LUDWIG INSTITUTE FOR SHARED ECONOMIC PROSPERITY

TRUE LIVING COST (TLC) INDEX – METHODOLOGY

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Ludwig Institute for Shared Economic Prosperity

Philip Cornell

Diana Dayoub

Santiago Dassen

Shannon Meyer

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Purpose

The purpose of the Ludwig Institute for Shared Economic Prosperity's True Living Cost (TLC) Index is to determine the change throughout time in costs necessary to satisfy the basic needs of an American household. The hypothetical person or family that makes up an "American household" meeting basic needs is difficult to define in either qualitative or quantitative terms. The Ludwig Institute for Shared Economic Prosperity (LISEP) attempts to solve this issue by using real world data as well as supplementing it with academic research. Throughout this methodology, LISEP notes each expenditure allocated to this household in each year of the sample (2001-2020). The term used throughout this methodology is "minimal adequate needs." The meaning of this standard for each expense category is defined in each section.

The TLC Index is intended to illuminate the change in costs throughout time faced by an American household who meets the barebone standard to function in and be a part of American society.[1]

Brief Explanation of the Consumer Price Index and its shortcomings as a cost-of-living metric

Currently, the most common way to adjust for prices throughout time is through the Consumer Price Index (CPI), usually the CPI-U. The CPI takes a basket of goods and services consumed by the average urban household and tracks the price of this basket over time. This provides a metric of the dollar amount needed to maintain a household's consumption. Every two years, the basket is reassessed based on the government-issued Consumer Expenditure Survey (CE), which tracks spending of households across the United States. The Bureau of Labor Statistics (BLS) recognizes that "the CPI only approximates a cost-of-living index. The CPI is sometimes called a conditional cost-of-living index, since the factors that affect the cost of living that aren't in scope are implicitly held constant" and that "The CPI is constructed using a set of surveys, and it is fundamentally a measure of price change." LISEP recognizes that the CPI is a laudable measure of price changes, but we seek to address some of the issues in using the CPI as a true cost-of-living metric. It is flawed when it is applied to measure cost of living, especially for low- to middle-income households.

First, the CPI is mathematically biased towards the consumption patterns of higher-income individuals and households. Because spending from the wealthier portion of the population is more than lower income portions, high-income households have a larger influence on average spending. So even while LMI households are completely unaffected by the price changes of, for example, luxury watches, these changes influence the CPI.

[1] LISEP would like to thank Dr Hal Hershfield, Dr Noelle Chesley, and Dr Tammy Leonard for their invaluable contributions to the formulation of this methodology.

Second, the CPI is actually the CPI-U, where the U stands for urban. This means only the urban population is considered, and for those living in rural areas, the CPI does not account for the price changes they might face. In spite of this shortcoming, the CPI does include suburban areas and manages to account for approximately 93% of the U.S. population – but this still excludes about 23 million Americans.

Third, the CPI does not adequately allow for the addition of completely new items to the basket unless an old item is replaced. For example, from 1990 to 2020 mobile phones and cellular spending became a part of the budget for a vast majority of Americans. But due to the CPI being a bundle where all the goods and services add up to 100%, these costs displaced other costs. But logically, purchasing a cell phone does not mean that one needs less housing – a key flaw in this approach to measuring consumer costs.

There are further anomalies that result from the construction of the CPI. One is the failure for the CPI to represent the cost of shelter. Because the CPI measures housing costs as imputed rents (what someone thinks that their current dwelling would rent for) the CPI often does not react to market changes in current rents or housing prices. People are less likely to change their estimation of their house from year to year even if someone looking for rent that year will face different prices. This discrepancy was made clear during the Great Recession where home prices tumbled but the CPI for housing went up about 3% from November 2007 to November 2008.[2] A similar discrepancy arises in medical costs versus medical CPI. From 2013 to 2019, the CPI for Medical Care went up only 17.2%[3] whereas the average spending for medical care as reported by the Consumer Expenditure survey[4] went up more than 43% during the same period. There is a misalignment between the cost of medical care (implicitly suggested by spending) and the CPI for this item.

