

OREGON POVERTY MEASURE 2017: TECHNICAL APPENDIX

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ABBREVIATIONS

ACS	American Community Survey
ACTC	Additional Child Tax Credit
CTC	Child Tax Credit
CDCTC	Child and Dependent Care Tax Credit
CPM	California Poverty Measure
CPS-ASEC	Current Population Survey Annual Social and Economic Supplement
EITC	Earned Income Tax Credit
LIHEAP	Low Income Home Energy Assistance Program
MOOP	Medical Out-of-Pocket Expenses
OPM	Official Poverty Measure (federal)
ORPM	Oregon Poverty Measure
SPM	Supplemental Poverty Measure (federal)
SNAP	Supplemental Nutrition Assistance Program
TANF	Temporary Assistance for Needy Families
TAXSIM	NBER Tax Microsimulation Model
TRIM3Urban	Institute Transfer Income Model, version 3
WIC	Special Supplemental Nutrition Program for Women, Infants & Children
WPM	Wisconsin Poverty Measure

OVERVIEW OF ORPM 2017 METHODOLOGY

These appendices offer detailed information about the process that we used to develop Oregon Poverty Measure (ORPM) estimates. The ORPM methodology reflects the overall spirit of the federal Supplemental Poverty Measure, while adopting many of the decisions used in recent iterations of selected state-level poverty measures, especially the California Poverty Measure (e.g., Bohn et al., 2017; Mattingly et al., 2019) and the Wisconsin Poverty Measure (e.g., Isaacs et al., 2010; Marks et al., 2011; Smeeding & Thornton, 2019). Our methodology also reflects the observations and recommendations offered by Renwick (2015). We especially appreciate the sharing of detailed information and insights by other researchers, which greatly facilitated our own development process. Where relevant, we note key differences between our approach and the approach taken by other research teams.

As described in the main report (Initial Findings from the Oregon Poverty Measure Project – April 2020), the ORPM aims to provide a more accurate measure of poverty status and related prevalence among Oregonians, than other available estimates (e.g., Official Poverty Measure), as well as provide sub-state estimates based on the improved measure. We found that the ORPM development process was best undertaken and represented as a seven-step approach, including:

- 1) Identifying data sources and restrictions
- 2) Defining the ORPM resource unit
- 3) Creating poverty thresholds
- 4) Estimating ORPM unit cash and non-cash resources
- 5) Estimating ORPM unit expenses
- 6) Estimating ORPM net tax liabilities and credits
- 7) Assign ORPM poverty status¹

¹ Throughout these appendices, ORPM poverty refers to the poverty status or rates associated with the newly developed ORPM measure.

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We started by identifying relevant data sources and restrictions. In this case, the main data source for observations is the American Community Survey (ACS), supplemented by several other data sources, including the Current Population Survey Annual Social and Economic Supplement. We also restricted the data by excluding college-aged individuals not living with their parents. We calculated ORPM poverty thresholds using aggregate national SPM threshold amounts and shares (US Bureau of Labor Statistics, n.d.), to which we applied 1) geographic adjustments at the sub-state level to adjust for regional variation in relative housing costs, using estimates of median housing costs from a 5-year sample of the American Community Survey (Ruggles et al., 2019); and 2) equivalence scales to adjust for the size of the resource unit (Betson, 1996).

We conducted statistical modeling to estimate selected other resources (e.g., SNAP, TANF, housing subsidies) and expenses (Medical Out-of-Pocket Expenses, childcare and other work-related expenses), using supplemental microdata from the Current Population Survey Annual Social and Economic Supplement (Ruggles et al., 2019) and TRIM3 (Parolin, 2019; TRIM3 project website, Data downloaded April 2019; Zedlewski and Giannarelli, 2015), as well as aggregate estimates from the Survey of Income and Program Participation (Mohanty et al., 2017). We also used the TAXSIM27 modeling program (Feenberg & Coutts, 1993; National Bureau of Economic Research, n.d.). Where relevant, these values were summed across all individuals in the ORPM resource unit. Net ORPM resources were calculated as follows for all individuals within each ORPM resource unit:

$$ORPM \text{ Net Resources} = (Resources - Expenses) - Net \text{ Tax Liability}^2$$

We then compared ORPM net resources with the ORPM poverty threshold. Individuals with unit-specific ORPM net resources below the unit-specific ORPM poverty threshold were considered as being in ORPM poverty.

² Where negative net taxes represents a liability and positive net taxes represent a credit.

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These seven steps reflect the various modifications to the Official Poverty Measure that is associated with the federal SPM and other state-level poverty measures. That said, our approach makes selected customizations that reflect data availability and selected state characteristics (e.g., size). See Table A1 for a summary of a comparison of poverty measurement approaches by the steps outlined above and related key components.

Table A1: ORPM Compared with Other Poverty Measures

Step	Key Component	OR Poverty Measure (2017)	CA Poverty Measure (2011-17)	WI Poverty Measure (2008-17)	U.S. Supplemental Poverty Measure Threshold (2009-18)	U.S. Official Poverty Measure Threshold (1967-18)
Identify restrictions	Excluded populations	Individuals in group quarters; some college-aged students	Individuals in group quarters; some college-aged students	Individuals in group quarters; some college-aged students	Individuals in group quarters	Individuals in group quarters
Define resource unit	Poverty unit	Resource unit/household: includes unmarried partners, co-resident, unrelated children, foster children, and unmarried partners and their relatives	Poverty unit/household: includes unmarried partners, co-resident, unrelated children, foster children, and unmarried partners and their relatives	Resource-sharing unit/household: includes unmarried partners, co-resident, unrelated children, foster children, and unmarried partners and their relatives	SPM resource unit/household: includes unmarried partners, co-resident, unrelated children, foster children, and unmarried partners and their relatives	Family: excludes unmarried partners, co-resident, unrelated children, foster children, and unmarried partners and their relatives
Calculate poverty thresholds	Basis for poverty threshold	Applies FCSU-based equivalence scales and geographic adjustment at PUMA level	Applies FCSU-based equivalence scales and geographic adjustment at county level	Applies FCSU-based equivalence scales, geographic adjustment at regional level, WI-specific COL adjustments and Medical Out-of-Pocket Expenses	FCSU; applies equivalence scales and geographic adjustment at state and metro/nonmetro level	Food: Cost in 1963 of the U.S. Dept of Agriculture economy food plan adjusted for CPI inflation

