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Economic Wellbeing and Where We Live: Accounting for Geographical Cost-of-living Differences in the US

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Summary. **Regional cost-of-living differences affect the quality of life that individuals and families experience in different metropolitan areas. Yet, lack of metropolitan cost-of-living indexes has left analysts without the ability to make accurate cost-of-living adjustments to measures of economic wellbeing. This paper evaluates alternative approaches to cost-of-living measurement and then applies the ACCRA cost-of-living index to various US metropolitan area datasets, including median household income, the number of people living in poverty, and family eligibility for the Free and Reduced Price School Lunch and Head Start programmes to illustrate some of the policy impacts of adjusting economic indicators of wellbeing for geographical cost-of-living differentials.**

Introduction

The regional cost of living affects the quality of life that individuals and families experience in different places. An income of $62 732, the 2002 median household income in the US for a family of 4 (HHS, 2004), purchases a much higher standard of living in Wichita, KS, than in New York City, NY. Yet, lack of available data directly measuring these differences, as well as disagreement on how to do so, has left analysts with manifestly inaccurate measures of economic wellbeing.

Both researchers and policy-makers often use income-based measures—particularly median household income, per capita income and the proportion of the population with incomes below the poverty level—as tools to gauge the relative economic wellbeing of an area's residents. However, since the cost of living varies significantly among US metropolitan areas, unadjusted income-based measures inevitably yield misleading results. For instance, researchers at the US Census Bureau found that in 2003 a larger proportion of people were living with incomes below the poverty line in Cleveland, Ohio, than in any other major city in the nation, making Cleveland the poorest city in America (Proctor and Dalaker, 2003). However, in measuring relative poverty rates among US cities, Census Bureau researchers did not account for differentials in the purchasing power of income. Rather, poverty was measured at a static rate across the nation (in 2003, it was $18 400 for a family of 4). Given that Cleveland's living costs are relatively low when compared with other major cities,[1] it is doubtful that the magnitude of poverty in Cleveland is in fact higher than in many other large but high-cost metropolitan areas. This has had a

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perceptible impact on investment confidence in the region and in risk perceptions about the region's economic future. Thus, without downplaying the reality of poverty, there is a question as to whether or not this statistical 'fact' is indeed correct and it is quite possible that the 'poorest big city' designation is having a negative impact on the economy of the city.

Further, while it is interesting to understand how regional price differences affect quality-of-life measures, it is arguably more important to understand how cost-of-living differences impact eligibility for social support and income transfer programmes. Economic and community development programmes such as the HOPE VI programme and the Community Development Block Grant programme provide financial assistance to communities based upon their level of need. However, regional living costs are not taken into account when computing community need levels. There are currently over 80 federal means-tested programmes providing cash and non-cash benefits to poor individuals and families. Eligibility criteria for these programmes are based upon: the federal poverty guidelines or the Census Bureau's poverty thresholds[2] (or a combination of both); state or area median income; the lower living standard income determined by the Bureau of Labor Statistics; an absolute monetary standard; or, an income level considered to indicate 'need' (CRS, 2003). With the exception of the qualification standards that are based upon state or area median income, and in some cases those that are based on multiples of the poverty standards,[3] most programmes do not take living costs into consideration when determining programme eligibility.

Thus, there is a clear distortion in having a single, national, poverty line.[4] Because land costs and associated housing and rental prices and insurance costs are typically lower in rural areas than in urban areas, it is safe to assume that the national average poverty line overstates rural poverty and understates urban poverty. At the same time, the national average poverty line will understate the poverty rate in 'expensive' metropolitan areas and central cities and overstate it in 'cheaper' metropolitan areas and central cities. Since differences in per capita income, average household income and the portion of the population with incomes below the poverty line are frequently used to compare the quality of life in different places, not accounting for differences in the regional cost of living distorts measures of economic wellbeing. Furthermore, failing to account for living cost differentials in programme eligibility means that there are large quality-of-life differences among those who qualify for federal means-tested programmes.

However, some argue that it is undesirable to account for geographical cost-of-living differences in measures of economic wellbeing and programme eligibility. (See Cebula, 1979a and 1979b for a survey of the literature regarding the relationship between welfare benefit levels, interstate migration and adjusting policies for geographical cost-of-living differences.) Proponents of this position argue that differences in living costs reflect the different packages of amenities/disamenities that are available in different areas because amenity packages are capitalised into land and housing costs. Thus, residents in high cost-of-living areas are, in effect, paying for the higher value of the amenities they receive. If they feel that they are paying too high a cost in terms of the amenities they value and are receiving, they will move elsewhere (thus 'voting with their feet' in a manner similar to that postulated by Tiebout (1956) for intrametropolitan moves in search of tax/service packages that best meet a household's preferences) and, if they are satisfied with the package of amenities they are receiving, they will remain in their current location.

The argument follows that regional variations in land costs and ground rents play an important allocative function in the economy because they are a device for rationing scarce resources such as environmental amenities, cultural amenities and access to region-specific labour markets. Low ground rents are a pull factor in interregional migration decisions, while high ground rents

are a push factor. Subsequently, regional variation in living costs is critical to establishing long-run equilibrium in the nation's regional labour markets.

However, despite the compelling nature of these arguments, there are several reasons why geographical cost-of-living differentials should be accounted for in measures of economic wellbeing and public policy, especially when addressing the needs of poor and low-income populations. First, while it is correct that regional variations in housing prices are likely to capture amenity or disamenity differences among areas (Kaplow, 1995), housing—as we shall argue later—is only one component of regional cost-of-living differences. Differences in the cost of food, clothing, health care, utilities, etc. are likely to reflect real variations in supply costs and these variations are real components in disparities in the quality of life. These differences are likely to be largely, if not completely, independent of the amenity characteristics of the area.

Secondly, even with respect to regional housing cost and land cost variations, which we agree partially reflect regional amenity and labour market differences, the implicit rationale for the argument against adjusting for geographical cost-of-living (COL) differentials assumes that individuals have perfect information and mobility, as is assumed by Tiebout in his *intrametropolitan* sorting hypothesis. But we are concerned here with *regional*—i.e. *intermetropolitan* differences. Within a metropolitan area, Tiebout's assumption was that households could locate anywhere within that area and still have access to the same job. Clearly, this is not true on an *intermetropolitan* level.

The application of Tiebout's hypothesis to the argument against making COL adjustments is weakened further by the fact that all segments of the population are not equally mobile. Highly educated and amenity-seeking households have a greater degree of intermetropolitan mobility and choice because they do not face the same financial, informational and educational constraints that poor households experience. Poor and low-income households have less money for moving costs, less information about intermetropolitan occupational and residential opportunities and less human capital to employ to take advantage of those opportunities than higher-income households. Subsequently, poor and low-income households have a relatively lower degree of intermetropolitan residential mobility and choice than the rest of the population (Gimpel, 1999). As a result, poor people often bear the costs of amenities through higher housing prices, regardless of whether or how much they actually value them.

Fourthly, the argument that regional variations in living costs serve to propel the national labour market into a long-run equilibrium is problematic for two primary reasons. First, individuals who relocate for specific jobs seek compensation for living cost differentials in high-cost areas. Thus, differences in compensation packages somewhat mitigate differences in living costs for higher-income, mobile people. Furthermore, regional differences in living costs redistribute income from those who are place-bound and do not place a high value on the amenity package (often poor and low-income people) to those who place a high value on the package of amenities in a given area.

Therefore, while low-income people may be enjoying some of the amenities associated with high-cost metropolitan areas (assuming their amenity preferences match those present in the area), when compared with the rest of the population they have a limited opportunity to make choices between residential locations. In this light, economic theory suggests that when households are immobile, adjusting for COL differences is economically efficient because it does not result in inter-regional distortions in the allocation of labour and production (Kaplow, 1995). Therefore, although there is no existing technique available for accounting for amenity differences in cost-of-living indices and it is therefore likely that cost-of-living indices overstate intermetropolitan variations in quality of life, we argue that adjusting for cost-of-living differences when measuring poverty is preferable to disregarding disparities in living costs altogether.

