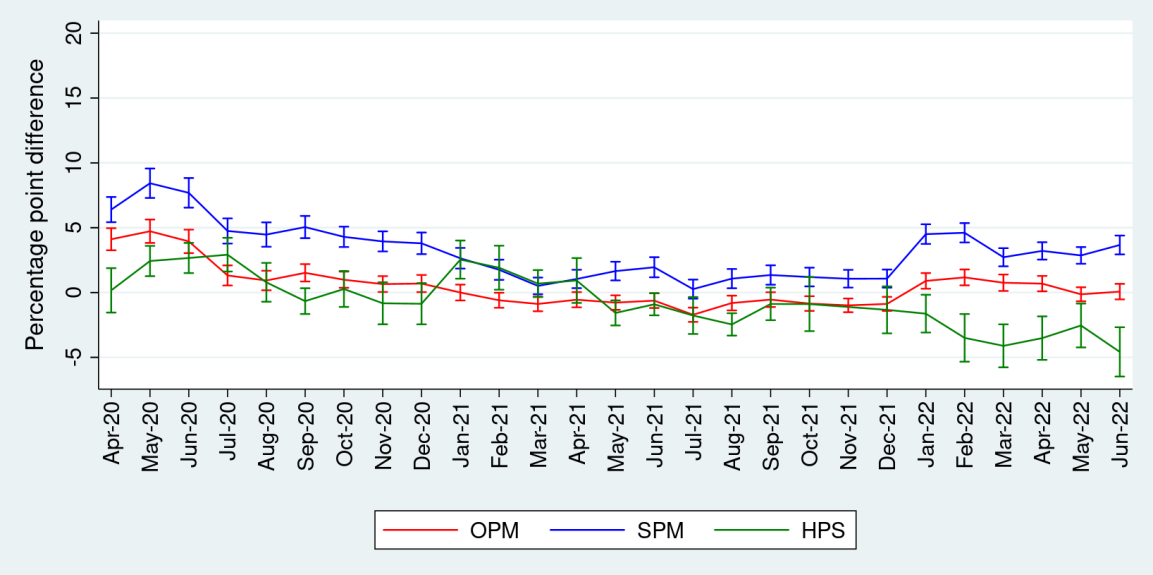
Figure 9: Poverty/Insecurity Rate Differences by Race and Hispanic Origin (Non-Hispanic Black minus Non-Hispanic White)



Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

Second, the HPS rate is lower than the other two poverty rates for non-Hispanic Asian individuals for 11 out of 27 months for the OPM and 21 out of 27 months for the SPM. This encompasses most of the time-period for the SPM and mainly in 2020 and 2022 for the OPM.

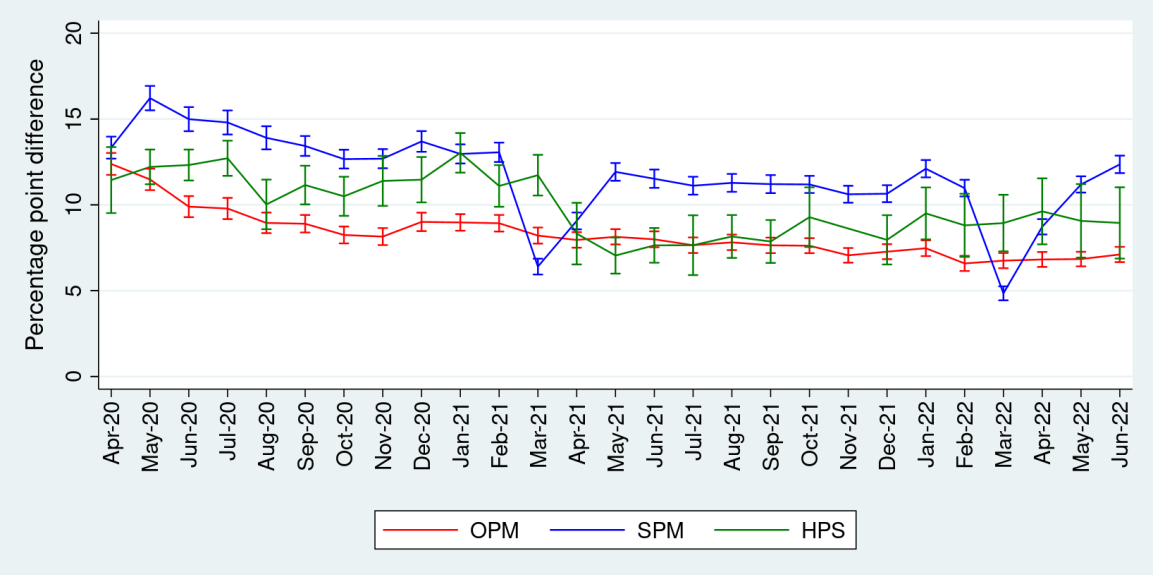
Figure 10: Poverty/Insecurity Rate Differences by Race and Hispanic Origin (Non-Hispanic Asian minus Non-Hispanic White)



Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

Third, the HPS rate falls between the other two poverty/insecurity rates for the Hispanic population for much of the time-period. The HPS rate is higher than the OPM rate and lower than the SPM rate for 8 months, not significantly different from the OPM rate and lower than the SPM rate for 10 months, and higher than the OPM rate and not significantly different from the SPM rate for 4 months.

Figure 11: Poverty/Insecurity Rate Differences by Race and Hispanic Origin (Hispanic minus Non-Hispanic White)



Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

F. Education

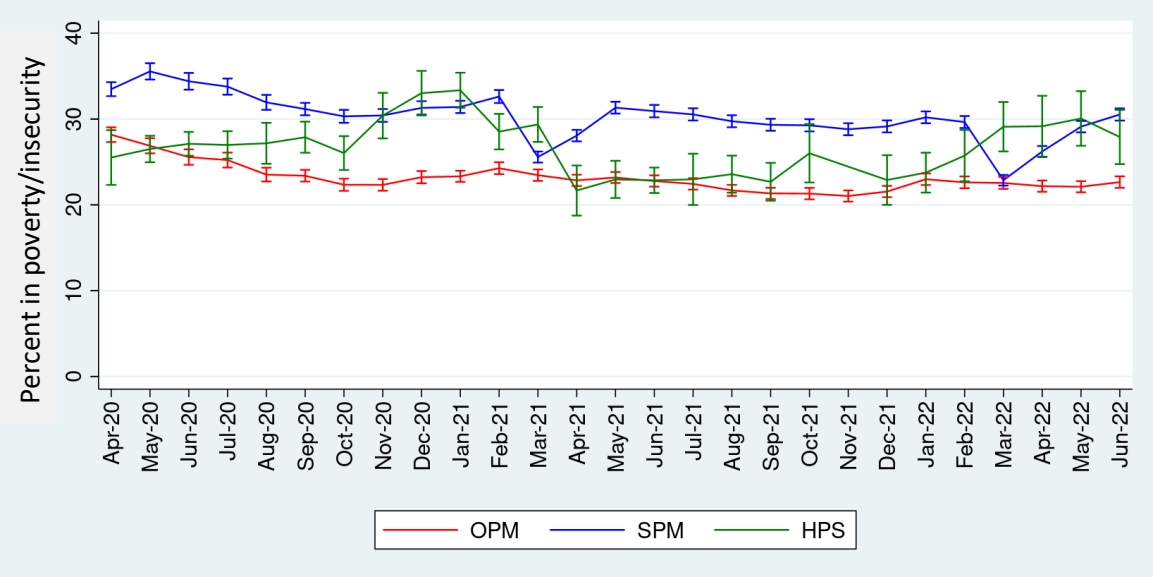
Educational attainment represents the highest level of education achieved by the respondent in the HPS and by the household reference person in the CPS. We examined household reference person educational attainment rather than individual educational attainment for two reasons. The first is that we followed the use of educational attainment in the literature.[30] The second is that we found that the educational composition of the populations were more closely aligned when we used one person per household rather than individuals.

For the purposes of this paper, we aggregated answers into four categories: No high school diploma, high school graduate, some college education, and bachelor's degree or higher. While there is overlap between the HPS rates and the OPM and SPM, there are important differences by education level.

For people without a high school degree, the HPS rate vacillated back and forth between the OPM rate and the SPM rate. The HPS rate was lower than the SPM and not statistically different from the OPM rate from April to July 2020, higher than the OPM rate and not statistically different from the SPM rate from November 2020 to January 2021, lower than the SPM rate and not statistically different from the OPM rate from April to September 2021 and from December 2021 to January 2022, and higher than the OPM rate and not statistically different from the SPM rate from April to June 2022.

