Measuring Housing Affordability: Assessing the 30 Percent of Income Standard

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Abstract

The 30-percent of income standard is a widely used and accepted measure of the extent of housing affordability problems across the country. While simple and easy to implement, the measure is not perfect. The limitations of the 30-percent standard have long been recognized: its rigid uniformity amidst a diverse and ever-changing array of affordability challenges raises questions about its validity over time and across markets and household types. This paper examines whether an alternative measure, based on the concept of residual income, produces a different assessment of the extent and incidence of housing affordability challenges. In the end, this paper finds that, compared to the residual income measure, the 30-percent standard tends to overstate housing affordability challenges for high-cost markets and for higher-income and smaller households but yields similar results regarding overall levels of affordability. Thus, given the simplicity of the 30-percent standard, it remains a reliable indicator of affordability both over time and across markets. Caution, however, should be used in using this measure assess affordability challenges among different income levels or household types as variations in the cost of other necessities would suggest the need for corresponding variations in the payment standard used.

Since its inception 30 years ago, one of the key metrics featured in the Joint Center for Housing Studies' annual *State of the Nation's Housing* report has been the number (and share) of households with housing cost burdens. This measure is based on a widely adopted standard that housing costs should not exceed 30 percent of household income. The Joint Center's most recent report, *America's Rental Housing 2017,* reported that at last count in 2016 there were 21 million renter households that failed to meet this standard and so were deemed to be housing cost burdened.[1] Importantly, the number of cost burdened renter households has increased sharply since the start of the century—by over 40 percent, or more than 6 million households, since 2001—and now encompasses nearly half of all renters. The extent of housing cost burdens led US Secretary of Housing and Urban Development Shaun Donovan in 2014 to describe the situation as the worst rental affordability housing crisis in the country's history.[2]

While housing cost burdens are most common among the lowest-income renters (those earning less than $15,000 a year), the incidence has increased most sharply among those at higher income levels. Between 2001 and 2015, the number of cost burdened renters earning less than $15,000 annually increased by 1.7 million. But this growth was outpaced by the 1.9 million household increase in cost burdens among renters earning $15,000 to $30,000 and the 2.3 million increase in cost burdened renters earning $30,000 to $75,000. Thus, the emergence of the housing affordability crisis was in no small part due to the challenges faced by higher-income renters in finding housing that did not require more than 30 percent of their income.

A Brief History of the 30 Percent Standard

Given the importance of the 30 percent of income standard as a gauge of housing affordability—and the growing extent of the problem among higher-income renters as captured by this measure—it is important to examine the origin and rationale for this standard. The origin of the standard can be traced back to an old aphorism that one should devote "a week's wages to a month's rent," which itself is based on studies of what typical families spent on housing going back to the late 1800s.[3] The notion was that if housing accounted for more than this share of income, there would not be enough left over to pay for life's other necessities. This 25 percent of income standard was incorporated into laws for federal housing assistance programs in the 1960s and 1970s. However, in the early 1980s, new legislation increased the standard to 30 percent for most programs.[4] Since then, the 30 percent of income measure has been the norm for defining housing affordability.

Although the origin of the standard is clear, the question is whether the measure's rationale is still valid. Is what a typical family spent on housing a century and a half ago an appropriate yardstick to gauge affordability today? With the share of renters exceeding this standard having skyrocketed since 2000 in part because more moderate-income renters exceed this cutoff, it is worth re-examining whether this well-worn standard is an appropriate gauge of housing affordability in the present.

[1] Joint Center for Housing Studies (2017).
[2] See for example Ben Lane, "HUD's Donovan: 'This is the worst rental crisis in this nation, ever,'" *HousingWire,* April 22, 2014, https://www.housingwire.com/articles/29757-huds-donovan-this-is-the-worst-rental-crisis-in-this-nation-ever.
[3] Pelletiere (2008).
[4] Pelletiere (2008).

Thus, the purpose of this paper is to review the rationale for the 30 percent of income standard, to reassess its validity as a measure of housing affordability in light of changing market conditions, and to examine an alternative measure based on the concept of residual income that addresses the main concerns with the standard metric to see if it leads to different assessment of the extent and incidence of housing affordability challenges.[5] In the sections that follow, each of these issues is addressed in turn. The paper concludes with a discussion of the implications of the findings for continued use of the 30 percent of income standard as a gauge of the extent of housing affordability problems.

Rationale for the 30-Percent Rule and Its Limitations

Imbedded in the use of an income ratio to assess affordability is the notion that housing is but one item that people need to meet their basic needs. This, in turn, means that if housing accounts for too large a share of income there will not be enough left over for these other necessities. This approach is not without precedent: it uses the same logic that underlies the poverty threshold, which is based on the idea that the cost of a minimum food basket should account for one-third of a family's after-tax money income.[6]

However, the fact that the poverty threshold has been defined based on the cost of food does raise the question of why housing should get special consideration in assessing the share of a household's budget that it commands. One important reason is because housing is generally the largest single household expenditure, so if housing accounts for an excessive share of income, it will have a significant impact on the household budget. But perhaps more importantly, housing deserves special consideration because having a place to live almost always takes precedence over all other expenses. As Matt Desmond has succinctly put it: "the rent eats first."[7]

Even if one were to accept the rationale for assessing the share of income devoted to housing as a key indicator of financial distress, there are two key problems with the assumption that these costs should not exceed a single fixed percent of income. First, non-housing living expenses vary with the number and ages of household members regardless of income, so other costs may account for more or less than the assumed 70 percent of income needed for "everything else." Indeed, large families require more spending on food and clothing than small families or single-person households. Families with young children will also incur additional costs for health and child care, those with chronic diseases or disabilities will have higher health care expenses, and households with working adults will have additional expenses for commuting costs. For these households with high levels of essential non-housing living expenses, spending 30 percent of income on housing may not leave enough to cover all other non-housing costs. In contrast, for smaller households without special needs, 30 percent of income on housing may leave plenty to cover all non-housing expenses.

Second, because the costs of necessities generally do not rise with income, higher-income households can devote a larger share of their income to housing and still have money left over to pay for other

[5] For a thorough review of alternative housing affordability standards, see Pelletiere (2008). Notably, Pelletiere identifies six different uses of affordability standards. This paper is concerned with two of these uses: as a gauge of the extent of affordability problems and as a means of comparing this measure across demographic groups and geographic areas. Other important uses beyond the scope of this paper are as a means of establishing payment standards for individuals or as a means of establishing preference for receipt of assistance.

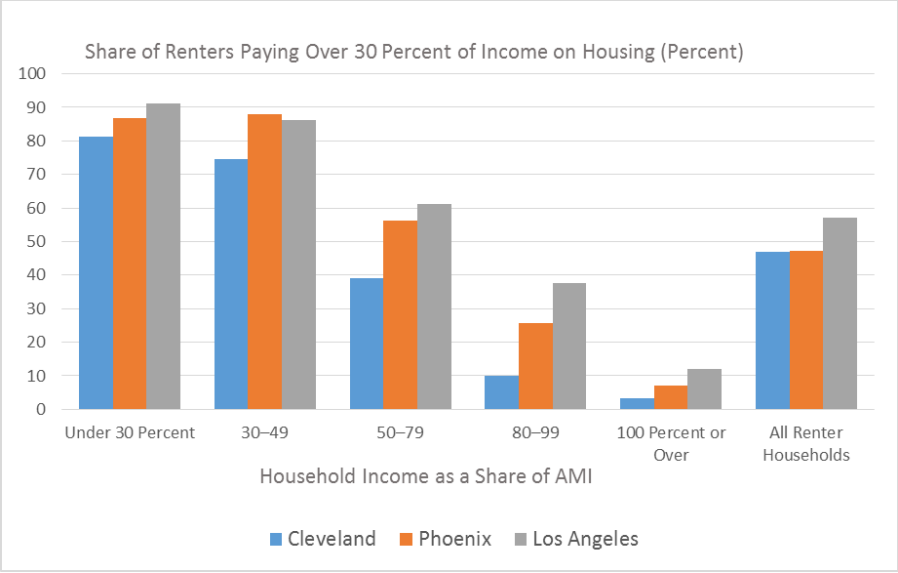
[6] Fisher (1992)

[7] Desmond (2016).

needs. For example, a household making $30,000 annually would have $1,750 in income left over each month if they devoted 30 percent of their income toward housing, while one earning $15,000 would have half that amount. Since it is conceivable that higher-income households can spend more than 30 percent of income on housing and not be financially burdened, there is concern that the 30-percent standard may overestimate housing affordability problems for higher-income households. This problem is particularly relevant when using housing cost burden rates to assess and compare affordability problems in high-cost, high-income metros with those in low-cost, low-income metros. For example, in Los Angeles, higher-income households are much more likely to be among those paying more than 30-percent of their incomes on housing, whereas in Cleveland, high cost burden rates are much more limited to those with the lowest incomes **(Exhibit 1)**. As a result, even though Los Angeles has a higher overall cost burden rate as a metro, a cost burdened renter in Los Angeles is more likely to be in a better position, with more income left over for other needs, than the typical burdened renter in Cleveland.