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Estimate resources	Cash resources	<p>ACS 1-year sample: Includes cash income from earnings, unemployment and workers compensation, Social Security, Supplemental Security Income, public (cash) assistance, veteran's payments, pension or retirement income, interest, dividends, child support, and educational assistance.</p> <p>CPS 3-year sample: Used to correct for ACS TANF/GA under-reporting</p>	<p>ACS 1-year sample: Includes cash income from earnings, unemployment and workers compensation, Social Security, Supplemental Security Income, public (cash) assistance, veteran's payments, pension or retirement income, interest, dividends, child support, and educational assistance.</p> <p>State administrative data: Used to correct for ACS TANF/GA under-reporting</p>	<p>ACS 1-year sample: Includes cash income from earnings, unemployment and workers compensation, Social Security, Supplemental Security Income, public (cash) assistance, veteran's payments, pension or retirement income, interest, dividends, child support, and educational assistance.</p>	<p>CPS 1-year sample: Includes cash income from earnings, unemployment and workers compensation, Social Security, Supplemental Security Income, public (cash) assistance, veteran's payments, pension or retirement income, interest, dividends, child support, and educational assistance.</p>	<p>CPS 1-year sample: Includes cash income from earnings, unemployment and workers compensation, Social Security, Supplemental Security Income, public (cash) assistance, veteran's payments, pension or retirement income, interest, dividends, child support, and educational assistance.</p>
	Non-cash resources	<p>TRIM 1-year sample: Used to correct CPS SNAP</p> <p>CPS 3-year sample: Used to impute SNAP</p>	<p>State administrative data: Used to correct SNAP participation and impute school meals subsidy</p>	<p>State administrative data: Used to impute SNAP, housing subsidy and LIHEAP subsidy to ACS sample</p>	<p>CPS 1-year sample: Includes SNAP, housing subsidies, school meals, WIC, LIHEAP</p>	<p>None</p>

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		and housing subsidy to ACS sample PUMA median rent: used to estimate housing subsidy value. WIC, LIHEAP, and school meals not included	CPS 3-year sample: Used to impute housing subsidies and WIC to ACS sample. HUD Fair Market Rent: Used to estimate housing subsidy value. LIHEAP not included	WIC and schools meals not included		
Estimate expenses	Medical Out-of-Pocket Expenses (MOOPs)	CPS 3-year sample: Used to impute MOOPs to ACS sample	CPS 3-year sample: Used to impute MOOPs to ACS sample	Not included as an expense (included in threshold)	CPS 1-year sample: Includes MOOPs	None
	Child care and work-related expenses	CPS 3-year sample: Used to impute child care expenses to ACS sample SIPP aggregate data: Used to estimate work-related expenses in ACS sample	CPS 3-year sample: Used to impute child care expenses to ACS sample SIPP aggregate data: Used to estimate work-related expenses in ACS sample	CPS 3-year sample: Used to impute child care expenses to ACS sample SIPP aggregate data: Used to estimate work-related expenses in ACS sample; adjusted for commutes from rural areas	CPS 1-year sample: Includes child care expenses SIPP aggregate data: Used to estimate work-related expenses in CPS sample	None

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Estimate net taxes	Federal and state tax liabilities and credits	TAXSIM: Used to estimate federal and state net taxes, including payroll taxes, income taxes and tax credits	TAXSIM: Used to estimate federal and state net taxes, including payroll taxes, income taxes and tax credits	In-house tax simulation model: Used to estimate federal and state net taxes, including payroll taxes, income taxes and tax credits	Census Bureau tax calculator: Used to estimate federal and state net taxes, including payroll taxes, income taxes and tax credits	None
Assign poverty status	Total resources < poverty threshold	Resource unit in poverty if: Resources – (Expenses + Taxes) < Poverty Threshold	Resource unit in poverty if: Resources – (Expenses + Taxes) < Poverty Threshold	Resource unit in poverty if: Resources – (Expenses + Taxes) < Poverty Threshold	Resource unit in poverty if: Resources – (Expenses + Taxes) < Poverty Threshold	Family in poverty if: Resources < Poverty Threshold

STEP 1: IDENTIFY DATA SOURCES AND RESTRICTIONS

The ORPM relies on multiple data sources to balance the challenges associated with data availability with the need for producing state and sub-state estimates of ORPM poverty. In particular, the federal Supplemental Poverty Measure (Fox, 2019) and associated anchored state-level SPM measures (Columbia Center on Poverty and Social Policy, n.d.) rely on the Current Population Survey Annual Social and Economic Supplement (CPS-ASEC) data. While CPS-ASEC data include detailed information about resources and expenses, including a variety of SPM-related variables, sample size limitations preclude its use for the production of sub-state SPM estimates (Renwick, 2015; US Bureau of Labor Statistics, 2018). Conversely, the American Community Survey (ACS), which is a robust source of sub-state population estimates, does not include detailed information on key SPM variables, such as non-cash resources (e.g., SNAP), expenses (e.g., MOOPs) or tax liabilities and credits (e.g., EITC).