While the CPI remains a good measure of inflation – that is, how prices change – when it is applied as a cost-of-living metric, the CPI shows a distorted reality. LISEP's goal is to construct a more accurate cost-of-living metric for LMI Americans by assessing the cost of meeting their "minimal adequate needs" each year. If defined specifically for each good, this will generally align to the spending needed to maintain a household's socioeconomic level. To develop this metric, an assessment is made for "minimal adequate needs" in the categories of housing, food, transportation, medical care, childcare, and transportation. A final category includes miscellaneous expenses deemed necessary for an adequate standard of living, including apparel and personal care.

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[2] U.S. Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers: Housing in U.S. City Average [CPIHOSNS], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/CPIHOSNS, December 20, 2021.

[3] U.S. Bureau of Labor Statistics, Consumer Price Index for All Urban Consumers: Medical Care in U.S. City Average [CPIMEDSL], retrieved from FRED, Federal Reserve Bank of St. Louis; https://fred.stlouisfed.org/series/CPIMEDSL, December 20, 2021.

[4] *Consumer Expenditure Survey*. (2021, October 8). United States Census Bureau. Retrieved December 20, 2021, from https://www.bls.gov/cex/tables/calendar-year/mean/cu-all-multi-year-2013-2020.pdf

Brief Literature Review

There have been past attempts to adjust the CPI for different populations. The BLS publishes a CPI for the elderly,[5] which analyzes price changes relevant to the U.S. population aged 62 and above. Further, BLS economists Thesia Garner, David Johnson, and Mary Kokoski (1996) developed a CPI for low-income households,[6] which addresses the first problem outlined above but not the latter two. A current working paper by two other BLS economists, Josh Klick and Anya Stockburger,[7] finds different results. The former paper finds that there is no significant difference in the inflation faced by poorer segments of the population, whereas the Klick and Stockburger paper finds that poorer segments face faster inflation.

The BLS also publishes the CPI For Urban Wage Earners and Clerical Workers (CPI-W), which measures the change in retail prices faced by households working in clerical and wage occupations (29% of the population).[8] [9] The CPI-W places more weight on "retail" prices facing those consumers, such as food, transportation, and apparel and less weight on housing, medical care, and recreation.[10] A fourth measure that the BLS constructed is the Chained Consumer Price Index (C-CPI-U). It differs from the CPI-U and the CPI-W by using a formula that allows for substitution across the categories of the goods basket and by updating the expenditure weights monthly as opposed to biennially.[11] What both these metrics have in common is that they measure inflation of prices rather than cost of living – an important distinction from the LISEP TLC Index.

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[5] Consumer Price Index Group. (n.d.). *R-CPI-E Homepage*. U. S. Bureau of Labor Statistics. Retrieved December 20, 2021, from https://www.bls.gov/cpi/research-series/r-cpi-e-home.htm

[6] Garner, T. I., Johnson, D. S., & Kokoski, M. F. (1996). An experimental consumer price index for the poor. *Monthly Lab. Rev.*, *119*, 32.

[7] Klick, J., & Stockburger, A. (2021, March 8). *Experimental CPI for lower and higher income households* [Working paper in preparation]. U. S. Bureau of Labor Statistics.