Cost-of-living Measures

There are several cost-of-living (COL) measures available and geographical COL estimates vary a great deal depending upon the measure that is used. For example, using four different widely available COL measures, whose methodology we describe and critique in the following section of the article, results in very different measures of median household income. Median household income in 2000, as reported in the US Bureau of the Census and not adjusted for regional cost-of-living differences, is reported in the second column of Table 1 for a set of 15 metropolitan areas.[5] We then used four existing measures of COL variation to adjust median household income levels for geographical living cost differences: the Department of Housing and Urban Development's (HUD) Fair Market Rents (FMR) measure, the Economic Policy Institute's (EPI) Family Budgets Measure, the Brookings Institution's Metropolitan Price Indices and ACCRA's Cost of living Indices. As is evident in the table, the estimated purchasing power of a household's income varies a great deal depending on the COL adjustment used. In the Chicago metropolitan area, for example, the Census Bureau's unadjusted median household income in 2000 was $51 680. Using the Fair Market Rent approach for measuring COL differences, the median household income in Chicago is adjusted down to $30 047, using the EPI Family Budget adjustment it is estimated at $45 333, using the Brookings Institution Index it is estimated at $41 757 and using the ACCRA index, it is $42 188. This represents a range in COL estimates of $21 633, depending on the measure used. Although adjusted median household income measures do not vary as much for all MSAs/PMSAs as they do for Chicago, all of the metropolitan areas in our sample vary by at least $5637 in adjusted median income levels.

The measures of central tendency for median household income unadjusted for COL differences (reported at the bottom of the second column of Table 1) differ from the measures of central tendency for the distributions of median household income that were adjusted for intermetropolitan area COL differences. HUD's Fair Market Rent measure produces the lowest average median household income estimates ($31 256), with the second-highest coefficient of variation (CV). The estimates of median household income produced with EPI's Family Budget, Brookings' Metropolitan Indices and ACCRA's COL measure are much closer to one another as measured by their average values than is HUD's Fair Market Rent measure. The average median household income estimates using the EPI's Family Budget COL adjustment is $40 749, using the Brookings Metropolitan Price Index it is $37 832 and using ACCRA's COL series it is $39 903. ACCRA's indices result in the highest variation among metropolitan areas.

The summary statistics from Table 1 demonstrate that failing to adjust for COL differences is likely to distort relative measures of wellbeing and that different methods for adjusting the original data yield widely varying results. Thus, it is important to examine the different COL measures that are available to gauge the impact that their methodologies and data collection strategies have on measuring geographical differences in the COL on the economic wellbeing of residents.

Housing-based Measures

There are two primary approaches to measuring geographical COL differences: housing-based measures and market basket measures. Housing-based measures rely on housing and utility costs as the sole source of regional COL differences and do not take the costs of other goods and services into account. Market basket models are more inclusive in their approach, as they compare the costs of a constant combination of goods and services across geographical areas (the composition of the market basket remains the same across metropolitan areas).

Housing-based COL measures rely on the assumption that housing and utility costs are the only source of COL differences among

Table 1. Reported census median household income and estimated median household income after adjusting for cost-of-living differences (in $)

Metropolitan area	Reported median household income1999[a]	Estimated median household income after cost-of-living adjustment				Range of household median income
		HUD Fair Market Rent (FMR)[b]	Economic Policy Institute Family Budget[c]	Brookings Institution Metropolitan Price Indices[d]	ACCRA Cost of Living Indices[e]	
Albuquerque, NM, MSA	**39 088**	29 600	38 701	35 349	38 739	9 488
Atlanta, GA, MSA	**51 948**	32 326	48 100	43 276	50 484	19 622
Baton Rouge, LA, MSA	38 438	41 110	**43 189**	37 735	38 095	2 079
Boston, MA–NH, PMSA	**55 183**	25 956	38 590	40 229	41 151	29 227
Chicago, IL, PMSA	**51 680**	30 047	45 333	41 757	42 188	21 633
Evansville–Henderson, IN–KY, MSA	39 307	35 096	**42 725**	37 814	41 289	7 629
El Paso, TX, MSA	31 051	26 093	34 122	29 219	**35 732**	9 639
Jacksonville, FL, MSA	42 439	34 872	**46 129**	38 718	44 115	11 257
Jersey City, NJ, PMSA	**40 293**	22 286	36 300	31 810	24 704	18 007
Kansas City, MO–KS, MSA	46 193	35 642	46 193	42 086	**47 136**	11 494
Philadelphia, PA–NJ, PMSA	**47 536**	28 533	42 067	38 972	40 047	19 003
Shreveport—Bossier, City LA, MSA	32 558	35 187	**36 582**	33 566	36 378	4 024
Spokane, WA, MSA	**37 308**	31 671	**37 308**	35 234	34 290	5 637
Springfield, MA, MSA	**40 740**	27 602	32 079	35 206	33 781	13 138
Washington, DC–MD–VA–WV, PMSA	**62 216**	32 814	43 814	48 016	50 418	29 402

(*Table continued*)

Table 1. Continued

Metropolitan area	Reported median household income1999[a]	Estimated median household income after cost-of-living adjustment				Range of household median income
		HUD Fair Market Rent (FMR)[b]	Economic Policy Institute Family Budget[c]	Brookings Institution Metropolitan Price Indices[d]	ACCRA Cost of Living Indices[e]	
Mean	43 732	31 256	40 749	37 932	39 903	14 085
Standard deviation	8 629	4 807	4 867	4 803	6 739	
Coefficient of variation	0.20	0.15	0.12	0.13	0.17	

[a]Source: US Census Bureau (http://factfinder.census.gov/servlet/DTGeoSearchByListServlet?ds_name=DEC_2000_SF3_U&_lang=en&_ts = 111680527320).

[b]FMR value based on two-bedroom apartment in 2000. MSA/PMSA FMRs are indexed to national average FMR, which was $443 for a two-bedroom apartment in 2000. *Source*: US Department of Housing and Urban Development (http://www.huduser.org/datasets/fmr.html).

[c]Family Budgets values are based on two-parent, one-child family, 1999. MSA/PMSA values are indexed to national average Family Budget values. *Source*: http://www.epinet.org.

[d]Brookings Institution Metropolitan Price Indices are based on the study by Berube and Tiffany (2004). The original indices used in the study were based on 1999 FMR values and were calculated using the following formula: metropolitan FMR/national FMR * 0.33 + 0.67. We applied Berube and Tiffany's formula to 2000 FMR values to increase comparability between the indices included in Table 1.

[e]ACCRA indices are for the fourth quarter, 2000.

Notes: Highest median household income after adjusted for metropolitan cost-of-living (COL) is listed in **bold**.

All indices are indexed to 100, which represents the national average. Adjusted median household income levels were derived by dividing the median household income in a metropolitan area reported by the US Bureau of the Census by the appropriate index and multiplying by 100. For instance, in Albuquerque, the original median household income ($39 088) was divided by the FMR index of 132.1, arriving at a quotient of 295.9. That number was then multiplied by 100, arriving at an adjusted income of $29 600. This method was used for all adjusted income levels in all subsequent tables.

The Metropolitan Statistical Areas (MSAs) and Primary Metropolitan Statistical Areas (PMSAs) included in Table 1 (and subsequent tables) were chosen from a study by Furdell *et al.* (2004) in which the authors studied urban distress in 98 central cities. The central cities included in their study were cities with populations over 125 000 that were in MSAs/PMSAs with populations of over 250 000 in 2000. The 15 MSAs/PMSAs included in our tables are a subset of the MSAs/PMSAs that were represented in the study by Furdell *et al*. The 15 MSAs/PMSAs that we selected to include in our tables were based on the criteria of national regional representation and variations in size. The set of 15 MSAs/PMSAs was chosen for illustrative purposes and is not a statistically representative sample.

areas or that the other sources of price differences in a region's COL are highly correlated with these costs. Thus, housing-based COL measures estimate geographical COL differences based on housing and utility costs alone, while other possible contributors, such as groceries, automobile insurance, and clothing are omitted from the regional COL estimates. While housing-based COL measures are useful in estimating the relative costs of housing between geographic areas, they have weaknesses as a broader measure of the regional differences in the quality of life.

Housing-based methods depend on housing price data from one of two sources: the US Census Bureau's American Housing Survey (AHS) or the US Department of Housing and Urban Development's (HUD) Fair Market Rents. Data from the Census Bureau's American Housing Survey (AHS) report on housing and resident characteristics such as income levels, housing and neighbourhood quality, housing costs, equipment and fuel consumption, the size of housing units and recent moves. These data are collected at the metropolitan statistical area (MSA) level every other year for a sample of housing units (AHS, 2004). Fair Market Rents (FMRs) are rental cost measures derived from the AHS data, census data and random digit dialing telephone surveys. FMRs are used by the Department of Housing and Urban Development (HUD) to determine programme eligibility for Section 8 housing assistance voucher programmes and are estimated annually for 354 metropolitan areas and 2350 non-metropolitan rural areas. FMRs are set at the 40th percentile rental level in a metropolitan area, meaning that the lowest 40 per cent of all rent and utility payments in a metropolitan area are at or below the FMR dollar amount (HUD, 1995). FMRs are updated annually with AHS and census data.