Lastly, in addition to the issues for higher-income households, the 30-percent standard may also be an inadequate gauge of housing affordability for the lowest-income households, for at the very lowest levels incomes are so low that even spending a minimal share of income on housing will still not leave enough left over to cover basic non-housing living costs. Consider the 5 million US households with incomes of $7,500 a year or less, for whom paying 30 percent of income on housing would leave less than $438 each month to spend on all other needs such as food, clothing, health care, and transportation.

Exhibit 1: In High-Cost Areas Like Los Angeles, Higher-Income Households Are More Likely to Pay More Than 30 Percent of Income on Housing



Source: JCHS tabulations of the US Census Bureau, 2015 American Community Survey 1-Year Estimates.

Measuring Housing Affordability Using a Residual Income Approach

Having enough income left over to meet basic non-housing costs after paying for housing is the conceptual basis of the "residual-income" approach to measuring housing affordability, long

championed by the late Michael Stone.[8] The approach recognizes housing spending as unique in being the largest and least flexible expenditure in the household budget. The residual income metric starts by establishing a given household's basic, minimum level of non-housing spending needs (as determined by the size and composition of the household) and then subtracts this amount from the household's income. The money left over—the residual income—is what's available, or should be available, to pay for housing. If housing costs exceed this amount the household will by definition have to scrimp on other essential expenses. These necessities typically include food, transportation, health care, child care, and taxes, and may also include other incidentals and savings. A household that does not have enough to pay for these necessities after paying for housing is considered to be suffering from "shelter poverty" – that is, poverty induced by the high level of housing expenditures.

In the residual income approach, a household's residual income is the maximum amount they can spend on housing without being "shelter poor." When this amount is measured as a share of total income it is comparable to the standard 30-percent ratio; however, rather than being a fixed share of income, residual income is a 'sliding scale' that varies with the size, composition, and income level of the household.[9] All else equal, larger households that have to devote a higher share of incomes to non-housing expenses have less available for housing, and therefore experience shelter poverty at lower ratios of housing costs-to-income than smaller households. Likewise, higher-income households would require smaller shares of their income for non-housing expenses and so would experience shelter poverty at higher shares of income.

The residual income approach is not without its own problems. Mainly, it is a much more complicated metric to create, especially for aggregating to area-wide or nationwide totals. Calculating residual income involves detailed and specific information about individual households as well as the prices of goods and services where they live. In addition, income, sales, and property tax rates differ both by location and by household structure. Calculating residual income also involves assumptions about the basic amount of these goods and services that represents a minimum level of adequacy for a household. Lastly, whereas income and housing cost information used in the standard 30-percent metric are commonly recorded in Census Bureau surveys of people and households, information needed for the residual income metric about the cost of other essential goods and taxes paid is not readily available.

Selection of Three Metro Areas for Comparison

To determine if the residual income approach to measuring housing affordability produces noticeably different results than the 30-percent standard, we assess housing cost burdens under both approaches in three metropolitan areas: Los Angeles (which has relatively high housing costs), Phoenix (which has moderate housing costs), and Cleveland (where costs are low). These three metropolitan areas reflect different prevailing rent levels, market sizes, and mixes of population by age and race/ethnicity. More practically, these are also metros where relatively recent estimates of the costs of necessities for different household configurations were available (as described in detail below).

Each of these metros was among the hundred largest metros by population in 2015. Among these metros, Los Angeles had the 8th highest median rent, Phoenix the 36th, and Cleveland the 89th. At $1,350, the median rent in Metro Los Angeles was about $600 more than the median rent in Metro

[8] Stone (2011).
[9] Stone (2011).

Cleveland, and $360 higher than in Metro Phoenix. Incomes were also highest in LA, followed by Phoenix and then Cleveland. In terms of race/ethnicity, Los Angeles and Phoenix both have large Hispanic and non-white populations compared to Cleveland. Sixty percent of households in Los Angeles are headed by a non-white individual, compared with one-third in Phoenix and 27 percent of households in Cleveland. Cleveland has the lowest share of renter households with children. Phoenix has the highest share of renter households with children and in turn the youngest median age among the renter population **(Exhibit 2).**

Exhibit 2: Metro Area Housing and Population Characteristics

	Cleveland	Phoenix	Los Angeles
All Households			
Median Household Income ($)	50,400	55,000	62,210
Median Age	41	37	37
Household Type			
Single Person (%)	34	27	25
Households with Children (%)	28	33	35
Cost Burdened Households (%)	30	33	47
Minority Households (%)	27	33	60
Hispanic (%)	4	22	34
Non-Hispanic Black (%)	20	5	8
Homeownership Rate (%)	65	61	48
Renter Households			
Median Household Income ($)	28,900	38,910	44,000
Median Rent ($)	750	990	1,354
Median Age	44	40	44
Household Type			
Single Person (%)	46	33	30
Households with Children (%)	30	38	36
Cost Burdened Households (%)	47	47	57
Minority Households (%)	48	47	67
Hispanic (%)	6	31	41
Non-Hispanic Black (%)	37	9	10

Source: US Census Bureau, 2015 American Community Survey 1-Year Estimates

Data Sources

This analysis uses household-level data from the US Census Bureau's 2015 American Community Survey 1-Year Estimates (ACS). The ACS provides relatively current information on household incomes and housing costs needed for the 30-percent standard approach to affordability as well as detailed information on household size and composition needed for the residual-income approach. It is the data source used by JCHS in its annual *State of the Nation's Housing* report to estimate housing cost burdens for the US according to the 30-percent affordability standard. And with a sample size of 3.5 million

households nationwide, the ACS contains enough data to allow for analysis at the metro area level for our three large metropolitan areas.

For the information about non-housing costs needed for the residual income approach, this analysis incorporates local estimates derived from the Self-Sufficiency Standard (SSS), produced at the University of Washington's Center for Women's Welfare.[10] We use self-sufficiency estimates for the costs of food, transportation, child care, and miscellaneous expenses[11] for each household type in each of our three metro areas.[12] In all, we obtained cost estimates for 35 unique household types covering all possible combinations of households with one, two, or three adults, and zero, one, or two children (though with some limitations in our coverage depending on the data available in SSS estimates for each geographic area).[13] These types cover the large majority of rental households in each metro, including 90 percent of renters in Cleveland, 81 percent in Los Angeles, and 76 percent in Phoenix.[14]

Lastly, in addition to ACS data and SSS data, we added our own estimates of the federal and state taxes households would pay in each of these markets, drawing on estimates from the Tax Policy Center of the Urban Institute and the Brookings Institution, as well as state income tax estimates derived from tax forms in those states.[15]

Measuring Housing Cost Burdens as a Function of Residual Incomes

To determine whether or not an individual household is cost burdened by the residual income standard, three pieces of information are needed: an estimate for the household's total basic non-housing costs, the household's income, and the household's total gross rent (including utilities). With this information, we can calculate how much a household can afford to spend on housing given its necessary non-housing expenses and its income and then compare this amount to how much the household actually is spending on housing to determine if it is cost burdened. The specific steps in the calculation are as follows.