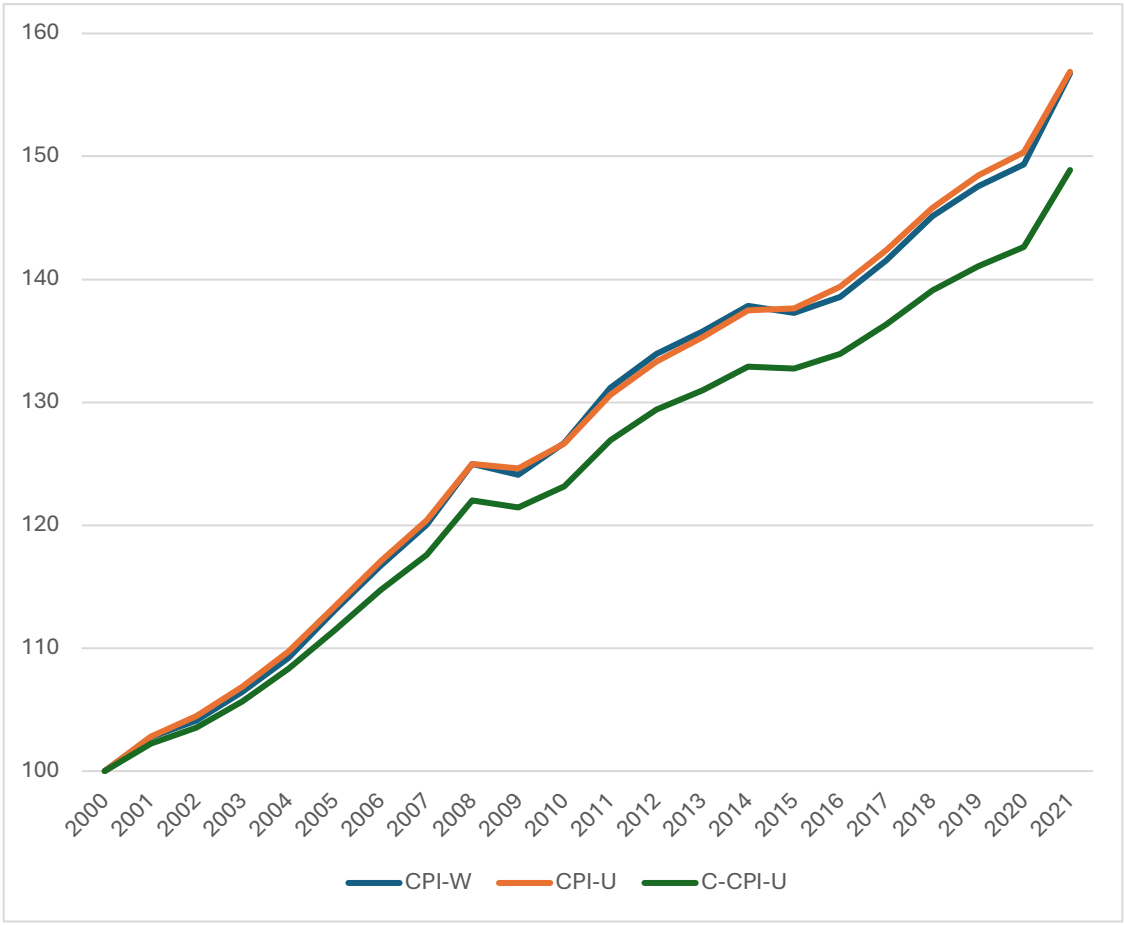
[8] Consumer Price Index Group. (n.d.). *News room Frequently Asked Questions*. U. S. Bureau of Labor Statistics. Retrieved December 20, 2021, from https://www.bls.gov/cpi/additional-resources/chained-cpi-questions-and-answers.htm

[9] Those households must meet two requirements: "more than one-half of the household's income must come from clerical or wage occupations, and at least one of the household's earners must have been employed for at least 37 weeks during the previous 12 months": https://www.bls.gov/cpi/questions-and-answers.htm

[10] Consumer Price Index Group. (n.d.). *News room Frequently Asked Questions*. U. S. Bureau of Labor Statistics. Retrieved December 20, 2021, from https://www.bls.gov/cpi/additional-resources/chained-cpi-questions-and-answers.htm

[11] Consumer Price Index Group. (n.d.). *News room Frequently Asked Questions*. U. S. Bureau of Labor Statistics. Retrieved December 20, 2021, from https://www.bls.gov/cpi/additional-resources/chained-cpi-questions-and-answers.htm

Figure 1: Change of CPI-U, CPI-W, and C-CPI-U, 2001-2020



Implications of using the CPI as a cost-of-living metric

The implications of using the CPI as a cost-of-living metric for lower- and middle-class American families are numerous. The BLS recognizes that "the CPI is used to adjust income eligibility levels for government assistance, federal tax brackets, federally mandated cost of living increases, private sector wage and salary increases, and consumer and commercial rent escalations. Consequently, the CPI directly affects hundreds of millions of Americans."[12]

More than 15 federal assistance programs are indexed to some iteration of the CPI in part or full. Two prominent categories are programs pertaining to children and veterans. The first category is important because 51% of households in the U.S. have children and the second due to the societal responsibility of ensuring the wellbeing of those who served in the armed forces.