There are several examples of interregional COL measures that rely on AHS and FMR data, including the National Research Council's alternative to the official poverty measure, the Basic Needs Budget and the Brookings Institution's Metropolitan Price Indices.[6] To illustrate the housing-based approach to COL measurement, we focus on the National Research Council's (NRC) COL measure, which was created in 1995 by the National Academy of Sciences Panel on Poverty and Family Assistance (NRC, 1995 and 2002). The NRC measure is a proposed alternative to the current poverty threshold and is based upon the purchase price of a constant market basket of goods and services.

Geographical COL variation in the NRC model is derived from rental cost differences among areas. The NRC constructed 54 regional housing price indices from 1990 Fair Market Rent values. Each of the indices created by the NRC corresponds to a set of metropolitan areas, differentiated by population size, within a census region. The nine census regions (New England, Middle Atlantic, East North Central, West North Central, South Atlantic, East South Central, West South Central, Mountain and Pacific) were broken down into six population size categories

—non-metropolitan areas;
—metropolitan areas under 250 000;
—metropolitan areas 250 000–500 000;
—metropolitan areas 500 000–1 000 000
—metropolitan areas 1 000 000–2 500 000; and
—metropolitan areas 2 500 000 or more.

Thus, each of the 9 census regions had 6 possible FMR values, for a total of 54 different COL differentials that were incorporated into the NRC poverty measure (NRC, 2002). Housing and utility costs were weighted at 44 per cent of the poverty budget, while the remaining 56 per cent of household costs are held constant in the NRC measure (NRC, 2002).

The National Research Council's alternative poverty measure, as well as housing-based COL measures in general, are inaccurate measures of interarea COL differentials because housing costs vary geographically more than the costs of other goods. The NRC attempted to remedy this problem by weighting housing costs at 44 per cent of the poverty budget, yet their measure assumes that all other household costs are constant, which is clearly not the case. Table 2

Table 2. ACCRA cost-of-living index values for the 26 largest metropolitan areas, second quarter 2004

Component of the cost-of-living index	Index values			Correlation with housing index
	Highest	Lowest	Standard deviation	
Housing	259.8	79.3	58.8	
Health care	138.3	82.9	13.7	0.36
Utilities	134.1	90.4	12.2	0.42
Groceries	133.3	85.9	10.8	0.79
Transport	131.9	95.7	10.4	0.79
Miscellaneous goods and services	124.3	95.3	8.3	0.68

Note: National average = 100.0.
Source: ACCRA (http://www.accra.org/media/).

illustrates the interarea variation of the costs of housing, health care, utilities, groceries, transport and miscellaneous goods and services for the second quarter of 2004 for the nation's 26 largest MSAs (ACCRA, 2004). (The national average value for each sub-index and the overall index is 100.) The standard deviations for these 26 metropolitan areas are displayed for each sub-index, as is their correlation with housing costs. As the table illustrates, the standard deviation of the housing cost indices is more than four times greater than the next highest sub-index, the cost of health care. The standard deviation of housing is more than seven times that of miscellaneous goods and services, the category with the lowest standard deviation across all of the 26 largest metropolitan areas. Thus, it is clear that measures relying only on housing costs to adjust for COL differences will overstate COL differences. In addition, it is evident that, while the costs of other goods do not vary as much as the cost of housing, they still exhibit important variations that should be captured in accurate COL measures.

Housing-based COL measures do not recognise regional variation in the 67 per cent of the average after-tax household budget that is not related to housing expenditures. This would not be a problem if interarea variations in the costs of other goods were highly correlated with the interarea variation in housing costs; however, Table 2 shows that variations in the non-housing sub-index values do not necessarily correspond with variations in housing prices. This is particularly the case with health care (with a correlation of 0.36), utilities (correlation of 0.42) and miscellaneous goods and services costs (correlation of 0.68). Thus, COL measures that only take housing costs into consideration will be inaccurate.

Furthermore, FMR values have additional problems as a generalised way of measuring interregional cost-of-living differences. First, FMRs were developed specifically for the Section 8 programme and were not intended as overall housing cost measures. Consequently, FMRs measure only rents, not total housing costs or costs associated with home-ownership (Short, 2001). Secondly, FMRs observe only the expenses of recent movers, who are defined as people that have moved in the past year. This is problematic because recent movers represent only a small portion of the population and it is likely that collecting data for recent movers results in an upward bias in the FMR because long-term renters often experience discounted rents (NRC, 1995). Thirdly, the National Research Council (1995) stated that the FMR measure does not control for housing quality and, as a consequence, sub-standard housing in low-income areas will exert a downward bias on the FMR.[7] Fourthly, because the FMR is calculated for the 40th percentile of the rent distribution, it is skewed towards lower-income households, making it a poor representation of the cost of living experienced for the middle and upper levels of the income

distribution. Thus, it is clear that relying on housing-based measures in general, and FMRs in particular, as measures of geographical variations in living costs is problematic. A broader measure of geographical COL differences is necessary in order accurately to gauge interarea living cost differentials and to make regional income measures better indicators of the economic wellbeing of residents.

Market Basket Measures

An alternative approach to housing-based measures for assessing geographical COL differences is to make use of market basket measures. Such measures estimate the costs of a constant combination of goods and services, or a market basket, across geographical areas. This approach offers a more accurate assessment of COL differences than housing-based measures because it includes the relative prices of goods and services such as health care, transportation, food, clothing and insurance—all of which are omitted in the housing-based measures.

Fundamental to market basket approaches to COL adjustments are consumer profiles. To determine the goods that are included in the market basket and the appropriate proportion of income spent on those goods, researchers construct profiles of consumers based upon consumption data from the US Bureau of Labor Statistics' (BLS) Consumer Expenditure Survey data. Consumer profiles are usually derived from the national average consumption patterns of a study population (for instance, the national average expenditure patterns of a family of 4, earning $55 000 per year) and the market basket of goods and services is then specified based upon average consumption patterns of the specified study population. The relative cost of obtaining the market basket across local areas is then compared and indices are constructed to measure how far prices in each locality deviate from the reference area or the national average.

Market basket measures using secondary data sources. Different types of market basket COL measures can be distinguished by examining their data collection methods. Market basket COL measures either use existing price data to construct COL indices or they rely on information collected for the specific purpose of COL measurement. Measures that use existing price data, such as local retail surveys, state-level data and national surveys that were conducted for other purposes, are referred to as secondary data measures. Measures that rely on original, first-hand data that were collected for the specific purpose of COL measurement are primary data measures. Primary data measures collect information through either on-site reporting or the use of surveys designed specifically for the collection of COL information.

Market basket COL measures using secondary data sources have been developed by organisations as diverse as the Economic Research Institute (ERI), the Economic Policy Institute (EPI) and Sperling's *Best Places.* [8] To illustrate, we focus on the Economic Research Institute (ERI), which is a private organisation that conducts salary, compensation and benefits research for public- and private-sector clients, and which developed a software package that uses secondary data sources to estimate geographical COL differences. ERI's Relocation Assessor Software provides estimates of COL differentials for professional and managerial persons living in over 10 000 cities world-wide. Estimates of COL differentials are based upon the consumption patterns of professional and managerial persons, which are obtained from the Consumer Expenditure Survey or equivalent international data sources. Then, using existing data sources, such as housing rental price data from local realtors' offices and local surveys of retail prices, ERI constructs estimates of geographical COL divergences based upon expenses for housing, transport, health care, utilities, taxes and miscellaneous goods and services. Data for US and Canadian residences are reported at the city level (defined by municipal boundaries) and the ZIP code level. COL information for all other international cities is available only at the city level (ERI, 2004).

ERI's Relocation Assessor software compares intrametropolitan COL differentials for various profiles of professional-level households. In addition, variables such as family size, income level, vehicle type and housing size can be altered in the programme so that users can project COL estimates that do not fit into ERI's pre-defined consumer profiles. However, despite the software's flexibility in estimating the COL experiences for professional-level households, the Relocation Assessor software is lacking in its applicability to low- and moderate-income households. The data presented in the first column of Table 3 illustrate this point. Table 3 compares the proportion of income allotted to expenditures on major categories of goods used by three different COL measures with the actual expenditure data of low- and moderate-income consumers obtained from

Table 3. Distribution of expenditures by major categories of goods compared to the US Bureau of Labor Statistics' Consumer Expenditure Survey data for the lowest 40 per cent of the income distribution (percentages)

Component of the cost-of-living indices	Economic Research Institute Relocation Assessor[a]	Economic Policy Institute Family Budget[b]	ACCRA Cost of Living Index[c]	US Bureau of Labor Statistics Consumer Expenditure Survey low- and moderate-income consumers[d]
Distribution of expenditures without payroll or income taxes				
Housing/utilities	42.8	19.7	13.0	16.0
Health care	45.9	21.8	39.0	34.2
Transport	8.9	8.8	10.0	17.9
Groceries	7.1	10.5	4.0	7.7
Miscellaneous goods and services	−4.7	39.2	34.0	24.3
Differences between the distribution of consumer expenditures: COL methodology and the Consumer Expenditure Survey[e]				
Housing/utilities	26.8	3.7	−3.0	16.0
Health care	11.7	−12.4	4.8	34.2
Transport	−9.0	−9.0	−7.9	17.9
Groceries	−0.6	2.8	−3.7	7.7
Miscellaneous goods and services	−28.9	14.9	9.8	24.3

[a]ERI estimates are for a family of 4 earning $18 850 in 2004. Homeowners/renters' insurance is included as a housing cost. The Relocation Assessor software produces a negative value for 'Miscellaneous goods and services' because the algorithm used in the computer programme is not designed to compute expenditures for low-income families. *Source*: ERI's Platform Library, CD ROM, April 2004.