Following Renwick's (2015) recommendations about developing a state-level SPM, as well as the processes described by the California Poverty Measure (e.g., Bohn et al., 2017; Mattingly et al., 2019) and the Wisconsin Poverty Measure (e.g., Isaacs et al., 2010; Marks et al., 2011; Smeeding & Thornton, 2019), we identified multiple data sources for use in the development of the 2017 ORPM. We used 1-year ACS 2017 data (Ruggles et al., 2019) as our main source of individual and resource unit observations. The ACS sample was supplemented by various other data sources, including a 3-year CPS-ASEC 2016-18 sample (Flood et al., 2019), SPM thresholds and shares from the US Bureau of Labor Statistics (US Bureau of Labor Statistics, n.d.), household equivalence scales (Betson, 1996), aggregate Survey of Income and Program Participation estimates (Mohanty et al., 2017), and TAXSIM microsimulation data (Feenberg & Coutts, 1993; National Bureau of Economic Research, n.d.). Selected data were also corrected for under-reporting using TRIM3 microdata (*TRIM3 project website*, downloaded in April 2019) following Parolin (2019).

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Similar to the federal SPM, we excluded individuals living in group quarters or institutions from our sample. We also excluded college students from our sample, following both the CPM and WPM. Specifically, we excluded individuals age 18-23 who: 1) were in school; 2) were an undergraduate; 3) earned a total income of less than \$5,000; 4) worked 0-13 weeks/year; 5) worked 0-20 hours/week; 6) did not live with their parents; and 7) did not have dependents.³

We used standard procedures to import and clean all data, including: 1) recoding NIU and missing data; 2) capping selected variables to reflect maximum payment amounts (e.g., Social Security Income and Supplemental Security Income amounts);⁴ and 3) applying the flat adjustment factor to account for survey timing.

See Table B1 for a list of data sources used in Steps 3-7 of ORPM 2017 poverty measure development.⁵ Plans for future integration of administrative data are also shown in Table B1.

³ Note that we do not exclude college-age students for our calculation of median housing costs and geographic adjustments in Step 3: Create poverty thresholds. For that step, we exclude individuals in group quarters, then restrict the data according to housing tenure and type.

⁴ All amounts exceeding maximum levels for specific household types were recoded as Other Income.

⁵ Steps 1 and 2 are conceptual.

Table B1: 2017 ORPM Data Sources by Component

	Data Element	ACS 1-year (2017, OR)	ACS 5-year (2012-16, US)	CPS 3-year (2016-18, OR)	BLS (2017, US)	SIPP (2014, US) ; CPS (2016, US)¹	TRIM (2015-16, OR)	TAXSIM27 (2017, OR)	Admin* (Future)
Calculate Poverty Thresholds	Expenditures Thresholds				X				
	Expenditure Shares				X				
	Median gross rent, national								
	Median gross rent, by Oregon PUMA		X						
Estimate Resources	Wage and salary income		X						
	Self-employment income	X							
	Social Security Income	X							
	Interest and dividend income	X							
	Other retirement income	X							
	SSI income	X							
	Other earnings	X							
	“Welfare” income (TANF, GA)	X		X					X
	SNAP	X		X					X
	School meals*								
	WIC*								
	Housing subsidies		X	X					
LIHEAP*								X	
Estimate Expenses	Medical out-of-pocket expenses			X					
	Child care expenses			X					X
	Other work-related expenses					X			
Estimate Net Taxes	State and Federal Income tax credits							X	
	State and Federal income tax liabilities							X	
Calculate ORPM	Aggregate resources, expenses and net taxes	X	X	X	X	X		X	X

* Elements and data sources shaded in grey are not included in current ORPM, but may be included in future iterations

¹ Work-related expenses from SIPP and CPS-ASEC data are estimated by Mohanty et al. (2017)

In Table B1, and throughout these appendices, we refer to all data sources by the data source's descriptor year. In some cases, the descriptor year is not the same as the ORPM reference year. For example, the CPS 2016-18 data reflect survey years 2016-18, but reference years 2015-17. In other cases, we have used data from alternative reference years, due to availability or intention. For example, the ACS 2012-16 data reflect reference years 2012-16. TRIM data were not available for 2017 at the time of publication, so we only used TRIM data for 2015-16, which were used to correct CPS 2016-17.

STEP 2: DEFINE ORPM RESOURCE UNIT

Following Fox (2019) and Renwick et al. (2015), we use the ORPM resource unit to assign individuals to resource-sharing individuals into groups. In contrast with the Official Poverty Measure, which groups individuals into "families" based on relatedness by birth, marriage or adoption, the ORPM use the SPM process, which assigns individuals to "resources units." ORPM resource units include:

- Individuals who are related based on original OPM definition;
- Any co-resident unrelated children (age<15);
- Foster children (age<22); and,
- Unmarried partners and their relatives.

As noted by Renwick et al. (2015), the ACS only includes information about relationships to reference persons. We begin with the reference person, then we use relationship pointers, other demographic information (e.g., age) and constructed IPUMS variables for location of mother, father or spouse in the household, to identify individuals who should be classified in the same ORPM resource unit. Individuals (age>15) who are not related to the reference person are assigned to unique ORPM resource units. Resource unit "heads" include all original reference persons, plus any individuals assigned to unique ORPM resource units. We generate new resource unit weights by applying the new ORPM head's original household weight to all others in the resource unit.

ORPM resource units are thus slightly more expansive than OPM families. The ORPM process is also aligned with the process of resource unit definition identified by both the California Poverty Measure and the Wisconsin Poverty Measure.

STEP 3: CREATE POVERTY THRESHOLDS

SPM poverty thresholds are based on national estimates of expenditures for food, shelter, clothing and utilities, adjusted for household size/composition, and adjusted for geographic differences in housing tenure and related costs. This approach differs dramatically from the Official Poverty Measure, which establishes poverty thresholds based on a 1963 basket of food (adjusted for inflation), adjusted for household size/composition/age, and applied to all families (i.e., not geographically adjusted).