[12] *Consumer Price Index: Concepts*. (2020, November 24). U.S. Bureau of Labor Statistics. Retrieved December 20, 2021, from https://www.bls.gov/opub/hom/cpi/concepts.htm

First, there is the Child Tax Credit (CTC). Even though the $1,000 amount per child itself is not indexed to the CPI, the refundability threshold was tied to the CPI-U intermittently between 2001 and the present, which has a dramatic impact on the number of families in difficulty qualifying for the tax credit.[13] Secondly, portions of the Supplemental Nutrition Assistance Program (SNAP), which keeps millions of children away from food insecurity, is also subject to the CPI trajectory. Families are eligible to receive SNAP benefits if they meet the income thresholds set by the federal poverty guidelines, which are directly indexed to the CPI-U.[14] Thirdly, Child Nutrition Programs are also greatly influenced by the CPI-U fluctuations. In addition to the eligibility thresholds set by the federal poverty guidelines, the per-meal subsidies participating schools receive are indexed to the Food Away from Home component of the CPI-U.[15]

Programs aimed at veterans suffer from the same issue. Military Retirement, Veterans Disability Compensation, Veterans Pensions, and the Subsistence Allowance for Veterans Vocational Rehabilitation and Employment Participants are all indexed to the Cost-of-Living Adjustment (COLA) issued by the Social Security Administration (SSA), which uses a statutory formula based on the CPI-W.[16] This means that veterans receive benefits that are not commensurate with the cost of living they face and thus are worse off over time.

[13] https://sgp.fas.org/crs/misc/R42000.pdf
[14] Ibid.
[15] Ibid.
[16] Ibid.

I. Population Determination

To calculate the overall TLC Index, the population is separated in two different ways and then estimates for the specific strata are aggregated. These strata are sorted first by geography and then by family type. LISEP determines the cost-of-living change throughout time to be the average change of each household's cost of living from year to year rather than the typical household's cost-of-living change from year to year. Of course, each American household is different, and nobody is average, and thus assessing the change of the average household is a useless exercise.

Geographic Breakdown

To obtain regional estimates of the population, data from the U.S. Census Bureau Population Estimates Program is used.[17] This produces intercensal (not on Census years) estimates of population by state and region. The Census defines four different census regions: Northeast, Midwest, South, and West. The table below lists the states in each region.

Table 1: Census regions state composition

Northeast	**Midwest**	**South**	**West**
Connecticut	Indiana	Delaware	Montana
Maine	Illinois	District of Columbia	Utah
Massachusetts	Michigan	Florida	Nevada
New Hampshire	Ohio	Georgia	Wyoming
Rhode Island	Wisconsin	Maryland	Alaska
Vermont	Iowa	North Carolina	California
New Jersey	Kansas	South Carolina	Hawaii
New York	Minnesota	Virginia	Oregon