[30] See Bitler, Marianne, Hilary Hoynes, and Elira Kuka. "Child poverty, the great recession, and the social safety net in the United States." *Journal of Policy Analysis and Management* 36, no. 2 (2017): 358-389.

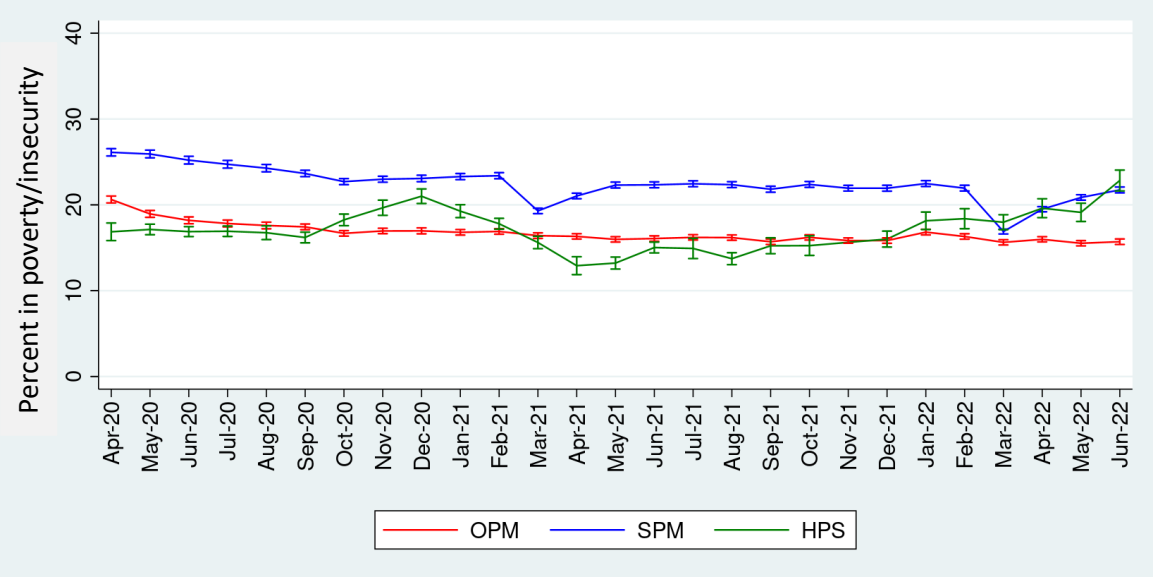
Figure 12: Poverty/Insecurity Rates for People Without a High School Diploma



Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

For high school graduates, the relationship among the three rates is quite different. First of all, the HPS rate is lower than the SPM rate from April 2020 through February 2022 and then it vacillates around the SPM rate for the remainder of the time period. Secondly, the HPS rate vacillates around the OPM rate over the entire time-period. In contrast to people without a high school degree, the HPS rate was lower than the OPM rate in Figure 14 from April through July 2020 as well as September 2020 and March through August 2021.