Our approach to calculating ORPM poverty thresholds echoes the SPM approach, but estimates them at the level of Oregon Public Use Microdata Areas (PUMAs). The steps involved in the development of ORPM poverty thresholds include the following:

- Acquire base national thresholds and housing shares
- Generate geographically adjustment for all Oregon PUMAs
- Generate equivalence scales to each housing tenure type
- Generate ORPM poverty thresholds

This process yields the following equation for ORPM thresholds, which is described in more detail below:

$$Threshold_{ijte} = BaseThreshold_t * Geographic Adjustment_{ijt} * EquivalenceScale_h$$

where:

$BaseThreshold_t$ = national base threshold by housing tenure (owner with mortgage, owner without mortgage, or renter)

$Geographic Adjustment_{ijt}$ = PUMA-specific geographic adjustment by housing tenure

Equivalence Adjustment_h = Household equivalence scale for each resource unit type

Acquire base thresholds and shares

We started by acquiring the base 2017 national thresholds and housing shares for a 2-adult, 2-child family, and for each of three housing tenure types (rental, home ownership with mortgage, home owner without mortgage) from the US Bureau of Labor Statistics (n.d.). The base national thresholds represent the average out-of-pocket expenditures for food, clothing, shelter and utilities derived from the U.S. National Consumer Expenditures Interview Survey and produced for use in the Supplemental Poverty Measure; mean expenditures are available for the three housing tenure types.⁶

While we do not need to calculate the base national thresholds (which have already been calculated for use in the SPM), it should be noted that their source equation is as follows:

$$\text{Base SPM threshold} = 1.2 * FCSU_E - (S+U)_E + (S+U)_h$$

where:

1.2 = a multiplier used to account for other basic goods and services;

F, C, S and U = expenditures on food, clothing, shelter and utilities, respectively, for the estimation of sample expenses within the 30th to 36th percentile range of expenditures;

E = consumer units within the 30th to 36th percentile range; and

h = refers to one of the three housing tenure groups.

⁶ While we do not need to calculate the base national thresholds (which are already calculated), it should be noted that their source equation is as follows: Base SPM threshold = 1.2 * FCSUE – (S+U)E + (S+U)h. Where 1.2 is a multiplier used to account for other basic goods and services; F, C, S and U refer to expenditures on food, clothing, shelter and utilities, respectively, for the estimation of sample expenses within the 30th to 36th percentile range of expenditures; E refers to consumer units within the 30th to 36th percentile range; and h refers to one of the three housing tenure groups. These base thresholds are applicable for a 2-adult, 2-child family.

The housing share represents the proportion of expenditures for shelter and utilities; this value is calculated separately for the three housing types (rent, own with mortgage, own without mortgage) using the following equation:

$$\text{Housing share} = (S+U)_E / FCSU_E$$

Again, neither of these values needed to be calculated; they were simply used in subsequent steps.

Generate geographic adjustment

Similar to the process used to calculate state SPM thresholds, we multiply the base national thresholds to generate geographic adjustments, geographically adjusted “base” thresholds for Oregon Public Use Microdata Areas (PUMAs), which represent the base expenditures for a 2-adult 2-child family in one of three housing tenure groups, adjusted by 1) a cost index for each housing tenure group calculated as the ratio of the PUMA median gross monthly rent to the national median gross monthly rent, multiplied by the national housing expenditures share; plus 2) the share of all other expenditures for the housing tenure group. These PUMA-specific thresholds are calculated using the following equation, which is applied to the 5-year ACS 2012-16 data:

$$\text{Geographic Adjustment}_{ijt} = (\text{HousingShare}_t \times (\text{MGRD2B}_{ij}/\text{MGRD2B}_n) + (1 - \text{HousingShare}_t))$$

where:

i = state

j = specific geographic area (metro/non-metro, county, etc.)

n = national

t = tenure: owner with mortgage, owner without mortgage, renter)

$(\text{MGRD2B}_{ij}/\text{MGRD2B}_n)$ = Cost index, or ratio of median gross rent for a “decent” two-bedroom unit in PUMA to national median gross rent

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Threshold = national base threshold amount

HousingShare = national housing share

Our approach calculates these thresholds at the PUMA level. In contrast, the SPM calculates them for each Metro area in a state and treats all Nonmetro areas in each state the same. As a result, we are able to achieve a heightened level of granularity by using ACS data rather than CPS data (used in the SPM). Our approach differs slightly from the California Poverty Measure approach, which calculates the geographic adjustment and base thresholds at the county level and only applies two housing tenure types: 1) renters and owners with mortgages; and 2) owners with mortgages (Bohn, 2017). Our approach is similar to the approach used by the Wisconsin Poverty Measure, although that measure generates geographic adjustments at a sub-state “regional” level, combining various PUMAs and counties into six groups, and relies on a 1-year ACS sample.

Generate household equivalence scales

After generating 2017 ORPM base thresholds for each PUMA and housing type, we multiply the base (geographically-adjusted) threshold by the following equivalence scales formulas to generate separate thresholds for each housing tenure type:

$$2 \text{ adults with no children scale} = 1.41/(3^{0.7})$$

$$1 \text{ adult with no children scale} = 1/(3^{0.7})$$

$$\text{Single Parent scale} = ((1 + 0.8 + 0.5 * (K-1))^{0.7}) / (3^{0.7})$$

$$\text{All other families scale} = ((A + 0.5 * K)^{0.7}) / (3^{0.7})$$

Where:

A = number of adults in unit

K = number of children in unit

Applying these equivalence scales yields a total of 3,534 possible ORPM thresholds, as follows:

*38 family types*3 housing tenure types*31 PUMAs = 3,534 thresholds*

These equivalence scales, which were initially developed by Betson (1996) are identical to those used in SPM production.