[b]EPI Family Budget for a 2-parent, 2-child household in 1999. Miscellaneous expenditures include childcare (24.4 per cent) and miscellaneous goods (11.5 per cent). *Source*: http://www.epinet.org/datazone/fambud/xls/2p2c.xls.

[c]Expenditure weights were updated in 2003 based on US Bureau of Labor Statistics Consumer Expenditure Survey data. ACCRA indices typically construct two separate sub-indices for housing and utilities; however, the two categories were combined in order to increase comparability between indices. *Source*: ACCRA Cost of Living Index Manual, 2003.

[d]Average expenditures for consumer units in 2002 with incomes in the lowest quintile ($8316 per year) and in the second quintile ($21 162 per year). *Source*: US Bureau of Labor Statistics, Consumer Expenditure Survey 2004 (http://www.bls.gov/cex/2002/Standard/quintile.pdf).

[e]Calculated as the percentage distribution from the COL methodology less the percentage distribution in the Bureau of Labor Statistics' Consumer Expenditure Survey.

Notes: EPI's Family Budget and ERI's Relocation Assessor include adjustments for local taxation expenditures; however, these results are reported without the tax component to maintain comparability with the other indices.

the Consumer Expenditure Survey. The data in the first column of the table show the Relocation Assessor software's apportionment of income into five categories of expenditures for a family of four earning the poverty wage. As the table illustrates, the Relocation Assessor software estimates that the family spends a negative portion of their income on miscellaneous goods and services. Thus, it is evident that the software package is not designed to estimate the expenditure realities of low-income consumers. In addition, ERI only collects housing price data on 'professional-standard housing.' This further limits the programme's applicability to low- and moderate-income households because the housing costs reflected in the Relocation Assessor software are likely to be much higher than those faced by consumers of more limited means.

Most critics of the COL measures based on secondary data analyses argue that their weakness lies in the fact that the baseline data used in constructing the measures are inaccurate (GAO, 1997). Biases and inaccuracies will skew COL estimates when the COL measure is based on price data that have not been carefully designed to measure differences in inter-area living costs. For instance, in the case of ERI's Relocation Assessor software programme, data for COL estimates are obtained from existing, independent, local-level data sources. Most of these local sources employ different definitions and methodologies for collecting their data, yet because ERI collects price data on several different items in 10 000 different cities, it would be virtually impossible for them to identify and control for all of the data inconsistencies. Thus, it is likely that secondary data measures, such as ERI's Relocation Assessor, are imprecise in measuring interregional cost-of-living differences.

In order to overcome the problem of local-level data unavailability and inconsistency, the market basket COL measures discussed often use large-area geographical data to measure COL differences. For instance, many of the measures use state-level data to estimate portions of their local indices. However, this, too, is problematic because living costs are likely to vary as much within states as between them. For example, the cost of living in metropolitan Chicago may have more in common with New York City than with Springfield, IL, and the cost of living in Seattle, WA, may have more in common with Portland, OR, than with Spokane, WA. The National Research Council (1995) found that after reviewing 1990 census data on housing costs, the population size of a geographical area was a more important factor in predicting housing (and other) costs than was the state of residence and that "most states include urban and rural areas that vary widely in population density and housing costs" (p. 62). Thus, COL indices that use state-level data to approximate living costs are less desirable than are measures that control for population size.

In conclusion, COL measures that are based on secondary data sources tend to lack precision. Secondary price data are often available only for large geographical areas and these data are often inconsistent with regional price variations. In the event that local-level price data are available, they are often incompatible with one another due to the fact that data collection techniques are inconsistent, resulting in misconstrued COL measures. It is desirable, therefore, that COL measures are based on local-level data sources that collect data under a consistent protocol.

Market basket measures using primary data sources. As an alternative to basing COL projections on existing data sources, two groups have developed COL estimates using primary price information. ACCRA, formerly the American Chamber of Commerce Research Association, develops COL indices for roughly 200 urbanised areas every quarter.[9] ACCRA collects its data through self-administered surveys in which retailers respond to questions regarding the prices they charge for goods and services (ACCRA, 2003). In addition, Runzheimer International creates cost-of-living differentials to estimate COL differences for 350 domestic and international cities on a monthly

basis using price data collected by on-site researchers (Runzheimer, 1994).

As an illustration of primary data market basket approaches, we examine the ACCRA COL index. The ACCRA COL index measures geographical price differences based on information for 59 items classified into six categories: grocery items, housing, utilities, transport, health care and miscellaneous goods and services. Retailers recruited by local ACCRA members in each urbanised area respond to detailed surveys regarding the prices they charge. The surveys are designed by ACCRA, yet are self-administered by respondents. Once local price data are obtained, they are compared with the national average of all prices, which is set at 100. Local-area COL indices are then expressed as a percentage of that number (ACCRA, 2003).

An earlier approach utilised the Bureau of Labor Statistics' (BLS) Family Budgets data to estimate and predict COL indices. Family Budgets were market basket COL measures constructed by BLS for 25 metropolitan areas and 4 metropolitan regions from 1966 to 1981 but have since been discontinued (GAO, 1997).[10] Several researchers (see Cebula, 1986; Fournier *et al.*, 1988; and McMahon, 1991), predicted Family Budgets for the metropolitan areas that were not included in the original BLS dataset. Regression analysis of 1981 Family Budgets data were used to estimate parameters that were then applied to calculate predicted cost-of-living estimates for other metropolitan areas. COL estimates for succeeding years for the original areas were inflated by the Consumer Price Index for specific urban areas and regions for which BLS collected data; regression coefficients were then estimated for these areas and once again applied to other areas in order to estimate their cost of living for that year. An obvious concern with using this approach today is that a quarter of a century has passed since 1981 and, while cost-of-living differences based on regional market baskets among areas may be slow to change, they surely are not invariant and errors are likely to have accumulated with the passage of time (McMahon, 1991).

Summary and Evaluation of Approaches

Our assessment of the usefulness of the COL methodologies suggest important trade-offs among them. First, housing-based COL measures are flawed because housing, on average, comprises only 33 per cent of households' after-tax budgets. Thus, relying on housing alone to gauge the magnitude of COL differentials between areas is inaccurate. Secondly, in terms of accuracy, the market basket primary data COL approach employs research methodologies that are far superior to the other two measures because they collect local-level, consistent data. Thirdly, in terms of the expenditure components covered, all of the measures are likely to understate interregional variations in COL because they do not reflect region-specific consumption patterns. Fourthly, care must be taken in applying the results beyond the baseline household income class (usually a professional middle-class household) for which the data are collected.

Although the market basket primary data COL approach is superior to other approaches, market basket measures are not without weaknesses. Koo *et al.* (2000) identify several potential biases in market basket measures such as ACCRA. First, because baseline indices count all cities equally rather than by population weighting them, the overall baseline (i.e. the standard against which other scores are based) is arguably too low. As a consequence, the cost of living for large cities is overestimated. None of the COL measures examined is weighted for population. Secondly, indices based on a national market basket of goods do not reflect regional differences in consumption patterns. The bias introduced by using a market basket measure has a marked effect on the housing price input of the ACCRA index. The price of housing that goes into the ACCRA index is for a 2400 square foot home with 3–4 bedrooms, 2 full baths, an attached 2-car garage and several other amenities (ACCRA, 2003). However, mid-level managers that live in high-cost areas such as New York City or San Francisco often do not live in this type of housing because of the cost of real estate in the area. Therefore, using this standard

of housing as a proxy for housing prices in all metropolitan areas results in an overestimate of living costs in high-cost areas. Incorporating regional consumption patterns into market basket measures could be done with the use of Consumer Expenditure Survey data. Together, these biases suggest that the cost of living for large cities with high housing costs may be overestimated using a market basket approach. Thus, in the best of all possible worlds, the market basket approach would be improved by incorporating population weighting and regional sensitivity to consumption patterns, especially in terms of housing.