Figure 13: Poverty/Insecurity Rates for High School Graduates

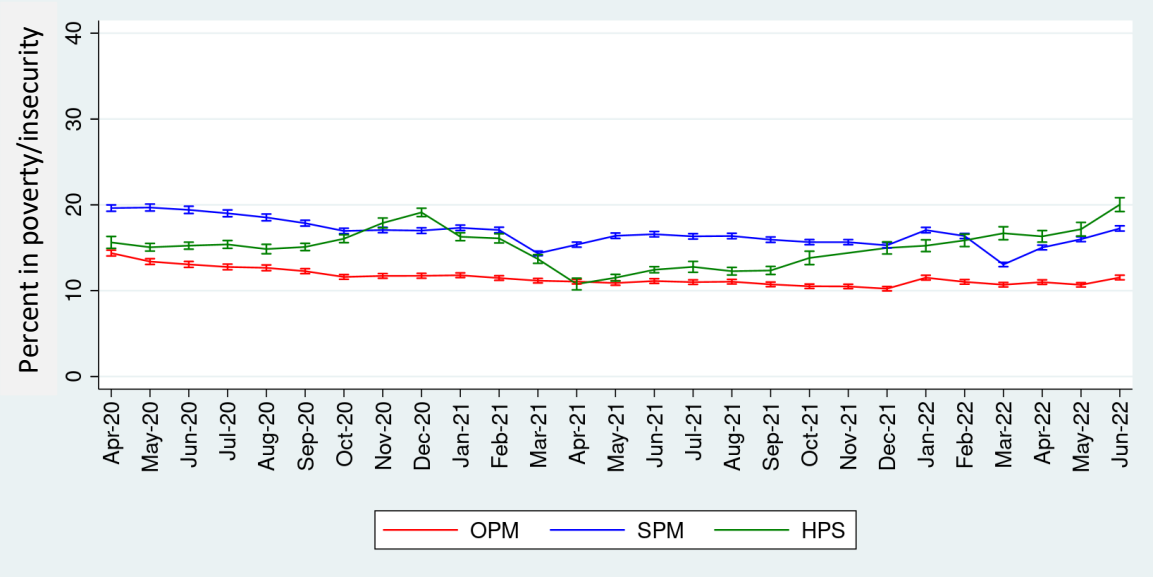


Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

For people with some college education but without a bachelor's degree, the relationship among the three poverty/Insecurity rates is different once again. Just like we found for high school graduates, the HPS rate is lower than the SPM rate for 18 out of the 27 months. The exceptions are that the HPS rate is higher than the SPM rate from November to December 2020 and from March to June 2022.[31] Unlike the other levels of education, the HPS rate was higher than the OPM rate for all months except for April 2021 for people with some college education.

[31] The two rates are not significantly different in December 2021 and February 2022.

Figure 14: Poverty/Insecurity Rates for People with Some College Education

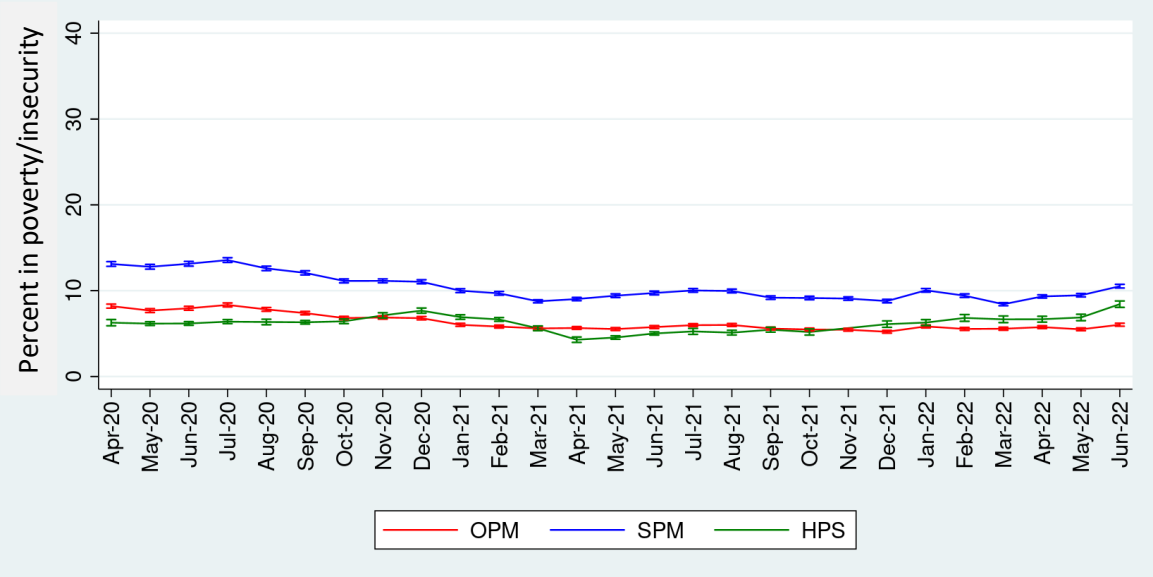


Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

For people with a bachelor's degree, the SPM rate is higher than the HPS rate for all months. The HPS rate does not surpass the SPM rate at the end of our time-period like it does for other levels of educational attainment. Just like we found for high school graduates, the HPS rate vacillates around the OPM rate during our time-period. The HPS rate was lower than the OPM rate from April through October 2020, higher than the OPM rate from December 2020 through February 2021, lower than the OPM rate from April to August 2021, and higher than the OPM rate from December 2021 through June 2022.[32]

[32] The two rates are not significantly different in November 2020 and March, September, and October 2021.

Figure 15: Poverty/Insecurity Rates for People with a Bachelor's Degree or Higher



Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022. Error bars represent 90% confidence intervals around the mean.