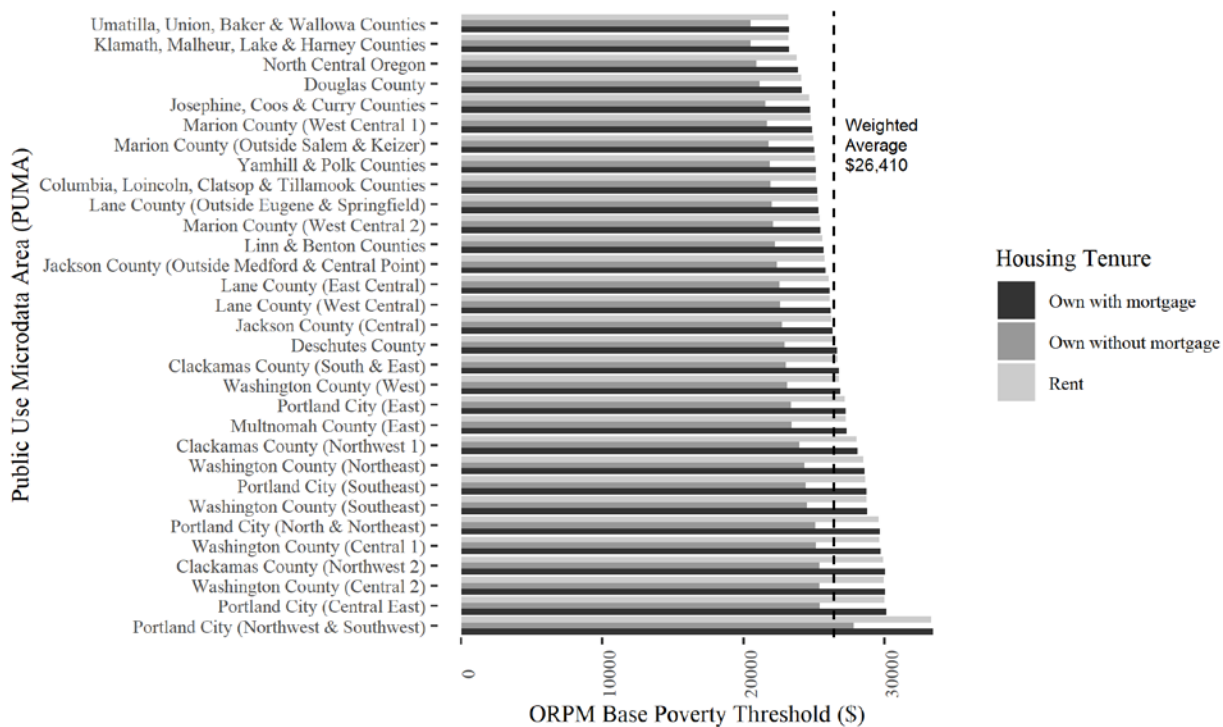
Generate ORPM poverty thresholds

In sum, ORPM poverty thresholds are calculated for each resource unit by multiplying the national base threshold by the geographic adjustment specific to both PUMA and housing tenure, and by the equivalence scale specific to the resource unit size and composition, as follows:

$$\text{Threshold}_{ijte} = \text{BaseThreshold}_t * \text{Geographic Adjustment}_{ijt} * \text{EquivalenceScale}_h$$

Our process of poverty threshold generation is closely aligned with both the thresholds used in the national SPM measure and those used by the California Poverty Measure and Wisconsin Poverty Measure. See Figure 1 for a figure of ORPM base thresholds (i.e., for resource units with 2 adults and 2 children) by PUMA and housing tenure.

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Source: Oregon Poverty Measure Project

Figure 1: ORPM base thresholds

STEP 4: ESTIMATE ORPM UNIT CASH AND NON-CASH RESOURCES

While the Official Poverty Measure incorporates information about cash income in national and state-level poverty estimates, one of the major contributions of the SPM is to include additional non-cash public transfers, including SNAP, housing subsidies, LIHEAP, school meals program, and WIC, in its poverty estimates. The CPS-ASEC includes detailed information about the value of benefits associated with these programs, while the ACS includes only minimal information about selected programs. As such, the ORPM is somewhat limited with respect to adding information about non-cash benefits to available data about cash income.

For the first year of ORPM production, our approach to overcoming this challenge has been to use a combination of data from the ACS and the CPS-ASEC. We use the ACS as the primary source of cash income data, information about participation in public programs (where available), and demographic characteristics, then impute

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the value of non-cash benefits for selected programs from CPS-ASEC data. We also augment ACS SNAP data by 1) correcting CPS-ASEC SNAP data with TRIM3 microsimulation data, following Parolin (2019); and 2) modeling SNAP benefits receipt and imputing additional recipients from TRIM'd CPS-ASEC data to correct for under-reporting in the ACS data; and 3) imputing the value of ACS SNAP cash benefits from the TRIM-corrected CPS-ASEC data.

Broadly, the steps we followed for calculating resources include:

- Calculate cash benefits
- Impute Supplemental Nutrition Assistance Program (SNAP) non-cash benefits
- Impute HUD housing subsidies
- Impute corrections to TANF cash benefits
- Calculate resources

The values of non-cash benefits are then added to the value of cash benefits and aggregated across the ORPM resource unit to yield a value for overall resources (cash and non-cash).^{7,8} More detailed information about our approach for each of these benefit programs is described below.

Impute Supplemental Nutrition Assistance Program (SNAP) non-cash benefits

The ACS includes information about SNAP benefits receipt, but does not include any information about the value of those benefits. Moreover, substantial evidence suggests that SNAP benefits receipts are substantially under-reported in the ACS (Meyer et al., 2009, 2015; Meyer & Sullivan, 2012). One way to address this measurement error is by applying TRIM3 microdata on receipt and value of SNAP benefits (Parolin, 2019), although Stevens et al. (2018) have found that TRIM3

⁷ Note that tax credits and liabilities are handled separately, in Step 6.

⁸ In future iterations of this work, we expect to use state administrative data for TANF, SNAP and LIHEAP to assess the accuracy of ACS data, and as necessary, impute participation in various benefits programs and the value of both cash and non-cash benefits. We may also impute values for the remaining benefits programs, including school meals and WIC.