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[10] A detailed description, history, and links to data sets for the Self-Sufficiency Standard is available at http://www.selfsufficiencystandard.org/self-sufficiency-standard-0. These estimates were identified by Pelletiere (2008) as a source of non-housing expenses that could be used to estimate residual incomes as an alternative measure of housing affordability. This data source was also identified by Bryan Grady of the Ohio Housing Finance Agency in discussions held with one of the authors in November 2016.

[11] Miscellaneous expenses are estimated as 10 percent of household income and are intended to cover all other household needs including clothes, household cleaning products, personal hygiene items, diapers, telephone service, etc.

[12] Because the self-sufficiency standard cost estimates are produced by county, metro-level estimates used in this analysis are the household-weighted average for the counties within each metro area.

[13] Three-adult households were included to improve coverage in Los Angeles, where it increased the share of renter households by about 9 percentage points. Cost estimates for households with three or more adults were unavailable in Phoenix. Sensitivity checks revealed that residual cost burden rates by income changed little in Cleveland and Los Angeles when including three-adult households.

[14] There are some necessary generalizations made in our analysis that differ from the Self-Sufficiency Standard. For example, the Standard's costs assume that the first two adults in a household are married and working, and any third adult is a non-working dependent. In contrast, this paper includes ACS data for all two- and three- adult households and does not require the two adults to be married or that the third adult be a dependent. This analysis does, however, conform with the Standard in counting as children only those that are 'own children' related to the householder.

[15] See Appendix A for the detailed methodology behind the treatment of taxes in the study.

First, to calculate the total basic non-housing costs for each household in our ACS sample, we take the sum of essential non-housing costs for that household's specific type as given by the SSS estimates and add to it our own estimates of tax expenditures based on the household income and its composition as reported in the ACS. Second, we subtract these costs from the household's reported income in the ACS to get the residual income remaining to cover housing costs (including rent and utility payments). Finally, we compare this residual amount (how much a household can afford to spend on rent and utilities given the cost of other essentials) to the actual spending on rent and utilities as reported by that household. If that household's housing costs are greater than its residual income, the household is considered to be housing cost burdened.[16]

Example of the Residual Income Approach for Three Prototypical Households

To illustrate both the methodology and how the estimates of non-housing costs and the share of income available for housing vary across household types, incomes, and market areas, this section presents details on each step of the residual income approach for three prototypical household types in each of the three markets. The first is a single-person household earning between 30 and 50 percent of the Area Median Income (AMI), which is considered by HUD definitions a "very low-income household." Average incomes for this group range from roughly $18,000 in the Phoenix and Cleveland metro areas to $23,000 per year in the LA metro. The second is a two-adult household without children earning between 50 and 80 percent of AMI, which is considered a "low-income household." Average incomes for this group range from $33,000 in Phoenix to $34,000 in Cleveland and $44,000 in LA. Third is a two-adult household with two children earning between 50 and 100 percent of AMI, which by HUD definitions is a low- or moderate-income household. (This third type encompasses two income categories due to the small sample size for this household type.) Average income for this group is roughly $48,000 in Phoenix and Cleveland and $61,000 in LA.

Costs for each household type are lowest in Cleveland and highest in Los Angeles by about 19-27 percent depending on the household type and income. In each metro, for the two household types without children, transportation and food are the two largest expenditures. For households of the third type, with two children, the largest non-housing spending item in each of our metros is childcare, requiring between $11,400 and $14,000 per year.[17] This spending is followed closely by spending on food, which costs these families between $9,800 and $10,300 per year. For the household types without children, transportation is the largest non-housing spending need, running about $3,000 to

[16] It is important to note that this approach assumes that the household's actual housing costs represent a reasonable and not extravagant expenditure, such as opting to rent a large, luxurious home or one in a prime location when a suitable but less expensive option was available. To the extent that some households choose to rent more expensive housing than needed to meet their need for basic, decent shelter, this measure would overstate the extent of housing affordability problems. This situation would seem most likely to occur for moderate-income households who could afford to make this tradeoff without having to compromise on other necessities.

[17] Child care costs assume that the family pays typical costs for professional child care for a full day in the case of preschool children and for after school care in the case of school-aged children through age 12. Of course, households may meet their child care needs through arrangements with family and friends that do not incur these costs or they may not be employed and so care for their children themselves. Given the high cost of child care and the availability of these alternatives, these estimated costs likely overstate actual household expenditures.

$3,800 per year for each adult in the household.[18] Transportation spending also varies widely between metros, requiring much less spending in the Cleveland metro than in Phoenix or Los Angeles **(Exhibit 3)**.

Exhibit 3: Estimated Annual Essential Non-Housing Spending by Family Type and Metro Area

	Mean Household Income	Total Non-Housing Costs	Child Care	Food	Transportation	Health Care	Misc	Taxes
Single-person households earning between 30 and 50 percent of AMI								
Cleveland	18,518	10,946	0	3,022	3,005	1,969	1,529	1,420
Phoenix	17,991	11,413	0	3,164	3,546	1,567	1,719	1,416
Los Angeles	22,812	13,003	0	3,172	3,783	1,731	2,235	2,082
Two-adult households (no children) earning between 50 and 80 percent of AMI								
Cleveland	34,345	20,596	0	5,966	5,800	4,981	2,405	1,445
Phoenix	33,240	22,503	0	6,241	6,839	5,451	2,745	1,227
Los Angeles	43,901	26,250	0	6,257	7,286	5,727	3,293	3,686
Two-adult households with two children earning between 50 and 100 percent of AMI								
Cleveland	48,477	41,849	12,312	9,765	5,875	5,582	4,278	4,037
Phoenix	47,648	42,868	11,402	10,146	6,927	5,953	4,519	3,922
Los Angeles	61,294	52,223	14,040	10,348	7,379	6,299	5,556	8,600

Sources: JCHS tabulations of data from US Census Bureau, American Community Survey 2015, Center for Women's Welfare self-sufficiency standards, and Urban-Brookings Tax Policy Center.

The total non-housing costs listed in Exhibit 3 also include taxes. Unlike costs of essentials, which increase only modestly as you move up the income scale due to the estimated cost of miscellaneous expenses, tax expenditures increase significantly with household income in each of our study metros. Average tax expenditures begin at nearly zero income taxes in all metros (net federal tax credits and other tax benefits) for those with incomes below $15,000 per year. However, they rise to roughly $3,000 per year for households in the $30,000-$44,999 income group in each of the metro areas, to well over $8,000-$9,000 per year for families earning between $45,000 and $74,999 **(Exhibit 4)**. As tax expenses grow with each income level, differences across metros also grow wider, mostly due to differences in tax rates among high-income groups. Tax levels in Los Angeles are the highest of the three metros given California's progressive taxation system, where the top marginal tax rate for even moderate-income earners (those with incomes exceeding $50,000) is almost double the tax rate for equivalent earners in Ohio and Arizona.

Exhibit 4: Unlike Other Non-Housing Costs, Income Tax Expenditures Vary by Income Level

[18] Because public transportation use is low in our three metros, transportation costs are based on the average costs of owning and operating a car to commute to work. These costs assume that up to two adults commute separately to and from work each day, plus make one trip per household each week for errands. Per-mile commuting costs are computed from the American Automobile Association, and commuting distances are calculated using the National Household Travel Survey. Estimates for automobile insurance, other fixed costs, and variable costs are also included, using data from the National Association of Insurance Commissioners and the Consumer Expenditure Survey; initial purchasing costs are not included.

Estimated Average Annual Income Taxes by Income Level

Household Income	Cleveland	Phoenix	Los Angeles
Under $15,000	165	106	106
$15,000-$29,999	645	548	260
$30,000-$44,999	3,415	3,338	2,874
$45,000-$74,999	8,066	7,699	8,689
$75,000 and over	26,162	25,358	35,015
All Households	5,341	6,710	11,836

Sources: JCHS tabulations of data from US Census Bureau, American Community Survey 2015, Center for Women's Welfare self-sufficiency standards, and Urban-Brookings Tax Policy Center.