III. Regression Results

In the previous section, we described how monthly poverty/insecurity rates varied by individual demographic, education, and regional characteristics. In this section, we estimate the following regression model using data from April 2020 through June 2022 in order to provide results for each characteristic while holding all other characteristics constant.

$$Y_{it} = \beta_0 + \beta_1 Age_{it} + \beta_2 Race_{it} + \beta_3 Gender_{it} + \beta_4 Child_{it} + \beta_5 School_{it} + \beta_6 Regions_{it} + \beta_7 Month_{it} + \varepsilon_{it} \quad (1)$$

Equation (1) is an Ordinary Least Squares model in which the dependent variable (Y) represents one of the three poverty/insecurity measures (Table 3). The dependent variable is whether or not the person is financially insecure in the HPS, whereas it is the predicted probability of an individual's family being OPM/SPM poor for the poverty measures. [33] Although the dependent variable is not strictly comparable across the measures, we consider the regression coefficients to be indicative of the importance of various correlates of these measures.

[33] For the OPM and the SPM, the dependent variable is the prediction from the multiple imputation model, which we can interpret as the probability that an individual is OPM poor or SPM poor. Since the multiple imputation model is based on a linear probability model of the poverty status, the predictions may be less than zero or greater than one. Although the individual values of predictions may not always make sense, this is fine since the estimation model is designed to give estimates for population groups. Although logit and probit are alternative estimation models, they also impose rather arbitrary distributional assumptions about the error term.

In equation (1), the suffix *i* denotes individuals and *t* denotes the survey month. The respondent characteristics include age, race and ethnicity, sex, the presence of children in the household, education level, and the region in which they live. Month fixed effects are also included in the estimation model.

The magnitude of the regression coefficients are not directly comparable: the regression is run on different surveys and the dependent variable is binary for the HPS and is a predicted probability of being poor for the OPM and SPM. However, the sign and the significance of the coefficients can be compared.

Results in Table 3 point to some important correlates of the monthly poverty/insecurity status and how those vary between HPS, OPM, and SPM. Among the variables in the model, having a college degree has the largest impact on the monthly poverty/insecurity rates compared to the reference group of people without high school degree.

There are three characteristics for which the three poverty/insecurity rates tell a consistent story: sex, race and Hispanic origin, and educational attainment. Holding all else constant, females were more likely to be in poverty and financial insecurity than males.[34]

For each of the three poverty/insecurity rates, the likelihood of being in poverty or financial insecurity decreased with educational attainment.[35]

For all three measures of poverty, non-Hispanic Black individuals had the highest predicted rates and non-Hispanic White individuals had the lowest rates. The main difference with these rates is that the Hispanic population had the second-highest OPM and SPM rates, while the non-Hispanic other race population had the second highest HPS rate.[36]

Table 3: Predictors of Poverty or Financial Insecurity Status

	HPS		OPM		SPM	
	Est.	Std. Err.	Est.	Std. Err.	Est.	Std. Err.
Age 65 and older	Reference Group					
Age 18 to 64	6.86	0.10	1.78	0.03	0.73	0.03
Male	Reference Group					
Female	2.22	0.09	2.11	0.02	1.82	0.02
No children in household	Reference Group					
Children in household	3.67	0.09	1.77	0.02	-0.80	0.02
Non-Hispanic White	Reference Group					
Non-Hispanic Black	10.41	0.17	9.11	0.03	9.65	0.03
Non-Hispanic Asian	0.33	0.17	1.61	0.04	4.31	0.04
Non-Hispanic Other Races	7.76	0.22	4.01	0.06	4.06	0.07
Hispanic	5.63	0.15	5.17	0.03	8.11	0.03
No High school degree	Reference Group					
High school degree	-6.54	0.26	-4.99	0.04	-5.36	0.04
Some college	-9.10	0.27	-9.65	0.04	-10.64	0.04
College degree	-16.47	0.25	-13.92	0.04	-16.23	0.04
Northeast	Reference Group					
South	0.52	0.13	1.11	0.03	0.43	0.03

[34] The HPS rate and OPM rate are not significantly different.

[35] The HPS and SPM rates were not significantly different.

[36] The SPM rate for Hispanics and the HPS rate for Other Races, NH are not significantly different.