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may over-allocate SNAP benefits to those in poverty. Our incorporation of the value of SNAP (non-cash) benefits into the ORPM involved three major steps, reflecting the probabilistic approach used by the California Poverty Measure (Bohn et al., 2015/2017) and other scholars (Meyer & Mittag, 2019; Mittag, 2019)⁹:

- Apply TRIM3 to CPS-ASEC data on receipt and value of SNAP benefits, where available
- Augment ACS data on receipt of SNAP benefits using CPS-ASEC
- Impute value of SNAP benefits from CPS-ASEC for all SNAP recipients in ACS data file

First, we applied TRIM3 microsimulation data to the Oregon CPS-ASEC 2016 and CPS-ASEC 2017 data, relying on methods and syntax from Parolin (2019).¹⁰

Next, following the imputation process used by Bohn et al. (2015, 2017), we used the full 3-year CPS-ASEC 2016-18 sample (with two years of TRIM'd data), we first modeled the probability of SNAP benefits receipt for CPS-ASEC households (i.e., restricting the data to household heads), using a Linear Probability Model.

Covariates in the model included cash income, household demographics (age, race, foreign-born, education, presence of adults, presence of children), demographics of household head (age, marital status), housing tenure, and household metro center city status. This model was used to predict the probability of SNAP benefits receipt for both the CPS-ASEC and ACS samples. We then calculated the proportion of households in the CPS-ASEC sample who received SNAP benefits for subsequent use as the target proportion in the ACS sample.

⁹ Both the California Poverty Measure and these scholars use state administrative data to model SNAP participation and benefits values. In contrast, due to the absence of state administrative data at this juncture, the ORPM uses CPS-ASEC data in a probabilistic approach, similar to that used by Bohn et al. (2015, 2017) for other data elements in the California Poverty Measure. We expect to use state administrative data in future iterations of this work.

¹⁰ There is a delay in access to TRIM3 data. At the time of analysis and publication, we were only able to apply TRIM3 microdata associated with the first two years of the 3-year CPS-ASEC 2016-18 sample (i.e., TRIM3 years 2015 and 2016).

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For all resource units in the ACS sample that initially reported SNAP benefits receipt, we kept that assignment. By sorting the ACS sample according to the predicted probability, we were able to identify those resource units with the highest probability of SNAP benefits receipt who had not initially reported receiving SNAP benefits. We sorted those resource units by predicted probability, and assigned SNAP benefits receipt to those resource units with the highest predicted probability until the cumulative proportion of all resource units with SNAP benefits receipt (both those that initially reported SNAP benefits, and those that were assigned SNAP benefits on the basis of predicted probability) matched the proportion in the CPS-ASEC sample.

Finally, we modeled the value of SNAP benefits in the CPS-ASEC sample using a Generalized Linear Model with a log link function, which ensured positive predicted values. We used the same covariates as those used to predict SNAP benefits receipt, but the model was applied only to households that reported receiving SNAP benefits. Similar to the benefits receipt process, this model was used to predict SNAP benefits values for both the CPS-ASEC and ACS samples. We then calculated the proportion of households in the CPS-ASEC sample who received SNAP benefits for subsequent use as the target proportion in the ACS sample. The predicted SNAP benefits value was then assigned to all resource units that had either reported SNAP benefits receipt or received a SNAP benefits receipt assignment based on the imputation process above. All ACS resource units without reported or imputed SNAP benefits received a value of \$0 for SNAP benefits.

In sum, SNAP benefits data represent a combination of the originally-reported ACS data (for SNAP benefits receipt) and an imputation process that corrects for under-reporting in the ACS, as well as the absence of SNAP benefits values by imputing from TRIM'd CPS-ASEC data. The application of TRIM data to CPS-ASEC is an innovation that has not been used by other states, to the best of our knowledge. However, the imputation process borrows heavily from previous state-level efforts,

especially the California Poverty Measure, although it does not precisely replicate that process.¹¹

Impute HUD housing subsidies

The ACS does not include information about receipt of HUD housing subsidies (e.g., Section 8 vouchers and public housing), while the CPS-ASEC includes information both about receipt of housing subsidies and the capped amount.

To integrate the value of housing subsidies into the ORPM, we begin by using a probabilistic approach similar to that used by the California Poverty Measure (Bohn et al. 2015/2017) to impute the probability of housing subsidy receipt using CPS-ASEC data. We begin by restricting our data files to resource units that rent housing, then separate those data into three groups: 1) resource units with one or more senior adults; 2) resource units without any senior adults and without children; and 3) resource units without any senior adults and with children.

For each of these groups, we modeled the probability of housing subsidy receipt using a Linear Probability Model with the CPS-ASEC data; covariates included measures of Official Poverty (100% and 150%), family income variables, imputed SNAP benefits and reported welfare benefits, and household demographics (education, number of adults, number of children). For each group, we used the relevant model to predict the probability of housing subsidy receipt for CPS-ASEC households and ACS resource units. We then sorted each ACS group according to the predicted probability and assigned housing subsidy receipt until the cumulative weighted proportion was equal to the proportion of households with housing subsidy receipt in the CPS within-group sample.

¹¹ Our efforts to apply TRIM corrections were also informed by personal communications with Linda Giannarelli (06/24/19), Zachary Parolin (07/04/19) and Nikolas Mittag (07/08/19), to whom we are grateful for their quick and thoughtful responses to our inquiries.

Our process for modeling the value of housing subsidy was somewhat different from the California Poverty Measure, which used county-level HUD fair market rent data to estimate the value of housing subsidy benefits for renters.¹² Instead, we used the PUMA-level median gross monthly rent amount (annualized) for the estimated rental amount, capped at the BLS amount for shelter expenditures. We estimated the resource unit's payment as 30% of the resource unit's total cash income, and the housing subsidy as the difference between the estimated annual rent and the resource unit's estimated rental payment.