In our three sample household types above, we found that total essential non-housing spending, including taxes, ranges from $10,946 per year for a single-person household earning 30-50 percent of AMI in Cleveland to $52,223 per year for two adults with two children earning 50-100 percent of AMI in Los Angeles. In sum, after adding up all essential non-housing spending and tax expenditures for all renter households of all types, we find that in Cleveland, the average household requires $22,500 dollars in essential annual non-housing spending to be self-sufficient, while in Los Angeles the average is $34,000, with Phoenix falling in between, requiring $26,100. Note that these averages reflect not just differences in costs of living but also the different mixes of households by income level and household type in each metro. For example, metro Los Angeles has a higher share of households with high incomes, which adds to the higher average tax expenditure for that metro relative to the others. However, the overall averages give a useful indication of the relative costs for the metro as a whole. We now look to see how these expenses match up to housing costs and incomes in these metros.

Cost burdens under the residual income approach are determined by comparing housing expenditures to income left over after required spending on all other necessities. If the residual income is less than housing expenditures, the household is deemed to be cost burdened since it has been forced to reduce spending on necessities to accommodate its housing costs. Exhibit 5 compares the basic non-housing spending from above with actual incomes as reported in the ACS to calculate the average residual income available for housing for our three example household types, which is then compared to average actual housing costs reported by these renters.

Exhibit 5 shows that renter housing costs vary much more across metros than basic non-housing costs. As shown in the right column, depending on the household type, average gross rents reported for our example households in Los Angeles are between 50 and 70 percent higher than in Cleveland and 25 to 30 percent higher than in Phoenix. Single-person households earning between 30-50 percent of AMI spend an average of $657 per month on rents and utilities in Cleveland, $825 per month in Phoenix, and $1,189 per month in the Los Angeles metro. In each of these metros, families with children report higher costs consistent with their need for larger units.

Given local non-housing costs, the average very low-income single-person household in the Los Angeles metro has only $816 per month of residual income left over for housing, but spends an average of $1,189 per month on it. The average household of this type in Phoenix has just $548 per month left over for housing, but spends $825 per month—a gap of nearly $300. Meanwhile, the single-person household in Cleveland has $631 per month of residual income left over for housing but pays an average

of $657 per month on it, making Cleveland the metro where housing costs come closest to the affordability range for this household type.

For all three of our sample household types, those in Los Angeles have the least amount of residual income available for housing after all non-housing spending is covered, and also face the highest housing costs. As a result, perhaps not surprisingly, all three sample household types in Los Angeles report average housing costs that exceed residual incomes. The most extreme case is for the low-to-moderate-income families with children in Los Angeles, whose residual incomes would allow for just $756 per month for housing on average but whose actual average monthly housing costs are $1,619—a gap of fully $863. That the average household is cost burdened foreshadows that, when calculated for each household and aggregated up to the metro level, cost burden rates in Los Angeles under the residual income approach will be high.

Exhibit 5: Residual Incomes Left for Housing Spending and Actual Housing Spending per Month

	Mean Monthly Household Income	Estimated Monthly Non-Housing Costs of Self-Sufficiency (	Residual Income Available for Housing Costs	Actual Reported Housing Costs	Income Available for Reported Housing Costs
Single-person households earning between 30 and 50 percent of AMI					
Cleveland	1,543	912	631	657	-26
Phoenix	1,499	951	548	825	-277
Los Angeles	1,901	1,084	817	1,189	-372
Two-adult households (no children) earning between 50 and 80 percent of AMI					
Cleveland	2,862	1,716	1,146	828	318
Phoenix	2,770	1,875	895	965	-70
Los Angeles	3,658	2,187	1,471	1,340	131
Two-adult households with two children earning between 50 and 100 percent of AMI					
Cleveland	4,040	3,487	552	975	-423
Phoenix	3,971	3,572	398	1,194	-796
Los Angeles	5,108	4,352	756	1,619	-863

Sources: JCHS tabulations of data from US Census Bureau, American Community Survey 2015, Center for Women's Welfare self-sufficiency standards, and Urban-Brookings Tax Policy Center.

The "Affordable" Share of Income for Housing Costs Implied by the Residual Income Approach

By comparing residual income to total income, we can estimate of the share of income that can be devoted to housing while still leaving sufficient income to cover other necessities. Rather than being a constant 30 percent as is commonly assumed, this share will vary across household types and income levels **(Exhibit 6)**.

Exhibit 6: Residual Incomes Left for Housing Spending as a Percent of Total Incomes

	Less than 30 Percent of AMI	30-50 Percent of AMI	50-80 Percent of AMI	80-100 Percent of AMI	Over 100 Percent of AMI
Single-person households					
Cleveland	0	41	56	61	66
Phoenix	0	37	53	59	65
Los Angeles	0	43	56	59	62
Two-adult households (no children)					
Cleveland	0	8	40	51	62
Phoenix	0	0	32	45	60
Los Angeles	0	15	40	50	58
Two-adult households with two children					
Cleveland	0	0	7	23	42
Phoenix	0	0	2	21	45
Los Angeles	0	0	8	25	44

Sources: JCHS tabulations of data from US Census Bureau, American Community Survey 2015, Center for Women's Welfare self-sufficiency standards, and Urban-Brookings Tax Policy Center.

As displayed in Exhibit 6, we find that according to the residual income approach, the average 'affordable' share of total income for housing varies widely above and below the traditional 30-percent standard across metros and incomes within our three sample household types. We see that across all metros and household types, households earning less than 30 percent of AMI have an affordability ratio of 0 percent of income, meaning that on average, standard non-housing costs exceed total household income for extremely low-income households, and therefore housing at any price would not be affordable. The largest range occurs for low-income households earning 50-80 percent of AMI. According to the residual income approach, the average low-income single-person household in Cleveland, Phoenix, and LA metros could afford to spend, respectively, 56, 53, and 56 percent of their income on housing without being considered cost burdened. Meanwhile the average low-to-moderate-income two-adult household with two children in these metros could afford to spend only 7, 2, and 8 percent of their incomes, respectively, on housing. These figures are consistent with the theory that smaller households have smaller necessary non-housing expenditures, allowing them to spend more than 30 percent of income on housing without being burdened, while larger households and those with children have more necessary non-housing expenditures and therefore may be cost burdened even if they spend less than 30 percent of income on housing. Surprisingly, for families with children, the effective cost burden rate from the residual income approach remains less than 30 percent across all three metros for households up through the median income group.

Comparing Cost Burden Rates Under the Residual Income Approach to 30 Percent of Income Standard

In the sections that follow, we present the main findings from our comparison of estimated housing cost burden rates using the residual income approach to those derived using the standard 30 percent of income measure. Among the key findings are the following:

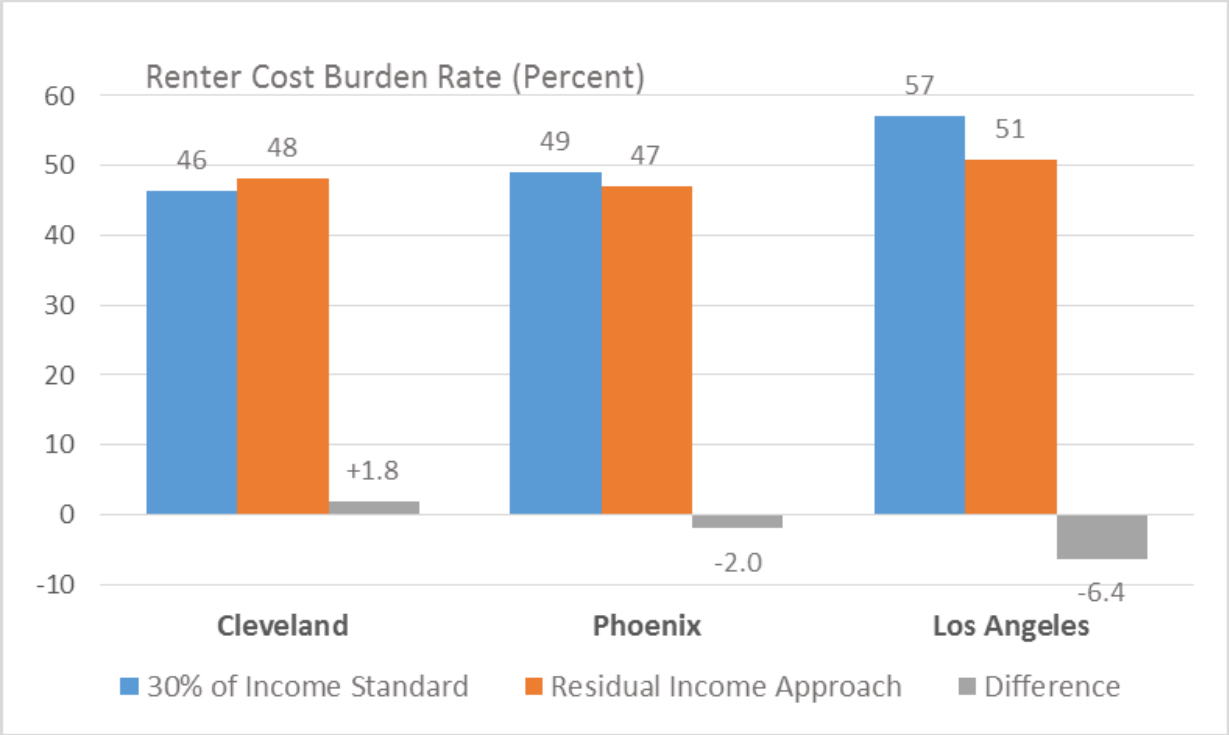
- Overall, the two approaches produce similar total cost burden rates for renters overall in each of the metro areas, with the largest difference in rates appearing in Los Angeles.
- The residual-income approach produces higher cost burden rates for the lowest-income renters and lower rates for higher-income renters.
- The residual income approach produces higher cost burden rates for larger families and lower rates for smaller families and single-person households.
- Among families with children, the residual income approach results in higher burden rates than the standard 30-percent approach at all incomes levels, and particularly at moderate incomes. In other words, the tendency toward higher cost burdens that comes with larger family size (due to higher non-housing expenses) outweighs the tendency toward lower cost burdens that comes with rising incomes.