Midwest	-1.10	0.13	-0.10	0.03	-1.63	0.03
West	-0.51	0.14	-0.81	0.03	0.30	0.03
Constant	13.20	0.39	18.78	0.07	26.04	0.07

Notes:

1. The unit of analysis in all three regressions is an individual. Person-level survey weights are used in all regressions.
2. The dependent variable for the first column of results is a binary variable, as described in Section II, on whether an individual (in HPS) lives in a household that is financial insecure. The dependent variable for the last two column of results is the estimated probability of an individual (in basic monthly CPS) living in a resource unit that is OPM or SPM poor.
3. All regressions include controls for the month of survey.
4. All of the coefficients are different from zero at the 90% confidence level.

Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022.

Conversely, there were two characteristics for which there were important differences among the three poverty/insecurity rates: the presence of children in the household and region. Households with children present were more likely than households without children present to be in poverty or financial insecurity according to the HPS and OPM, while the reverse was true for the SPM. This result may be due to small differences between the two types of households in most months, and relatively large differences during the EITC months. We need to bear in mind that the SPM measure presented here excludes children, thus does not represent the full effect of the expanded Child Tax Credit implemented in 2021.

Finally, the regression results show some regional differences. All three rates are highest in the South, but the SPM and HPS are lowest in the Midwest while the OPM is lowest in the West.[37]

IV. Comparisons to Prior Values

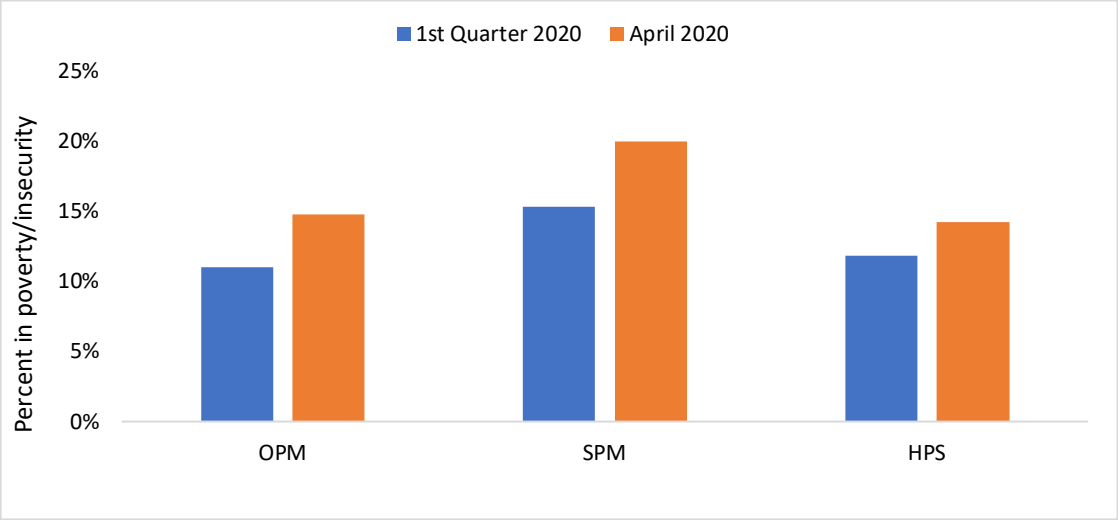
The HPS began in April 2020. However, we created a pre-pandemic HPS financial insecurity rate using two related questions in the HPS. The first question asks about food insufficiency prior to March 13, 2020.[38] The second question asks about current food insufficiency. Approximately 8.2 percent of respondents reported having sometimes or often not enough to eat prior to the pandemic (food insufficiency). After the pandemic started, 9.8 percent of respondents reported food insufficiency. The pre-pandemic to pandemic food insufficiency ratio is 0.83. We multiply this value by our financial insecurity value in April 2020, 14.21 percent, to get our financial insecurity value prior to the pandemic, 11.84 percent.

The HPS increased by 2.4 percentage points, the OPM by 3.8 percentage points, and the SPM by 4.7 percentage points from the first quarter of 2020 to April 2020.

[37] The SPM rate in the South is not significantly different from the HPS rate in the South.

[38] We would like to note this is meant to be an illustrative exercise, since we do not fully address differences in the reference period food insufficiency and poverty in HPS.

Figure 17: Prior to Pandemic Comparisons



Source: U.S. Census Bureau, Household Pulse Survey Week 1; CPS Basic Monthly data January 2020-April 2020.