Impute Temporary Assistance for Needy Families (TANF) cash benefits

While the ACS includes data about the amount of “welfare” cash benefits, there is reason to believe that the value of TANF benefits may be under-reported (Meyer et al., 2009, 2015; Meyer & Sullivan, 2012).¹³ The California Poverty Measure (Bohn et al., 2015, 2017) uses state administrative data to correct ACS data. Without current access to state administrative data, we have elected to apply a probabilistic approach to augment ACS data by imputing additional benefits receipt and value using CPS-ASEC data.¹⁴

¹² We chose to use PUMA median rent for two reasons. First, the Fair Market Rental data is available at the zip code and county-level; our data are only available at the PUMA-level. While we could have aggregate zip code data to the PUMA level, the main benefit of such a process is detailed information on rent by number of bedrooms. However, the reassignment of individuals to single-person resource units would likely yield incorrect information about the number of bedrooms and related rent for those units. Both of those complicating factors led us to simply use median PUMA rent data for this iteration of the ORPM. We may, however, turn to Fair Market Rent in future iterations of the ORPM.

¹³ In the ACS, the `incwelfr` variable does not distinguish between TANF and General Assistance (GA). However, in Oregon, the GA program is very new, targeted and small (Oregon Department of Human Services, n.d.). Therefore, we assume that all income associated with this variable represent TANF income.

¹⁴ In January 2020, we received the last of extensive state administrative associated with participation in self-sufficiency programs (SNAP, TANF, LIHEAP and ERDC) from 2014-18. We also have access to wage data associated with self-sufficiency participation during the same timeframe. We expect to use administrative data in future iterations of the ORPM.

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We take as given ACS reported TANF benefits receipt, and focused our imputation process on correcting the value of TANF benefits.¹⁵ First, we modeled the value of TANF benefits in a restricted CPS-ASEC sample (TANF recipients only) using a Generalized Linear Model with a log link, to ensure positive predicted values. Covariates in the model included household cash income variables, household demographics (age, race, foreign-born, education, presence of adults, presence of children), household head demographics (age, sex, marital status), housing tenure, and household metro central city status. We then predicted the value of TANF benefits for the CPS-ASEC restricted sample and the ACS sample of TANF recipient resource units. For all ACS resource units with imputed benefits greater than reported TANF benefits, we replaced the reported value with the imputed value. For all other resource units, we kept the reported value of TANF benefits.

Calculate resources

ORPM resource unit resources were calculated as the sum of cash income and non-cash benefits. As stated earlier, tax liabilities and credits were treated separately in Step 6.

STEP 5: ESTIMATE ORPM UNIT EXPENSES

One of the innovations of the Supplemental Poverty Measure was to incorporate additional expenditures, namely Medical Out-of-Pocket-Expenses (MOOPs), Childcare expenses and other Work-related expenses. We take similar steps in estimating resources for use in the ORPM, using a probabilistic approach that involves the following steps:

- Impute medical out-of-pocket expenses
 - Impute childcare expenses
-

¹⁵ We did not apply TRIM corrections to the CPS-ASEC TANF data.

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- Estimate other work-related expenses

Our approach is similar to that used in our approach to estimating various resource categories, as described below. The approaches in this step are aligned with, and were heavily informed by, the methods used in the 2014 California Poverty Measure (Bohn et al., 2017).

Impute medical out-of-pocket expenses

The ACS does not include information about the occurrence or value of MOOPs; the CPS, in contrast, includes an overall estimate of MOOPs that is used in construction of the Supplemental Poverty Measure (Flood et al., 2019; Fox, 2019). We took advantage of these data, in addition to data on access to health insurance in both surveys, in a two-step process that first modeled the probability of MOOP expenses, then imputed the value of MOOPs expenses for units in the ACS with the highest likelihood of incurring such expenses.

In the first step, we modeled the probability of MOOPs expenses using separate linear probability models for two groups in the CPS sample: resource units with and without a senior adult (age > 64). In both models, covariates include the resource unit cash income, type of health insurance in the unit, unit-level demographic variables (race, foreign-born, educational attainment, maximum age), and categorical variables for the number of persons in the unit. The fitted values from the model were then applied to the same two groups (separately) in the ACS sample. We then sorted each ACS group according to the predicted probability and assigned MOOPs expenses to the highest probability units until the cumulative weighted proportion was equal to the proportion of households with MOOPs expenditures in the CPS within-group sample.

In the second step, we used CPS data modeled the value of MOOPs expenditures separately for both groups, but only including units with MOOPs expenditures, using a Generalized Linear Model with log link (to ensure positive fitted values) and the same covariates as those used in the first step. The fitted values from that model

were then assigned to units in the ACS sample that had been assigned the status of positive MOOPs expenditures.

Impute childcare expenses

The ACS does not include information about the occurrence or value of childcare expenses. However, the CPS includes an overall estimate of childcare expenses that is used in construction of the Supplemental Poverty Measure (Flood et al., 2019; Fox, 2019). We used these data, in addition to other extant data, in a two-step process that first models the probability of childcare expenses, then imputed the value of childcare expenses for units with the highest likelihood of incurring such expenses.

In the first step, we modeled the probability of incurring childcare expenses using separate linear probability models for two groups in the CPS sample: 1) resource units where the minimum age is 0 to 5 (i.e., units with young children); 2) resource units where the minimum age is 6-17 (i.e., units with school-aged children, but no young children). In both models, covariates included participation in welfare programs (TANF; SNAP), presence of various age groups in the unit, number of children and adults, and various unit-level demographic variables (race, foreign-born, educational attainment). The fitted values from the model were then applied to the same two groups (separately) in the ACS sample. We then sorted each ACS group according to the predicted probability and assigned childcare expenses to the highest probability units until the cumulative weighted proportion was equal to the proportion of households with childcare expenditures in the CPS within-group sample.

In the second step, we used CPS data modeled the value of childcare expenditures separately for both groups, but only including units with childcare expenditures, using a Generalized Linear Model with log link (to ensure positive fitted values) and the same covariates as those used in the first step. The fitted values from that model were then assigned to units in the ACS sample that had been assigned the status of positive childcare expenditures.