Each of these findings is discussed in detail below.

Finding 1: The Two Approaches Produce Similar Metro-Area-Wide Cost Burden Rates

For each metro area as a whole, the renter cost burden rate under the residual income method is similar to that under the 30 percent of income standard. The differences that do occur under the residual approach make the burden rates of the three metros more similar to each other. The results of the two approaches are within two percentage points of each other in Cleveland and Phoenix. In Phoenix the estimated share of cost burdened renters is two percentage points lower under the residual income method than under the standard 30-percent method (47 versus 49 percent), while in Cleveland, the residual income method produces a cost burden rate that is two percentage points higher than the standard 30-percent method (48 versus 46 percent). The widest difference is in Los Angeles, where 51 percent of all renters are cost burdened under the residual income method, 6 percentage points lower than the 57 percent of renters who are cost burdened using the 30-percent standard **(Exhibit 7)**. As a result, where the 30 percent of income standard has a range of cost burdens across these three markets of 11 percentage points (a high of 57 percent and a low of 46 percent), the residual income approach shrinks this range to just 4 percentage points (51 percent to 47 percent).

Exhibit 7: The 30-Percent Standard and Residual Income Approaches Produce Similar Shares of Cost Burdened Renters in All Three Markets



Sources: JCHS tabulations of data from US Census Bureau, American Community Survey 2015, Center for Women's Welfare self-sufficiency standards, and Urban-Brookings Tax Policy Center.

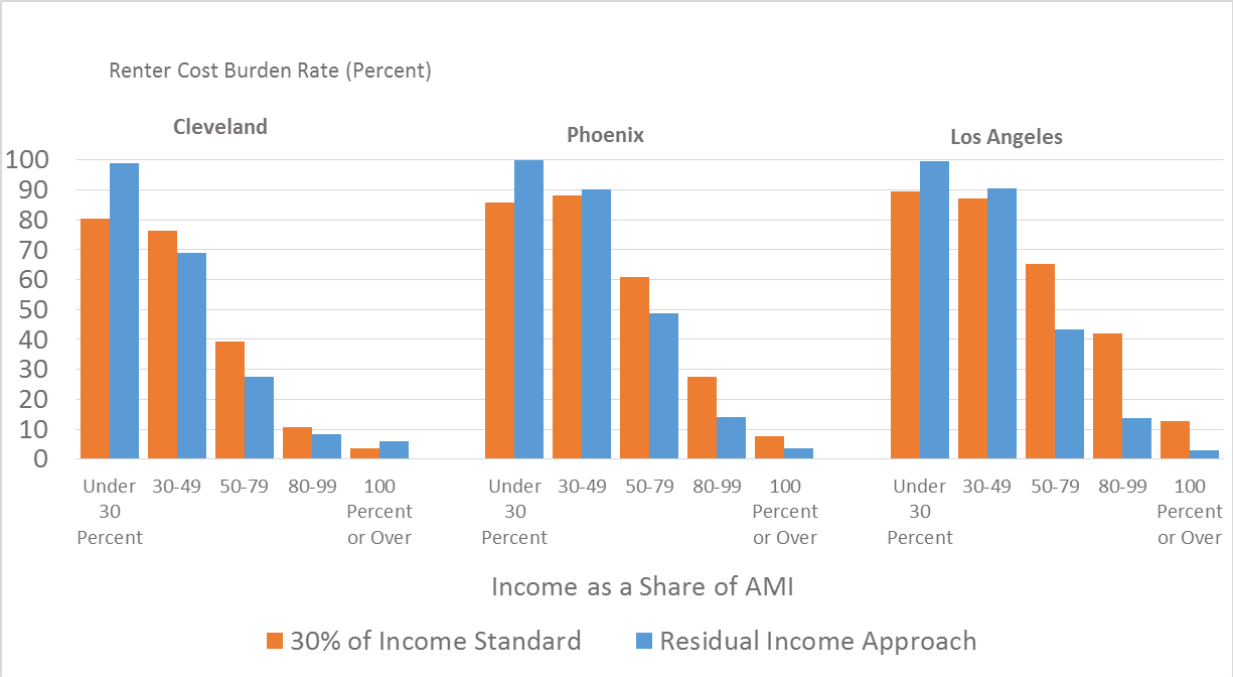
Finding 2: Compared to the 30-percent standard, the residual income approach produces higher cost burden rates for the lowest-income renters and lower cost burden rates for higher-income renters.

Although the overall cost burden rates for each metro are similar under the two approaches, the composition of burdens differs by income level. In each of our metros, renters with the lowest incomes are much more likely to be considered cost burdened under the residual income approach, while higher-income households are less likely to be considered burdened. Among extremely low-income renters earning less than 30 percent of area median income (AMI), rates of burden under the residual income approach were between 10 and 19 percentage points higher than under the 30-percent standard. Given that, under the 30-percent metric, rates for this income group were already very high—about 80 percent in Cleveland, 86 percent in Phoenix, and 89 percent in Los Angeles—the residual income approach raised those rates to nearly 100 percent in all three markets. Results were similar when lowest-income was defined as earning less than $15,000.

Meanwhile, burden rates among those with very low incomes (between 30 and 50 percent of AMI) do not vary much between the two measures. Then, for low-income renters earning between 50 and 80 percent of AMI, the residual income approach produces markedly lower burden rates in all three metros, a drop ranging from 12 percentage points in Cleveland and Phoenix to 22 in Los Angeles. Next, for moderate-income renters earning 80-100 percent of AMI, the impact of the residual income approach varies widely. Burden rates for this income group are just 2 percentage points lower in

Cleveland, 13 points lower in Phoenix, and fully 28 points lower in Los Angeles under the residual income approach than under the 30-percent standard. Overall, we find that the impact of the residual income approach increases burden rates universally for extremely low-income households (<30 percent AMI), but reduces rates among low- (50-80 percent of AMI) and moderate-income households (80-100 percent of AMI) in each of the three metros. Increases among extremely low-income households are greatest in Clevelend, while declines among low- and moderate-income households are largest, and at slightly higher relative income levels, in Los Angeles.

Exhibit 8: Compared to the 30-Percent Standard, the Residual Income Approach Produces Higher Rates of Burden at the Lowest Income Levels and Lower Rates at Higher Incomes



Notes: Extremely, Very Low, Low, and Moderate incomes are defined as, respectively, less than 30, 30-49.9, 50-79.9, and 80-99.9 percent of area median income. Residual income is household income less non-housing expenses.
Sources: JCHS tabulations of data from US Census Bureau, American Community Survey 2015, Center for Women's Welfare self-sufficiency standards, and Urban-Brookings Tax Policy Center.