V. Conclusion

The purpose of this paper was twofold. The first was to use a question about difficulty paying household expenses in the HPS to create a new financial insecurity measure that could be released faster and at a higher frequency than poverty measures coming from the CPS ASEC or the ACS. The second was to provide some validation for new monthly poverty measures that are being researched and explored at the Census Bureau.

A major takeaway from this paper is that the three poverty/insecurity rates identified populations within approximately two to six percentage points of each other over this time-period. They are good candidates for a suite of measures of well-being that are updated and released more frequently than the OPM and SPM that are updated once a year.

Despite these encouraging similarities, there were a few important differences in the measures. The first difference was by age group. The HPS identified a far smaller proportion of people aged 65 and older in poverty/insecurity than either the OPM or SPM. This may be partially due to the idiosyncrasies of the surveys, partially due to the difference between measuring income and consumption, and partially due to reporting differences by different age groups.

The second difference was between households with children present and households without children present. These differences could be partly explained by differences in sample composition, the difference between families or SPM units and households, and the difference between an objective income measure and a subjective financial difficulty measure.

While there were differences in the three measures, it is important to remember that the three measures are measuring different things. The OPM and the SPM measure income poverty, while the HPS measures respondent's subjective feeling of their financial insecurity. Both of these are important and can tell us a lot about the monthly well-being of Americans.

While both the CPS and HPS have strengths and weaknesses, further research can improve upon these measures to make them more reliable. The modeling decisions made during computation of the monthly OPM and SPM may need to be revisited as they can affect the level and trend of poverty. For example, whether EITC payments and school lunch program are allocated to the months when the benefits are received or equally spread out across 12 months can affect the SPM rate. Whether we model family income or individual income may also have an effect the level and change in poverty over time. With HPS, an addition of one or a series of questions on the income level of families would be ideal for measuring income poverty, although that would come with added respondent burden. The results of this paper show that measuring poverty and financial insecurity at a monthly level is possible given the datasets and methods that are available, although further work is still needed to improve the credibility of these estimates.

References

Creamer, John, Emily A. Shrider, Kalee Burns, and Frances Chen. *Poverty in the United States: 2021*. U.S. Census Bureau, Current Population Reports, P60-277, U.S. Government Publishing Office, Washington, DC, September 2022.

Han, Jeehoon, Bruce D. Meyer, and James X. Sullivan. "Income and Poverty in the COVID-19 Pandemic." *Brookings Papers on Economic Activity 2020*, no. 2 (2020): 85-118.

Lachenbruch, Peter A. "Stata tip 89: Estimating means and percentiles following multiple imputation." The *Stata Journal* 10, no. 3 (2010): 496-499.

Parolin, Zachary, Megan Curran, Jordan Matsudaira, Jane Waldfogel, and Christopher Wimer. "Estimating Monthly Poverty Rates in the United States." *Journal of Policy Analysis and Management* (2022).

Appendix

Table A1: Difference Between Item Responders and Item Non-responders Population

	Missing responses		No missing responses		Difference	
	Population percent	Std. Err.	Population percent	Std. Err.	Population percent	Std. Err.
Age 18 to 29	25.95	0.31	16.36	0.04	9.60	0.31
Age 30 to 39	18.94	0.23	18.39	0.04	0.55	0.23
Age 40 to 49	16.47	0.21	16.85	0.03	-0.38	0.22
Age 50 to 59	15.51	0.20	17.23	0.03	-1.72	0.20
Age 60 to 69	13.69	0.16	18.01	0.04	-4.32	0.17
Age 70 and above	9.44	0.16	13.16	0.03	-3.72	0.17
Female	49.08	0.28	51.49	0.03	-2.41	0.28
Children in household	46.39	0.25	38.11	0.08	8.28	0.26
White, NH	50.74	0.22	63.35	0.02	-12.61	0.22
Black, NH	15.22	0.19	11.08	0.02	4.14	0.20
Asian, NH	6.44	0.13	5.24	0.02	1.20	0.13
Other, NH	4.00	0.09	3.68	0.02	3.17	0.09
Hispanic	23.60	0.23	16.65	0.03	6.96	0.23
Less than HS	14.08	0.24	7.76	0.04	6.32	0.24
High school	37.57	0.26	30.23	0.04	7.34	0.27
Some college	28.90	0.21	30.46	0.02	-1.56	0.21
College	19.45	0.14	31.55	0.01	-12.10	0.14