Estimate other work-related expenses

We also estimated other (i.e., non-childcare) work-related expenses, namely the cost of transportation, using a two-step process. We relied on ACS data to identify individuals likely to have incurred transportation expenses and assigned work-related expenses based on three factors: 1) having positive earned income; 2) means of transportation; 3) number of weeks worked. For the value of work-related expenses, we relied on a flat estimate of weekly work-related expenses, with a low-cost proportion applied to commuters who walk, bike or work from home, produced by Mohanty et al. (2017) from the Survey of Income and Program Participation (SIPP). Individuals without positive earned income or any commuting costs were assigned a value of "0" for work-related expenses.

The estimates for weekly work-related expenses was then annualized by multiplying by the number of weeks worked, and the total work expenses were capped at the level of the individual's earned income. Individual-level expenses were then aggregated at the unit-level.

Calculate expenses

ORPM expenses were calculated as the unit-level sum of MOOPs, childcare expenses and other work-related expenses. As stated earlier, tax liabilities and credits were treated separately in Step 6.

STEP 6: ESTIMATE ORPM TAX LIABILITIES AND CREDITS

We relied on TAXSIM (Feenberg & Coutts, 1993; National Bureau of Economic Research, n.d.) to generate estimates of ORPM tax liabilities and credits. This process involved the following steps:

- Allocate individuals to taxpaying units
- Assemble TAXSIM data set and run TAXSIM27

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These steps, which are closely aligned with those taken in development of the California Poverty Measure (Bohn et al., 2017), are described in more detail below. Note that TANF values used in the tax estimation process reflect the corrected values from Step 4: Estimate resources. Also note that we included imputed childcare expenses to estimate itemized childcare deductions.

Allocate individuals to taxpaying units

Taxpaying units cannot be assumed to be the same as either families (Official Poverty Measure) or resource units (ORPM). In particular, unmarried partners and their children (who are not children of the household head) need to be classified as separate taxpaying units. As such, we used relationship pointers to identify and allocate individuals to taxpaying units based on their relationships and dependency status. The steps included:

- Identify taxpaying reference persons and sub-families
- Identify qualifying dependents
- Allocate individuals to taxpaying units
- Identify primary taxpayer

To identify taxpaying units, we first identified ACS household heads, their spouse and any dependent children or other dependent relatives on the basis of ACS sub-family assignment and relationship pointers.¹⁶ All unmarried partners and their children (who are not children of the household head) were then assigned to unique sub-families according to ACS relationship pointers. Within each sub-family, we identified the reference person's marital status, age, and spouse's age.

Within each newly identified sub-family, we used ACS relationship pointers and demographic information to identify child dependents and other dependent

¹⁶ Note that this process does not utilize the ORPM resource unit definition. It uses the ACS household heads to initially identify a tax unit "reference person."

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relatives, based on the rules for qualifying dependents published in IRS Publication 501. Within each sub-family, we then generated TAXSIM variables indicating: 1) the total number of qualifying dependents for tax exemptions; 2) the number of qualifying dependent children age<13 for calculation of dependent child care credits; 3) the number of qualifying dependent children age<17 for calculation of child credits; and 4) the number of qualifying dependent children age<17 or full-time students age<24 for calculation of the Earned Income Tax Credit. For all dependent relatives, we also identified the dependent tax filing status based on rules published in IRS Publication 929 (Internal Revenue Service, n.d.).

We then allocated individuals to taxpaying units on the basis of sub-family assignment and tax filer status, with dependents with individual taxfiler status assigned to their own taxpaying units. Finally, we identified the primary taxpayer in each taxpaying unit as: 1) ACS sub-family reference person; 3) unmarried partner of ACS reference person; 4) dependent with independent tax filing status.

Assemble TAXSIM data set and run TAXSIM27

To run TAXSIM27, we generated a data set of 27 variables in accordance with the TAXSIM27 requirements. In addition to selected administrative and demographic indicators, qualifying dependents data, the final data set included a selection of ACS income and expense variables for the reference person and their spouse, including wage and salary for the taxpayer and spouse, Investment Income, Retirement Income, Social Security Income, Other Income, Welfare Income, and Supplemental Security Income. Finally, we entered the imputed child care expenses, ACS gross monthly rent (annualized) and ACS property taxes. The value of mortgage payments was calculated as 80% of the monthly mortgage amount, annualized, following Bohn (2017). We did not enter information about dividends, interest received, short-term capital gains, other property income, unemployment compensation, or other itemized deductions.

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These data were saved and processed using the Stata Taxsim27 package, yielding full output about tax liabilities and credits for each taxpaying unit. The main variable used in production of ORPM poverty status is overall net tax liability.

STEP 7: ASSIGN ORPM POVERTY STATUS

Our final step in the ORPM development process was to assign ORPM poverty status by resource unit, including:

- Calculate net ORPM resources
- Compare net ORPM resources with ORPM threshold

Each of these steps is described in more detail below.

Calculate net ORPM Resources

We calculated net ORPM resources for each ORPM resource unit using the following equation:

$$\text{ORPM net resources} = \text{Resources} - (\text{Expenses} + \text{Taxes})$$

Where:

$$\text{Resources} = \text{Market Income} + \text{Transfer Income}$$

$$\text{Market Income} = \text{Wage and Salary Income} + \text{Business and Farm Income} + \text{Retirement Income} + \text{Investment Income} + \text{Other Income}$$

$$\text{Transfer Income} = \text{SNAP} + \text{TANF} + \text{Housing Subsidies} + \text{Social Security Income} + \text{Supplemental Security Income}$$

$$\text{Expenses} = \text{Medical Out-of-Pocket Expenses} + \text{Childcare Expenses} + \text{Work-related Expenses}$$

$$\text{Taxes} = \text{Tax Liabilities} + \text{Tax Credits}^{17}$$

¹⁷ Where tax liabilities are expressed as a positive number and tax credits are expressed as a negative number.

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We then compared net ORPM resources with each resource unit's ORPM threshold, assigning resource units with ORPM net resources less than the unit's ORPM threshold a status of "ORPM Poor." Resource units with ORPM net resources that equaled or exceeded the unit's ORPM threshold were assigned a status of "ORPM Not Poor."

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