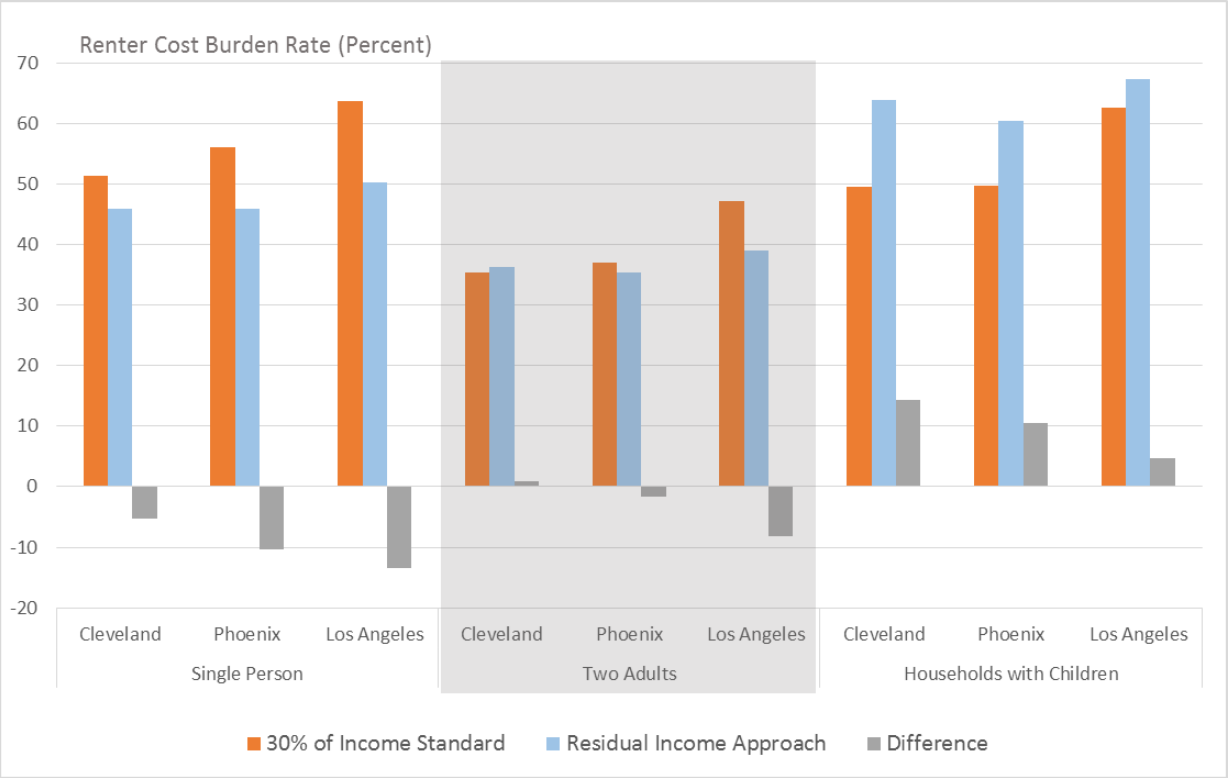
The way in which differences in cost burden rates by income level line up with the income distribution of renters in each metro area determines whether the overall cost burden rate under the residual income approach is higher or lower than that produced by the 30-percent standard. This helps explain why the residual income approach resulted in higher burden rate than the 30-percent standard for Cleveland and a lower burden rate for Los Angeles. Cleveland has a larger share of renters with extremely low incomes, who have much higher cost burden rates under the residual income method. In contrast, Los Angeles has high shares of renters with middle and high incomes, who have lower burden rates under the residual income method. As a result, the overall burden rate for Cleveland is higher under the residual income method than under the 30-percent method, while In Los Angeles it is lower. Still, in both metros the overall burden rates were similar, and arguably very high, at near 50 percent. But in

both methods, the residual income method resulted in burdens that were much more heavily concentrated among the lowest-income renters.

Finding 3: Compared to the 30-percent standard, the residual income method shows higher burden rates for families with children and lower burden rates for single-person households.

The residual income approach results in higher cost burden rates for families with children and lower cost burden rates for single-person households in each of the three metro areas. Among families with children, rates of cost burdens under the residual income approach were 14.3 percentage points higher in Cleveland, 10.6 percentage points higher in Phoenix, and 4.7 percentage points higher in Los Angeles. Among single-person households, residual income cost burdens were 13.4 percentage points lower in Los Angeles, 10.3 percentage points lower in Phoenix, and 5.4 percent lower in Cleveland.[19]

Exhibit 9. The Residual Income Approach Lowers Burden Rates for Single Persons and Raises Rates for Families with Children



Sources: JCHS tabulations of data from US Census Bureau, American Community Survey 2015, Center for Women's Welfare self-sufficiency standards, and Urban-Brookings Tax Policy Center.

[19] Under the residual income method, for two- and three-adult households without children, cost burdens were 7.6 percentage points lower in Los Angeles and 1.7 points lower in Phoenix, while in Cleveland cost burdens were actually 4.1 points higher than under the traditional 30-percent approach. This group is not mentioned or shown in the tables or figures.

Finding 4: The residual income approach shows significantly higher cost burden rates for families with children of all incomes and for the lowest-income single persons.

The finding that the residual income approach produces lower cost burden rates for renters with higher incomes does not hold true among families with children. Notably, switching to the residual income approach increases burden rates for families with children across *all* income groups in Cleveland and Phoenix, and in LA decreases rates only slightly for family households in income groups above 80 percent of AMI—groups which represent just 12 percent of burdened households in that metro. Furthermore, increases are most sharp for households earning 50-80 percent of AMI, not for those at the bottom income levels. However, among those bottom groups of renter households with children earning less than 50 percent of AMI, burden rates are lifted to roughly 100 percent under the residual income approach. As noted earlier, the high estimated costs of child care are a key driver of these affordability challenges, although many households may find alternative means of meeting their child care needs.

As another exception, the finding that the residual income approach produces lower cost burden rates for single-person households does not hold for single-person households with extremely low incomes (under 30 percent of AMI). Indeed, in Exhibit 10 we see that burden rates for these extremely low-income single-person households are actually between 10 and 19 percentage points higher under the residual income approach than under the 30-percent standard. At higher incomes, however, particularly the 50-80 and 80-100 percent of AMI groups, single-person households do have significantly lower cost burden rates under the residual income approach.

In all, as shown in Exhibit 10, we conclude that general trends of switching to the residual income approach do not hold for specific household types. Even though there is a general trend that switching to the residual income approach produces lower cost burden rates for single-person households overall, it produces significantly higher burden rates for single-person households with extremely low incomes. And even though there is a general trend that the residual income approach produces lower burden rates for higher-income households overall, this trend does not hold true among families with children in most cases.

Exhibit 10. In Contrast to General Trends, the Residual Income Approach Raises Burden Rates for Single Person Households if they are Extremely Low Income and for Higher Income Households if they are Families with Children

Cost Burden Rates by Household Type and Income

Income Level as Percent of AMI	Households with Children			Single Person Households			All Households		
	30 Percent Standard	Residual Income Approach	Change	30 Percent Standard	Residual Income Approach	Change	30 Percent Standard	Residual Income Approach	Change
Cleveland									
Under 30%	86	100	+14	77	98	+21	80	99	+19
30-49	82	98	+16	71	47	-24	76	69	-7
50-79	35	64	+29	43	8	-35	39	28	-12
80-99	2	12	+10	18	8	-11	11	8	-2
100%+	2	6	+4	4	4	+1	3	6	+2
Total	*49*	*64*	*+15*	*51*	*46*	*-5*	*46*	*48*	*+2*
Phoenix									
Under 30	93	100	+7	83	100	+17	86	100	+14
30-49	87	99	+12	89	79	-10	88	90	+2
50-79	58	87	+29	62	18	-43	61	49	-12
80-99	30	37	+6	29	2	-26	28	14	-13
100%+	3	4	+1	12	4	-8	8	4	-4
Total	*50*	*60*	*+11*	*56*	*46*	*-10*	*49*	*47*	*-2*
Los Angeles									
Under 30	95	100	+5	87	99	+13	89	100	+10
30-49	88	99	+11	87	74	-13	87	90	+3
50-79	61	75	+14	73	20	-52	65	43	-22
80-99	34	33	-1	52	7	-45	42	14	-28
100%+	12	7	-6	16	2	-14	13	3	-10
Total	*62*	*67*	*+5*	*64*	*50*	*-13*	*57*	*51*	*-6*

Notes: Households with children include a family member 18 years of age or younger who is related to the head of household, limited to households with four or fewer members.
Sources: JCHS tabulations of data from US Census Bureau, American Community Survey 2015, Center for Women's Welfare self-sufficiency standards, and Urban-Brookings Tax Policy Center.