Bureau of Labor Statistics' researchers Kokoski, Cardiff and Moulton (1994) and Kokoski, Moulton and Zieschang (1996) addressed many of the problems associated with the market basket approach through the use of hedonic regression on Consumer Price Index (CPI) microdata (or baseline data) for urban areas. This approach, known as the KCM or KMZ measure, uses CPI baseline data to construct interarea COL indices. KCM/KMZ use hedonic regression on the CPI microdata to standardize the types of goods contained in the market basket across areas. In addition, the researchers control for differences in regional consumption patterns (or weights within the market basket) by including a control for climate in their regression models. The KCM/KMZ approach is very complex and uses CPI data on tens of thousands of items to construct their interarea COL indices. Although this approach addresses many of the problems associated with market basket measures, because of its complexity, the KCM/KMZ measure is cost-prohibitive to most researchers. In addition, because of confidentiality restrictions, CPI microdata are usually unavailable to the public. In sum, this approach should be followed by a national government in constructing cost of living measures. It cannot be used by research teams on limited budgets.

Application of COL Adjustments: What Difference Does It Make?

Since the ACCRA data reflect the preferred COL approach described for a research team—a market basket primary data approach—and since the data were readily available to us, we opted to employ the ACCRA COL measure to illustrate the impact of accounting for COL differences in measures of economic wellbeing and determinants of programme eligibility. One weakness we encountered when using ACCRA's information for measuring geographical COL differences, however, is that although the data are reported for geographical areas that represent 70 per cent of the US population (ACCRA, 2003), the set of urbanised areas for which cost-of-living indices are available varies every quarter because participation in the ACCRA survey is voluntary.[11] As a consequence, the ACCRA data would appear to pose serious problems for research use because they are inconsistent and often unavailable for specific metropolitan areas and cities.[12] However, we have remedied this problem through the specification of a regression equation that estimates geographical COL indices for the several areas that are not included in ACCRA reports. Because of lack of data availability for specific urbanised areas, we predicted indices at the MSA/PMSA level.

As the first step in our analysis, we estimated a regression equation for 2000 ACCRA indices in which a sample of 67 ACCRA index values were regressed against 3 independent variables. The independent variables include the median owner-occupied housing value in the central city of the MSA/PMSA, the natural log of population in the central city of the MSA/PMSA and the region in which the MSA/PMSA is located. Median home value and population figures were obtained from the US Census Bureau's American Housing Survey and the US decennial Census of Population. The 12 regions used in the model were derived from the Bureau of Economic Analysis' 8 regions, but were modified to group regions by similarity in economic trends.[13]

When the ACCRA indices were regressed against the independent variables, the model produced an R^2 value of 0.789 for the year 2000. The high R^2 value suggests that the

independent variables (median home value, population and regional location) explain roughly 79 per cent of the variation in the ACCRA Cost of living Index in 2000. Furthermore, when the model is used to predict the COL index for a metropolitan area, the actual and predicted indices had a correlation coefficient of 0.882. Thus, we concluded that our model can be used to predict the ACCRA COL indices for those metropolitan areas where there are missing observations.[14]

As discussed in the beginning of this article, the primary public policy applications of COL adjustments involve measuring economic wellbeing. Typical indicators used to gauge economic wellbeing are the portion of the population or the percentage of households with incomes that are at, or below, the official poverty thresholds, the median household income and per capita income. In order to assess the difference that would result if COL adjustments were applied to these measures, we applied, for illustrative purposes, the ACCRA Cost of living Index to the official 2000 poverty guidelines and the 1999 median household incomes of a selection of 98 MSAs. The MSAs included in our selection are MSAs of at least 250 000 people that contained central cities with populations of at least 125,000 in 1980. Table 4 reports these results and it is evident that the purchasing power of the median household income varies a great deal across metropolitan areas. In the Chicago metro area, the census-reported 2000 median household income of $38 625 is only equal to $31 527 after adjusting for living costs (a decline of 18.4 per cent), while the purchasing power of Memphis' median household income of $32 285 increases to $35 517 (an increase of 10.0 per cent). Overall, average median household income levels in our group of 98 MSAs and PMSAs decreased by $2489 when adjusted for cost-of-living differences.

As stated previously, the poverty guidelines, which are used by states in setting qualifying standards for a number of social welfare programmes for households and individuals, are currently set at uniform levels across the country (although states sometimes use different multiples of the poverty level to establish their qualifying standards). When adjusting for geographical COL differentials, however, the poverty guidelines show significant variation across the nation's metropolitan areas. The coefficient of variation for the maximum federal poverty level rises from zero to 0.21.[15] For the group of 98 MSAs/PMSAs examined, the mean household income poverty level for a family of 4 increases from the unadjusted level of $17 050 to an adjusted level of $18 272 in 2000. The impact of adjusting for cost-of-living differences is particularly significant in cities with especially high living costs, such as in the Honolulu, HI, MSA, where the poverty line would increase from $17 050 for a family of 4 to $22 818 if cost-of-living differentials were recognised.

The percentage and number of families that are considered to be poor would change dramatically in a number of metropolitan areas if the official income guidelines recognised metropolitan area differences in the cost of living. Table 5 illustrates the number of families that were considered to be below the poverty threshold in 1999 in the group of 15 metropolitan areas used earlier in this article, versus the number that would have been considered poor in the same year, had the poverty guidelines been adjusted for living cost differences.[16] In the Chicago PMSA, the number of families considered to be poor in 2000 rises from 8.0 per cent of all families in the PMSA to 10.3 per cent. This represents a real increase of 46 216 families. Several jurisdictions see gains in the number of families considered poor, while others experience losses in their poor populations.

Accounting for regional differences in the cost of living would have an impact on the number of people and families eligible for public policies. Table 6 shows the change in the number of families that would be eligible for the Free and Reduced Price School Lunch and Head Start programmes in the group of 15 metropolitan areas that have been followed in this article.[17] The Free and Reduced Price School Lunch programme provides free lunches for school-aged children from families with incomes at or below

Table 4. ACCRA-adjusted poverty guidelines and median household income for 98 central cities, 1999 and 2000

Selected central cities	Federal poverty guideline, family of four, 2000				Median household income, 1999			
	Reported federal maximum income level ($)	ACCRA cost-of-living adjusted maximum income level ($)	Difference (ACCRA - federal)		US Bureau of the Census	ACCRA cost-of-living adjusted median income[a] ($)	Difference (ACCRA - federal)	
			Dollars	Percentage[b]			Dollars	Percentage[b]
Akron OH	17 050	17 287	237	1.4	31 835	31 398	−437	−1.4
Albuquerque NM	17 050	17 203	153	0.9	38 272	37 931	−341	−0.9
Anaheim CA	17 050	23 535	6 485	38.0	47 122	34 138	−12 984	−27.6
Atlanta GA	17 050	17 544	494	2.9	34 770	33 790	−980	−2.8
Austin TX	17 050	16 351	−699	−4.1	42 689	44 514	1 825	4.3
Baltimore MD	17 050	16 539	−512	−3.0	30 078	31 008	930	3.1
Baton Rouge LA	17 050	17 203	153	0.9	30 368	30 097	−271	−0.9
Birmingham–Hoover AL	17 050	16 504	−546	−3.2	26 735	27 619	884	3.3
Boston MA	17 050	22 864	5 814	34.1	39 629	29 552	−10 077	−25.4
Bridgeport CT	17 050	28 895	11 845	69.5	34 658	20 451	−14 207	−41.0
Buffalo NY	17 050	16 862	−188	−1.1	24 536	24 809	273	1.1
Charlotte NC	17 050	17 135	85	0.5	46 975	46 741	−234	−0.5
Chattanooga TN	17 050	16 845	−205	−1.2	32 006	32 395	389	1.2
Chicago IL	17 050	20 888	3 838	22.5	38 625	31 527	−7 098	−18.4
Cincinnati OH	17 050	16 965	−85	−0.5	29 493	29 641	148	0.5
Cleveland OH	17 050	19 113	2 063	12.1	25 928	23 129	−2 799	−10.8
Colorado Springs CO	17 050	16 897	−153	−0.9	45 081	45 490	409	0.9
Columbus OH	17 050	17 152	102	0.6	37 897	37 671	−226	−0.6
Corpus Christi TX	17 050	14 358	−2 692	−15.8	36 414	43 240	6 826	18.7
Dallas TX	17 050	17 152	102	0.6	37 628	37 404	−224	−0.6
Dayton OH	17 050	17 186	136	0.8	27 423	27 205	−218	−0.8
Denver CO	17 050	18 397	1 347	7.9	39 500	36 608	−2 892	−7.3
Des Moines IA	17 050	15 818	−1 232	−7.2	38 408	41 399	2 991	7.8
Detroit MI	17 050	19 351	2 301	13.5	29 526	26 015	−3 511	−11.9
El Paso TX	17 050	14 808	−2 242	−13.2	32 124	36 988	4 864	15.1
Evansville IN	17 050	16 232	−818	−4.8	31 963	33 575	1 612	5.0
Flint MI	17 050	16 373	−677	−4.0	28 015	29 174	1 159	4.1