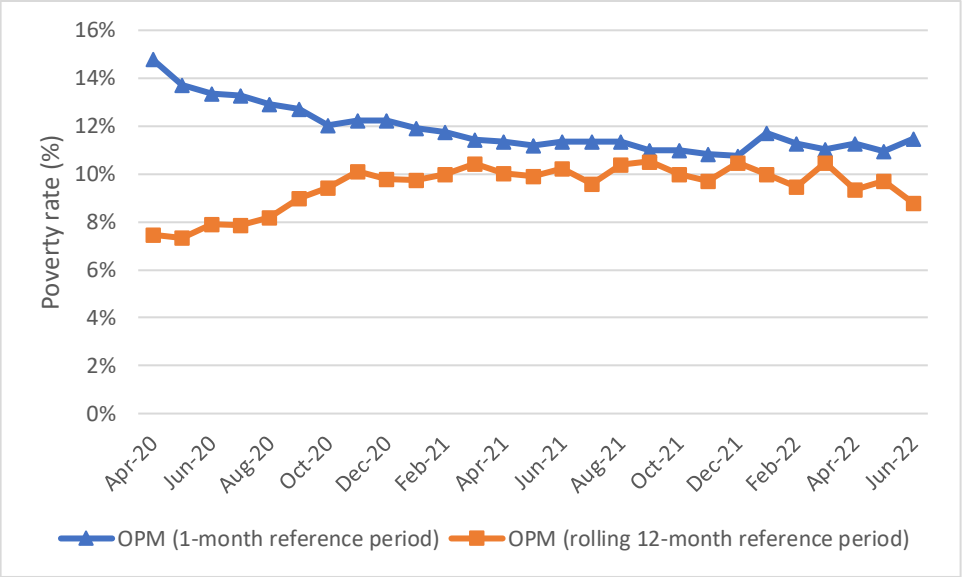
Note: All estimates are different from zero at the 90 percent confidence level.
Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46.

Table A2: Poverty/Insecurity Measures for Adults by Month

	OPM		SPM		HPS	
Month	Est.	Std. Err.	Est.	Std. Err.	Est.	Std. Err.
April 2020	13.65	0.12	18.84	0.14	14.21	0.28
May 2020	12.52	0.12	18.76	0.15	14.25	0.15
June 2020	11.93	0.12	18.19	0.15	14.34	0.15
July 2020	11.98	0.12	18.16	0.14	14.47	0.17
August 2020	11.48	0.11	17.31	0.14	13.72	0.19
September 2020	11.38	0.10	16.98	0.12	13.78	0.16
October 2020	10.64	0.10	15.97	0.12	14.44	0.16
November 2020	10.89	0.10	16.19	0.12	15.92	0.24
December 2020	10.85	0.10	16.14	0.12	17.23	0.21
January 2021	10.59	0.10	15.99	0.12	15.65	0.18
February 2021	10.52	0.10	15.90	0.12	14.78	0.20
March 2021	10.08	0.09	13.03	0.10	12.93	0.19
April 2021	10.12	0.09	14.23	0.11	10.13	0.28
May 2021	9.90	0.09	15.16	0.11	10.66	0.19
June 2021	10.05	0.09	15.32	0.11	11.56	0.14
July 2021	10.13	0.09	15.40	0.11	11.81	0.31
August 2021	10.04	0.09	15.31	0.11	11.43	0.21
September 2021	9.67	0.09	14.78	0.11	11.96	0.21
October 2021	9.59	0.09	14.72	0.11	12.57	0.29
November 2021	9.41	0.09	14.46	0.11	----	----
December 2021	9.41	0.09	14.38	0.11	13.07	0.27
January 2022	9.94	0.09	15.09	0.11	13.81	0.26
February 2022	9.48	0.09	14.46	0.11	14.51	0.32
March 2022	9.23	0.09	11.89	0.10	14.81	0.29
April 2022	9.43	0.09	13.30	0.10	15.41	0.30
May 2022	9.15	0.09	14.05	0.11	15.64	0.30
June 2022	9.39	0.09	14.35	0.11	17.92	0.36

Note: All estimates are different from zero at the 90 percent confidence level. No data available for November 2021 in the HPS.
Source: U.S. Census Bureau, Household Pulse Survey Weeks 1 through 46; CPS Basic Monthly data from April 2020-June 2022.

Appendix Figure 1: A Comparison of Monthly and Annual Poverty Rates Updated Every Month



Source: U.S. Census Bureau, CPS Basic Monthly data from April 2020-June 2022.