That the metro with the widest (though still modest) overall difference in cost burden rates between the residual method and the 30-percent method is Los Angeles underscores a major point: the two methods produce notably different results across households and income levels. As a result, the income and household type distribution of renters in each metro affects how much the overall burden rates differ between the two methods. In Los Angeles, our example of a high-cost metro, the income distribution of renters skews significantly higher than that of the other two metros. Higher shares of renters in LA are moderate- and middle-income renters without children, for whom rates of burden are much lower under the residual income approach than under the standard approach. Meanwhile, at the lowest incomes, for whom rates are much higher under the residual income approach, rates in LA are already

high under the standard approach and cannot rise enough to offset the effects of declines in other income groups, as occurs in the other metros. All of these factors combine to give LA the largest difference in metrowide renter burden rates between the two methods.

Limitations of the Approach

The residual income approach to measuring cost burdens is highly attractive in its logic and specificity, but it has several practical limitations that make it difficult to extend this type of analysis for wider use. One of the main advantages of the residual income approach over the 30-percent standard is in its implied precision. Rather than a rough generalization of a household's budget, the residual income method attempts to provide a more precise measurement of a household's ability to pay for housing based on other essential spending. But the additional precision of the residual income burden calculation is both difficult to implement and in many ways potentially misleading. It is difficult to implement because it requires recent estimates of a range of non-housing expenditures for each specific location and for dozens of different household configurations of adults and children of different ages. It is potentially misleading because it relies on a number of assumptions about the costs of food, health care, transportation, and child care that may not reflect actual household costs due to differences in specific household circumstances (e.g., special needs for food or health care) or household choices (e.g., taking advantage of opportunities to economize or a preference for higher quality goods). Nevertheless, these assumptions heavily influence the method's results.

One example of the difficulty is how the residual income method estimates costs for a basic level of child care. The self-sufficiency estimate for basic child care costs assumes costs for private, professional child care based on an estimated average cost for each area depending on the age of the child. For families with children, child care is a major household cost and a significant determinant of burdens under the residual income approach, averaging from $8,400 per year in Cleveland to $9,600 in Los Angeles. Given how high these costs are, many households make other informal arrangements through family and friends that may not incur any outrden-of-pocket expenses. Families might also have access to low-cost public options or receive private or public assistance to defray these costs—scenarios that are not reflected in the method's assumptions.

Using alternative assumptions for child care costs would significantly alter the rates of cost burden. To account for some of this variation, we recalculated our residual income cost burdens excluding child care costs altogether to see what impact this recalculation would have on estimated burden rates for the three metro areas. Overall, excluding child care from the residual income calculations decreases the total cost burden rate among all renter households by 2.8 percentage points in Los Angeles, 3.2 percentage points in Cleveland, and 3.6 percentage points in Phoenix.[20]

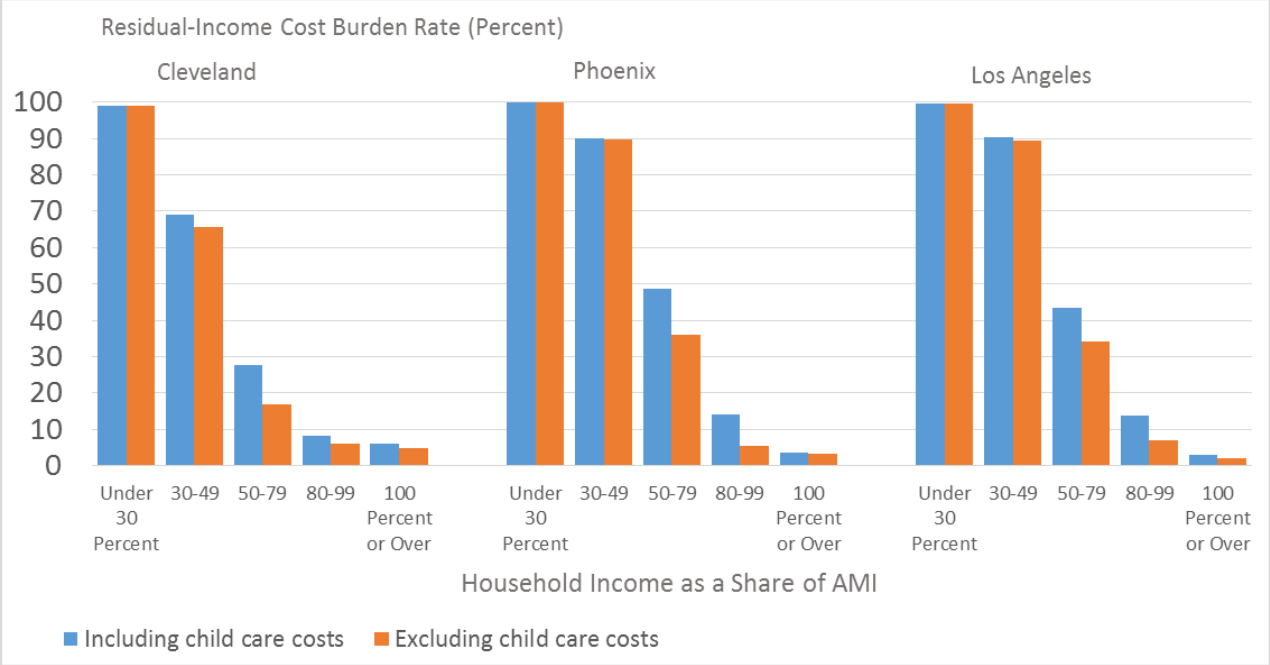
For the subsample of renter families with children, eliminating child care costs from the calculation lowers burden rates by 11 percentage points in Los Angeles, 13 points in Phoenix, and 14 points in Cleveland. Reductions are so dramatic because child care costs, as calculated under the residual income method, represent between 20 and 26 percent of essential non-housing expenditures (on average) for households with children in our three metros. What is more surprising, however, is that even with these assumed reductions in cost, 48-56 percent of families with children still register as cost burdened in

[20] These are the differences in rates for all renter households, including those without children whose costs are unchanged by the exclusion of child care costs.

these metros, rates that are approximately equal to the cost burden rates for these households under the 30-percent standard.

Also surprising is that for the lowest-income households (with incomes below 30 percent of AMI), eliminating child care costs entirely does not lower cost burden rates at all under the residual income approach. This means that other non-housing costs are so high that even with no child care costs at all, the same number of households would still not be able to afford non-housing costs after paying for housing. Looking across income levels, eliminating child care costs lowers burdens most for low- and moderate-income households earning from 50-80 and 80-100 percent of AMI **(Exhibit 11)**.

Exhibit 11: Excluding Child Care Costs Has Little Effect on Cost Burdens of the Lowest-Income Households



Sources: JCHS tabulations of data from US Census Bureau, American Community Survey 2015, Center for Women's Welfare self-sufficiency standards, and Urban-Brookings Tax Policy Center.

In addition to child care, assumptions behind the basic cost estimates for other major household expenditures such as transportation, health care, and taxes also affect the resulting cost burdens under the residual income approach. Transportation costs in the self-sufficiency budget assume that all adults are working and need to commute. However, many low-income households, particularly retirees, do not work and as a result may need to spend much less than assumed on transportation to be self-sufficient. The self-sufficiency budget estimates health care costs assuming that each adult is employed and has employer-provided health care plan. Many low-income households may not have such plans, and therefore may incur much higher (or lower) health care costs. Additionally, estimates for taxes and other items assume two-adult households file as married couples, which may not be the case.