(*Table continued*)

Table 4. Continued

Selected central cities	Federal poverty guideline, family of four, 2000				Median household income, 1999			
	Reported federal maximum income level ($)	ACCRA cost-of-living adjusted maximum income level ($)	Difference (ACCRA - federal)		US Bureau of the Census	ACCRA cost-of-living adjusted median income[a] ($)	Difference (ACCRA - federal)	
			Dollars	Percentage[b]			Dollars	Percentage[b]
Fort Lauderdale FL	17 050	17 426	376	2.2	37 887	37 069	−818	−2.2
Fort Wayne IN	17 050	15 976	−1 074	−6.3	36 518	38 973	2 455	6.7
Fort Worth TX	17 050	17 272	222	1.3	37 074	36 598	−476	−1.3
Fresno CA	17 050	18 312	1 262	7.4	32 236	30 015	−2 221	−6.9
Gary IN	17 050	16 970	−80	−0.5	27 195	27 323	128	0.5
Grand Rapids MI	17 050	17 527	477	2.8	37 224	36 210	−1 014	−2.7
Greensboro NC	17 050	16 470	−580	−3.4	39 661	41 057	1 396	3.5
Hartford CT	17 050	20 594	3 544	20.8	24 820	20 549	−4 271	−17.2
Honolulu HI	17 050	22 818	5 768	33.8	45 112	33 709	−11 403	−25.3
Houston TX	17 050	16 198	−853	−5.0	36 616	38 543	1 927	5.3
Indianapolis IN	17 050	16 573	−477	−2.8	40 051	41 205	1 154	2.9
Jackson MS	17 050	15 669	−1 381	−8.1	30 414	33 095	2 681	8.8
Jacksonville FL	17 050	16 402	−648	−3.8	40 316	41 909	1 593	4.0
Jersey City NJ	17 050	27 804	10 754	63.1	37 862	23 218	−14 644	−38.7
Kansas City MO	17 050	16 709	−341	−2.0	37 198	37 957	759	2.0
Knoxville TN	17 050	16 300	−750	−4.4	27 492	28 757	1 265	4.6
Lansing MI	17 050	18 005	955	5.6	34 833	32 986	−1 847	−5.3
Las Vegas NV	17 050	18 175	1 125	6.6	44 069	41 341	−2 728	−6.2
Lexington KY	17 050	16 607	−443	−2.6	39 813	40 876	1 063	2.7
Little Rock AR	17 050	16 215	−835	−4.9	37 572	39 508	1 936	5.2
Los Angeles CA	17 050	21 398	4 348	25.5	36 687	29 233	−7 454	−20.3
Louisville KY	17 050	16 266	−784	−4.6	28 843	30 234	1 391	4.8
Madison WI	17 050	17 995	945	5.5	41 941	39 740	−2 201	−5.2
Memphis TN	17 050	15 498	−1 552	−9.1	32 285	35 517	3 232	10.0
Miami FL	17 050	18 141	1 091	6.4	23 483	22 070	−1 413	−6.0
Milwaukee WI	17 050	18 582	1 532	9.0	32 216	29 561	−2 655	−8.2
Minneapolis MN	17 050	17 937	887	5.2	37 974	36 097	−1 877	−4.9
Mobile AL	17 050	15 754	−1 296	−7.6	31 445	34 031	2 586	8.2
Montgomery AL	17 050	16 521	−529	−3.1	35 627	36 767	1 140	3.2

Nashville TN	17 050	16 283	−767	−4.5	39 232	41 081	1 849	4.7
New Haven CT	17 050	20 989	3 939	23.1	29 604	24 049	−5 555	−18.8
New Orleans LA	17 050	16 920	−130	−0.8	27 133	27 342	209	0.8
New York NY	17 050	39 556	22 506	132.0	38 293	16 506	−21 787	−56.9
Newark NJ	17 050	30 483	13 433	78.8	26 913	15 053	−11 860	−44.1
Norfolk NE	17 050	16 521	−529	−3.1	31 815	32 833	1 018	3.2
Oakland CA	17 050	24 004	6 954	40.8	40 055	28 451	−11 604	−29.0
Oklahoma City OK	17 050	15 345	−1 705	−10.0	34 947	38 830	3 883	11.1
Omaha NE	17 050	16 283	−767	−4.5	40 006	41 891	1 885	4.7
Orlando FL	17 050	16 675	−375	−2.2	35 732	36 536	804	2.2
Patterson NJ	17 050	22 768	5 718	33.5	32 778	24 546	−8 232	−25.1
Philadelphia PA	17 050	20 238	3 188	18.7	30 746	25 902	−4 844	−15.8
Phoenix AZ	17 050	17 613	563	3.3	41 207	39 891	−1 316	−3.2
Pittsburgh PA	17 050	17 392	342	2.0	28 588	28 026	−562	−2.0
Portland OR	17 050	19 181	2 131	12.5	40 146	35 685	−4 461	−11.1
Providence RI	17 050	20 202	3 152	18.5	26 867	22 675	−4 192	−15.6
Raleigh NC	17 050	17 272	222	1.3	46 612	46 014	−598	−1.3
Richmond VA	17 050	17 715	665	3.9	31 121	29 953	−1 168	−3.8
Riverside CA	17 050	19 028	1 978	11.6	41 646	37 317	−4 329	−10.4
Rochester NY	17 050	17 075	25	0.1	27 123	27 084	−39	−0.1
Rockford IL	17 050	16 266	−784	−4.6	37 667	39 483	1 816	4.8
Sacramento CA	17 050	19 284	2 234	13.1	37 049	32 758	−4 291	−11.6
Salt Lake City UT	17 050	17 911	861	5.0	36 944	35 169	−1 775	−4.8
San Antonio TX	17 050	15 243	−1 807	−10.6	36 214	40 508	4 294	11.9
San Diego CA	17 050	21 585	4 535	26.6	45 733	36 124	−9 609	−21.0
San Francisco CA	17 050	29 039	11 989	70.3	55 221	32 423	−22 798	−41.3
San Jose CA	17 050	28 701	11 651	68.3	70 243	41 728	−28 515	−40.6
Seattle WA	17 050	21 927	4 877	28.6	45 736	35 563	−10 173	−22.2
Shreveport LA	17 050	15 267	−1 783	−10.5	30 526	34 090	3 564	11.7
Spokane WA	17 050	18 550	1 500	8.8	32 273	29 663	−2 610	−8.1
Springfield MA	17 050	20 562	3 512	20.6	30 417	25 221	−5 196	−17.1
St. Louis MO	17 050	16 487	−563	−3.3	27 156	28 083	927	3.4
Stockton CA	17 050	18 257	1 207	7.1	35 453	33 108	−2 345	−6.6
Syracuse NY	17 050	17 221	171	1.0	25 000	24 752	−248	−1.0
Tacoma WA	17 050	17 749	699	4.1	37 879	36 387	−1 492	−3.9
Tampa FL	17 050	16 627	−423	−2.5	34 415	35 289	874	2.5
Toledo OH	17 050	17 442	392	2.3	32 546	31 814	−732	−2.2

(*Table continued*)

Table 4. Continued

Selected central cities	Federal poverty guideline, family of four, 2000: Reported federal maximum income level ($)	ACCRA cost-of-living adjusted maximum income level ($)	Difference (ACCRA - federal): Dollars	Difference (ACCRA - federal): Percentage[b]	Median household income, 1999: US Bureau of the Census	ACCRA cost-of-living adjusted median income[a] ($)	Difference (ACCRA - federal): Dollars	Difference (ACCRA - federal): Percentage[b]
Tucson AZ	17 050	17 374	324	1.9	30 981	30 403	−578	−1.9
Tulsa OK	17 050	15 942	−1 108	−6.5	35 316	37 771	2 455	7.0
Washington DC	17 050	21 040	3 990	23.4	40 127	32 518	−7 609	−19.0
Wichita KS	17 050	16 402	−648	−3.8	39 939	41 517	1 578	4.0
Worcester MA	17 050	19 894	2 844	16.7	35 623	30 531	−5 092	−14.3
Summary statistics								
Mean	17 050	18 655	1 605	9.4	35 372	32 883	(2 489)	−6.4
Standard deviation		3 832	3 832	22.5	6 994	6 605	5 845	13.9
Coefficient of variation		0.21	2.39	2.39	0.20	0.20	−2.35	−2.16

[a]ACCRA-adjusted poverty levels were derived by dividing the appropriate index by 100, and multiplying by the current poverty guideline. *Example*: The calculation for Albuquerque's poverty level was (100.9/100) * 17 050 = 17 203. ACCRA-adjusted median household incomes were derived by dividing the appropriate index by 100 and dividing into the current median household income.

Example: The calculation for Albuquerque's median household income was 38 272/(100.9/100) = 37 931.

[b]The percentage difference was calculated as [(ACCRA - federal)/federal].

Notes: The central cities in Table 4 were chosen from a study by Furdell *et al.* (2004), in which the authors studied urban distress in 98 central cities. The central cities included in their study were cities with populations over 125 000 that were in MSAs/PMSAs with populations of over 250 000 in 2000. MSAs/PMSAs in **bold** are the regions for which the ACCRA COL index was predicted using our regression model.

Sources: 2000 Poverty Guidelines: *Federal Register*, 65(31), 15 February, 2000, pp. 7555–7557; 1999 Median household income, Table P53 (US Census Bureau, 2000).

Table 5. Effect of using ACCRA's cost-of-living adjustments to estimates of the poverty level and the number of families with incomes at, or below, the poverty level in 2000

	Current federal maximum poverty income level		ACCRA cost-of-living adjusted poverty estimates		
	Number of poor families	Poor families as a percentage of total families	Number of poor families	Poverty families as a percentage of total families	Change in number of poor families
Albuquerque NM, MSA	19 323	10.6	19 592	10.7	269
Atlanta GA, MSA	73 716	7.0	76 594	7.3	2 878
Baton Rouge LA, MSA	19 112	12.3	19 342	12.4	230
Boston MA–NH, PMSA	49 766	6.0	73 106	8.8	23 340
Chicago IL, PMSA	161 787	8.0	208 004	10.3	46 216
El Paso TX, MSA	33 380	20.0	27 213	16.3	−6 168
Evansville–Henderson IN–KY, MSA	5 993	7.5	5 556	6.9	−437
Jacksonville FL, MSA	23 907	8.1	22 596	7.7	−1 311
Jersey City NJ, PMSA	19 795	13.7	36 411	25.1	16 617
Kansas City MO–KS, MSA	29 470	6.3	28 674	6.1	−796
Philadelphia PA–NJ, PMSA	107 924	8.3	132 174	10.2	24 250
Shreveport–Bossier City LA, MSA	15 058	14.5	12 900	12.4	−2 158
Spokane WA, MSA	9 064	8.4	10 352	9.6	1 288
Springfield MA, MSA	15 241	10.5	19 076	13.1	3 835
Washington DC–MD–VA–WV, PMSA	64 610	5.2	85 232	6.9	20 623

Notes: The metropolitan statistical areas (MSAs) and primary metropolitan statistical areas (PMSAs) included in Table 6 were chosen from a study by Furdell *et al.* (2004), in which the authors studied urban distress in 98 central cities. The central cities included in their study were cities with populations over 125 000 that were in MSAs/PMSAs with populations of over 250 000 in 2000. The 15 MSAs/PMSAs included in our tables are a subset of the MSAs/PMSAs that were represented in the study by Furdell *et al*. The 15 MSAs/PMSAs that we selected to include in our tables were based on the criteria of national regional representation and variations in size. The set of 15 MSAs/PMSAs was chosen for illustrative purposes and is not a statistically representative sample.

Federal poverty guidelines from US Department of Health and Human Services were used as opposed to the US Census Bureau's Federal Poverty Standards because HHS' poverty guidelines are used more frequently to determine programme eligibility than the census' poverty standards. (For a detailed discussion of poverty guidelines and poverty standards, see http://www.irp.wisc.edu/faqs/faq1.htm.)

Using data from the US Census Bureau on family income by family size (1999), we interpolated both the number of families considered poor under current standards as well as the number of poor families considered poor under income-adjusted standards. The calculation used for the number of 2-person poor families under current standards in Albuquerque, NM, is as follows

Federal poverty guideline for a family of 2: $11 250	
Number of 2-person families earning less than $10 000 in Albuquerque, NM	5173
Number of 2-person families earning $10 000 - $14 999 in Albuquerque, NM	4858
Poverty guideline - lower bound of range ($11 250–$10 000)	1250
Upper bound of range - lower bound of range ($14 999–$10 000)	4999
Percentage of category that are poor: (1250/4999)	25
0.25(4858) =1294 families in category that are poor	1215
Two person poor families under current standards (5,173 + 1,294)	6388

The same calculation was used for all MSAs/PMSAs for all family sizes (up to 7 or more people). The total number of poor families is the aggregate number of poor families at each family size in each MSA/PMSA. The same calculation was used for current and income-adjusted standards.

ACCRA-adjusted poverty guidelines and median household income levels were derived by dividing the reported federal level by the appropriate index, multiplied by 0.01. The total number of poor families (under current and income-adjusted standards) is the aggregate number of poor families at each family size in each MSA/PMSA. Poor families as a percentage of total families = (total number of poor families)/(total families).

Source: US Census Bureau, Census 2000 SF4 Summary Tables, Table PCT117.

Table 6. Change in the number of families eligible in 2000 if cost-of-living adjustments were permissible

MSA/PMSA	Change in eligibility for free school lunch through the Free and Reduced-price Lunch programme[a] Poor families with children aged 6–17		Change in eligibility of families for Head Start programme[b] Poor families with children under 5	
	Number	Percentage difference	Number	Percentage difference
Albuquerque, NM, MSA	144	1.3	49	1.4
Atlanta, GA, MSA	1 680	4.1	458	3.9
Baton Rouge, LA, MSA	410	3.7	38	1.2
Boston, MA–NH, PMSA	13 951	49.0	3 614	46.9
Chicago, IL, PMSA	26 841	30.7	6 690	28.6
El Paso, TX, MSA	−11 851	−57.9	−750	−18.5
Evansville–Henderson IN–KY, MSA	−318	−9.5	−101	−7.3
Jacksonville, FL, MSA	−1 236	−8.4	−214	−5.5
Jersey City, NJ, PMSA	9 380	80.5	2 091	83.9
Kansas City, MO–KS, MSA	−402	−2.4	−144	−2.7
Philadelphia, PA–NJ, PMSA	15 125	24.7	3 072	22.5
Shreveport–Boisser, LA, MSA	−4 830	−51.9	−367	−14.3
Spokane, WA, MSA	803	14.9	286	14.2
Springfield, MA, MSA	2 238	25.3	668	25.2
Washington, DC–MD–VA–WV, PMSA	12 331	33.9	2 913	31.9

[a]Children eligible for free school lunches under the Free and Reduced-price School Lunch programme are school-aged children whose annual family income is at or below 130 per cent of the federal poverty guidelines. Children with family incomes greater than 130 per cent but less than 185 per cent of the federal poverty guidelines are eligible for reduced-price lunches, however we did not include reduced-price lunches in our analysis. The following calculation was used to calculate the COL-adjusted and unadjusted number of families eligible for free lunches (Albuquerque, NM MSA)

Unadjusted Federal Poverty Guideline for 2-person families	11 250	Unadjusted poverty guideline for 2-person families	11 250
Adjusted for COL by ACCRA (Index/100): 100.9/100 = 1.09	11 351		
Adjusted for programme eligibility: 11 351 * 1.3	14 757	Adjusted for programme eligibility: 11 250 * 1.3	14 625
Number of 2-person families earning less than $10 000	5 173	Number of 2-person families earning less than $10 000	5 173
Number of 2-person families earning $10 000–14 999	4 858	Number of 2-person families earning $10 000–14 999	4 858
14 999–10 000	4 999	14 999–10 000	4 999
14 757–10 000	4 757	14 625–10 000	4 625
4757/4999	0.952	4625/4999	0.925
0.952 * 4 858	4 622	0.925 * 4858	4 495
Families with adjusted incomes 130 per cent FPG (5173 + 4622)	9 795	Families with incomes130 per cent of FPG (5173 + 4495)	9 668

This calculation was repeated for all family sizes, up to families with 7 or more persons. Totals for Albuquerque are as follows: Families with COL-adjusted incomes at or below 130% of poverty

Families with incomes at or below 130% of poverty			
2-person families	9795	2-person families	9 668
3-person families	6939	3-person families	6 855
4-person families	5849	4-person families	5 772
5-person families	3389	5-person families	3 341

6-person families	1603	6-person families	1 583
7-person families	1283	7-person families	1 270
Total families	28,858	Total families	28 490
Percentage of poor families in Albuquerque with children aged 5–17	0.390	Percentage of poor families in Albuquerque with children aged 5–17	0.390
Total families eligible for free lunches	11,262	Total families eligible for free lunches	11 118
Change (19 787 - 19 534)	144		
Percentage difference (19 787 - 19 534)/19 534	1.3		

[b]The Head Start programme is available to pre-school-aged children from families with incomes at or below 100 per cnet of the federal poverty guideline. The same basic calculation as above was used to determine the number of families eligible for Head Start. The only differences were: there was no need to adjust incomes by a multiplier for program eligibility; and, the total number of families eligible for the Head Start program was multiplied by the percentage of poor families in each MSA with children under 5 (as opposed to children aged 5–17).