Ultimately, excluding these other non-housing expenses (as in the exercise above with child care costs) has the effect of lowering burden rates overall, but has little impact on burden rates of the lowest-income households, 100 percent of which are burdened under the residual income approach.

There are other, more specific limitations on the extent to which our findings about cost burdens under the residual income approach apply to older adult households. The self-sufficiency standards we used do not provide different estimates of health care, transportation, or supportive service expenses for older adults at different ages (as they do for children of different ages). Given the aging of the population and the projected growth in older-adult households, the self-sufficiency standards' failure to account for the effects of aging limits our ability to make accurate inferences about future cost burdens. It also impacts our ability to make inferences by family type, particularly for single-person households that are increasingly likely also to be older-adult households. The direction of this impact is not clear, however. Older adults may often have above-average costs for health care, but lower basic transportation costs if they are retired and do not commute, or higher costs if they no longer drive and have to rely on ride services where public transit is not available or accessible. In the future, the number of older, single-person households is expected to grow significantly and make up a large portion of the expected growth in the number of burdened households. For this reason, it is important to note that while analysis here shows that, due to their relatively low levels of non-housing expenditures, the residual income method results in lower rates of burden for single-person households as a group, it may not do so for *elderly* single-person households, who will make up much of the growth in this type of household in the coming decades.

What's the Bottom Line?

For the metro areas overall, housing cost burden levels based on the residual-income approach are not significantly different than those generated by the cruder 30 percent of income metric, with the caveat that the rates are somewhat higher in the lowest-cost market and lower in the highest-cost market. However, the measures do differ substantially in their estimates for specific income groups. The 30-percent metric produces lower cost burden rates for the lowest-income households and higher rates for those with higher incomes. In aggregate, these differences changed the overall rate only in the high-cost market of Los Angeles, where, it bears mentioning, both measures find that more than half the region's renters are cost burdened, a figure slightly higher than in both the moderate-cost Phoenix and lower-cost Cleveland metro areas.

Whether or not use of the 30 percent of income standard is problematic depends on how the measure is to be used. As a gauge of the overall level of housing affordability for a market, the 30 percent of income standard actually produces estimates that are quite similar to the residual-income approach. Michael Stone's work, which generated national estimates from 1970 through 2001, shows that the trend over time in these two measures was quite similar.[21] But this analysis does suggest that the 30 percent of income standard may overstate the degree of cost burdens in higher-cost markets like Los Angeles where more low- and moderate-income renters exceed this standard. However, even in this case, the overall measure is not that different and still very high.

Perhaps the largest concern is when the measure is used to compare the rate of housing-cost burdens across income groups or household types. But here too the differences are just a matter of degree. Under either measure, the vast majority of extremely low-income renters are unable to afford housing in every type of market. However, the residual income approach puts a spotlight on the particular

[21] Stone (2006).

challenges for low- and moderate-income families with children who face higher costs for child care, food, and health care.

The 30-percent standard also results in a higher estimate for the challenges facing moderate-income households generally, which is an important consideration when deciding how to target scarce housing assistance funding. However, this analysis shows that for families with children, even at moderate incomes, burdens may actually be underrepresented by the 30-percent standard compared to the residual income approach.

One final consideration in choosing between measures is the extent to which differences in cost burden rates over time or across markets are driven by differences in housing costs or incomes or by the costs of other essential goods. For example, under the residual income approach changes in housing cost burdens could arise from changes in the costs of food, transportation, health care, child care or taxes. While these changes would produce financial stress, they would not be the result of changes in household financial capacity relative to housing costs. One advantage of the simple 30 percent of income standard is that it is more purely a metric for comparing housing costs and incomes, and is not influenced by the cost of other goods or services.

In the end, the fact that the 30-percent standard provides a reasonably accurate measure of the share of households for whom housing costs are creating a financial hardship, coupled with the simplicity of its calculation and its ready availability over time and for broad geographic areas, supports its continued use as the go-to benchmark for assessing the overall extent of housing affordability problems. But because of its imprecision at the household level, it is important that it not be the only data point used when crafting policy responses that target specific segments of the renter population in different market contexts. The large share of income required for non-housing expenditures by the lowest-income households also points to the need for more sensitivity in policies setting the share of tenant income required to be spent on rent. The analysis presented here finds that for the lowest-income households, this share may well need to be less than 30 percent to avoid financial hardship given the large share of income needed to pay for other necessities.

Although the residual income method's complexity makes it difficult to implement in nationwide studies, approximate versions of it could be useful in helping us to gauge the 30-percent method's shortcomings in identifying the types of households that are burdened. For example, given the limited amount of geographic variation in many essential expenditures, national estimates of these costs could be used to reduce the complexity of calculating costs at a local level. Or, findings from more detailed estimates could be used to derive share-of-income standards that vary with income level and household composition. At a minimum, understanding the nature and extent of shortcomings of the 30-percent standard is important in interpreting differences in housing cost burdens over time and across markets.

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Appendix A. Calculating Federal and State Income Taxes

Household tax expenditures used in this analysis were derived from summing up author-made estimates of state and federal income taxes. Estimates of federal and state income taxes were calculated separately for each household and required making a number of assumptions and simplifications to approximate the tax liabilities of household types described in the Self-Sufficiency Standard. Neither local income taxes, such as those levied in cities in the Cleveland metro area, nor state-level EITC were considered for this analysis.

Federal taxes were estimated using the Urban-Brookings Tax Policy Center microsimulations model of effective tax rates by filing unit and income level in 2015.[22] Effective tax rates in the model account for individual income taxes including the federal EITC and the child tax credit, payroll taxes, corporate income taxes, estate taxes, and excise taxes. For this analysis, effective tax rates from the Brookings model are matched to households in the ACS based on their filing status (via the composition of the household) and their income using several assumptions: all single-person households are assumed to be single filers, all households with children are assumed to be filers with children, and all two- and three-adult households without children are assumed to be joint filers **(Table A1)**. By assuming all households choose the filing option that produces the lowest effective rate for their household type, these assumptions produce a generally conservative estimate of federal tax liability overall. Once an effective tax rate is matched to households, the assumed tax rate is applied to the household's reported income to produce an estimate of the federal taxes paid. If a household's income is below zero, the effective tax rate is assumed to be zero.

State taxes were estimated using income tax forms from 2015 for Ohio, Arizona, and California. We assumed that all taxpayers utilized the standard deduction and any deductions for dependents, applying the marginal tax rates to the household's income minus these deductions. All households with one adult are assumed to be single filers, and all households with two or more adults are considered joint filers. The number of dependents is estimated based on the number of children plus the third adult for any three-adult households. Deductions per dependent, plus the standard deduction and any other assumed deduction, are subtracted from the household's reported income to produce an estimate of taxable income. State-level marginal tax rates are then applied to that income level to produce an estimate of state income taxes paid.

[22] See http://www.taxpolicycenter.org/publications/urban-brookings-tax-policy-center-microsimulation-model. The Tax Policy Center's income estimates are based on their definitions of Expanded Cash Income, which differ from the gross income reported in the ACS. See their website for more details.

Table A1. Assumed Effective Federal Tax Rate by Filing Status and Income (2015)

Household Income ($000s)	Single Filers	Joint Filers	Filers with Children
Negative	0.0	0.0	0.0
0-10	7.2	1.5	-13.3
10-20	5.2	-0.3	-13.2
20-30	8.2	-0.4	-6.8
30-40	11.6	2.7	-0.2
40-50	13.9	5.5	4.6
50-75	16.9	9.3	9.8
75-100	19.9	13.2	13.8
100-200	22.2	18.0	17.9
200-500	26.1	22.8	22.8
500-1,000	30.9	28.0	28.2
More than 1,000	36.6	33.6	33.9

Source: Urban-Brookings Tax Policy Center

Note: Effective tax rates were used to estimate federal income taxes for individual respondents in the ACS. All single-person households in the ACS are assumed to be single filers, all households with children are assumed to be filers with children, and all two- and three-adult households without children are assumed to be joint filers. If a household's income is below zero, the effective tax rate is assumed to be zero.