Sources: US Census Bureau, Census 2000 SF4 Summary Tables, Table PCT117. US Census Bureau, Census 2000 SF3 Summary Tables, Table P90. Programme eligibility data obtained from CRS (2003).

130 per cent of the poverty level. The Head Start programme provides early childhood and pre-school education for children under 5 from families with incomes below 100 per cent of the poverty guideline. As Table 6 depicts, adjusting for metropolitan cost-of-living differences when determining poverty levels greatly increases the number of people eligible for social services in high-cost MSAs and PMSAs, while it decreases the number in low-cost MSAs and PMSAs. In Chicago, for example, 26 841 more families qualify for free lunches and 6690 more families qualify for Head Start. In low-cost MSAs and PMSAs, such as Kansas City, MO, programme eligibility for free lunches and Head Start decreases by 402 families and 144 families respectively.

Conclusion

Economic indicators of wellbeing such as the official poverty measure and median household income are currently insensitive to geographical cost-of-living differentials. This is problematic because real income indicators do not account for the geographical differences in the purchasing power of income and the subsequent differences in living standards faced by individuals and families across geographical areas. While several cost-of-living measures exist, they vary greatly in their accuracy, cost-effectiveness, applicability to populations of various income levels and appropriateness of their components.

Based upon these criteria, we conclude that market basket measures using primary data sources currently best meet these conditions. However, market basket approaches could be greatly improved by including population weights, controlling for differences in regional consumption patterns and accommodating households of varying income levels into their measures. Using hedonic regression on high-quality baseline data is one way of addressing these weaknesses; however, the research to date has proved to be prohibitively costly.

For illustrative purposes, we utilised the ACCRA market basket measure to illustrate that adjusting for cost-of-living differences would have substantial impacts on public policy and on eligibility for means-tested programmes. While we acknowledge that all existing cost-of-living indices contain biases and defects (which we have discussed), we believe that the test should be whether applying a well-constructed, though imperfect, cost-of-living index yields a better understanding of the world than would ignoring these differences and not adjusting for regional variations in the cost of living at all. We believe that it does and point to the

simple calculations we have performed as evidence of the potential impact of taking cost-of-living variations into account.

Notes

1. See Table 4.
2. The official poverty line, or threshold, was developed by economist Molly Orshansky of the Social Security Administration in 1963 based on the US Department of Agriculture's economy food plan of 1961. Orshansky used the average national ratio of food expenditures to total family after-tax income as measured by the 1955 Household Food Consumption Survey to estimate the minimum family income required to purchase the food basket (Orshansky, 1976). To this day, the market basket of food is repriced and used to estimate the poverty threshold. The size of the basket and the resulting poverty threshold are adjusted for family size (Ruggles, 1990). The US Census Bureau maintains a website on poverty research http://www.census.gov/hhes/www/povmeas.html. The US Census Bureau discusses the poverty threshold at: http://www.census.gov/hhes/poverty/povdef.html. The Office of Management and Budget's directive on the calculation and use of the poverty threshold can be found at: http://www.census.gov/hhes/poverty/povmeas/ombdir14.html.
3. Interstate differences in the COL are not the only determinant of the portion of the low-income population that is eligible for income support programmes. States set their own eligibility requirements, with some being at 150 or 200 per cent of the federal poverty level.
4. Three panels of the National Research Council (1995, 2000 and 2002) have looked at measurement issues related to poverty and cost-of-living adjustments. Citro and Michael (NRC, 1995) report on the findings of a panel that looked at general poverty measurement issues. Citro and Kalton (NRC, 2000) report on the findings of a panel that examined small-area income and poverty measurement. This topic was also the subject of a report by the US General Accounting Office in 1997. Schultze and Mackie (NRC, 2002) led a panel that examined cost-of-living adjustments and their effect on measuring inflation and constructing price indices at the national level.
5. The Metropolitan Statistical Areas (MSAs) and Primary Metropolitan Statistical Areas (PMSAs) included in Table 1 (and subsequent tables) were chosen for illustrative, not statistical, purposes. All MSAs/PMSAs included have central cities that had populations over 125,000 and were in MSAs or PMSAs with populations over 250,000 in 2000. The 15 MSAs/PMSAs included in our tables were selected to be illustrative of America's metropolitan areas by region and size. They do not constitute a statistically valid random sample.
6. Both the Basic Needs Budget and the NAS alternative measure are proposed alternative poverty measures to the current US Bureau of the Census' poverty threshold. They are not currently used in any social programmes. The Brookings Institution's Metropolitan Price Indices were employed for research purposes. See Berube and Tiffany (2004) for further information on the Brookings Institution's Metropolitan Price Indices. See National Research Council (NRC, 1995 and 2002) for further information on the National Research Council's alternative poverty measure and see Renwick (1998) for information on the Basic Needs Budget.
7. Malpezzi *et al.*'s (1996) place-to-place housing price indices addressed this issue by examining the impact of housing and neighbourhood quality (among other variables) on variations in the price of housing using data from the Population Census Public Use Microdata Samples (PUMS).
8. See ERI (2004) for further information on the Economic Research Institute's COL indices, EPI (1999) for information on the Economic Policy Institute's Family Budgets COL measure and BestPlaces.net (2005) for information on Sperling's Salary and Cost of living Calculator.
9. Urbanised areas are defined by the Census Bureau as areas within a federally designated metropolitan area (MA) that have a residential population density of at least 1000 persons per square mile. For a discussion of the geographical units used in ACCRA's analysis, see the "ACCRA Cost-of-Living Index Manual" available at http://www.accra.org.
10. From 1966 to 1978, Family Budgets data were collected for 39 metropolitan areas.
11. On average, ACCRA reports COL data for 200 urbanised areas each quarter. We do not have information about why regions do or do not particiapte in the ACCRA survey or why they drop in or out. There is a chance that there is some sort of selection

bias in the ACCRA data. We inspected the data and could not find any obvious omissions or pattern that should be considered.

12. A further weakness of ACCRA data, identified by Koo *et al.* (2000), is that, because participation in the survey varies each quarter, the base (100) value in each period is just the average of the cities included, not a fixed concept. Therefore, ACCRA data cannot be used for time-series measures of COL.
13. The 12 regions included in the model for this article are defined as follows
    (1) Coastal South-east: Florida, Georgia, North Carolina, South Carolina, Virginia
    (2) Continental Far West: California, Nevada, Oregon
    (3) Great Lakes: Illinois, Indiana, Michigan, Ohio, Wisconsin, all New York State MSAs west of Albany, and all Pennsylvania MSAs west of Philadelphia
    (4) Inland South-east: Alabama, Arkansas, Kentucky, Louisiana, Mississippi, Tennessee, West Virginia
    (5) Non-continental Far West: Alaska, Hawaii
    (6) Northern Mideast: New Jersey (except those in the NYC CMSA), New York (excluding those in Great Lakes region or NYC CMSA), Pennsylvania (excluding those in Great Lakes region)
    (7) Northern New England: Maine, New Hampshire, Vermont
    (8) Plains: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota
    (9) Southern Mideast: Delaware, District of Columbia, Maryland
    (10) Southern New England: Connecticut, Massachusetts, Rhode Island
    (11) Southwest: Arizona, Colorado, Idaho, Montana, New Mexico, Oklahoma, Texas, Utah, Wyoming
    (12) New York City CMSA
14. Khandker and Mitchell (1998) estimated a regression equation for predicting missing 1990 ACCRA values based upon county-level data. The independent variables in their analysis were the average age of county residents, percentage of females in the county, percentage of White residents, percentage of college graduates, the average size of households, the log of home value, median monthly rent, population per square mile, local unemployment and region of the country. They then applied these estimates to adjust poverty rates for the elderly in 25 major cities.
15. The coefficient of variation of the poverty line has to be zero by definition because it is the same across the nation.
16. Using data from the US Census Bureau on family income by family size in 1999, we interpolated both the number of families considered poor under current standards as well as the number of poor families that would be considered poor under income-adjusted standards. A detailed explanation of our methodology is contained within the table.
17. Using income data from the Census Bureau, we interpolated the number of children currently available for the selected programmes and compared that with the interpolated number that would be available for the same programmes under COL-adjusted qualification standards. A detailed explanation of our calculations is shown in the table.

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