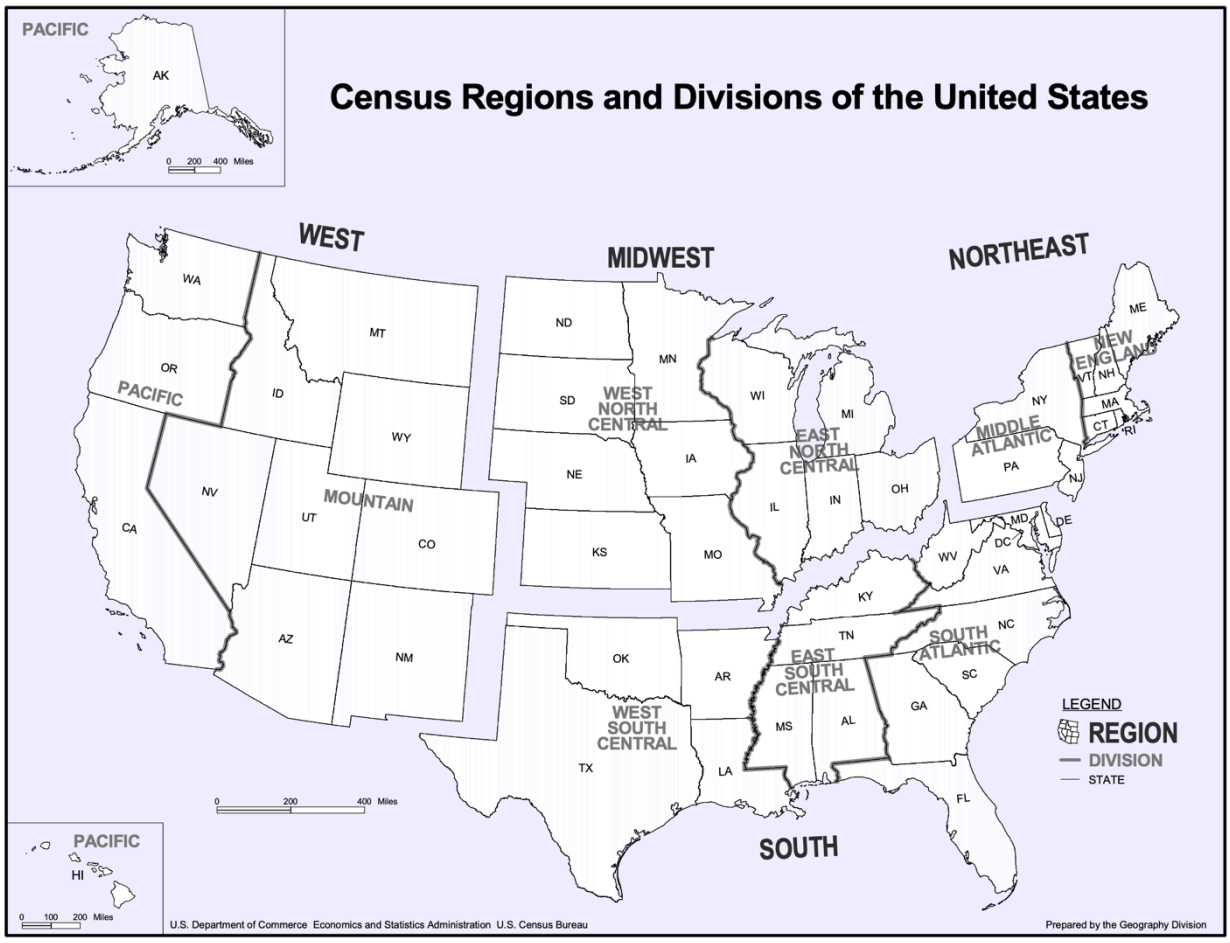
[17] (United States Census Bureau)

Pennsylvania	Missouri	West Virginia	Washington
	Nebraska	Alabama	Arizona
	North Dakota	Kentucky	Colorado
	South Dakota	Mississippi	Idaho
		Tennessee	New Mexico
		Arkansas	
		Louisiana	
		Oklahoma	
		Texas	

Census regions are graphically depicted here: [18]

[18] (United States Census Bureau Cartographer)

Figure 1: United States regions as defined by the U.S. Census Bureau



Source: Census Regions and Divisions of the United States. (n.d.). U.S. Census Bureau. https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf

Conceptually speaking, the intercensal annual estimations of the population at each geographic level are used to find the national proportions of households (further stratified by family type as described in the next section) represented by a given geographic area. These proportions are used as weights during the procedures that estimate the typical costs of goods (again, appropriate for the given family type) at the national level. First, for expenses measured by the state, cost data is aggregated into national data using appropriate population weights. Second, regional data is weighted appropriately when nationally aggregating the data from the regional to the national level. We cover this process explicitly in part C- the Aggregation.

Family Structure Breakdown

After sorting the data into different regions, the data is further stratified by family structure. This is because different family sizes imply different minimal adequate living needs. For example,

when renting an apartment, LISEP has determined that the minimal needs of a family of three to be a two-bedroom apartment, one for the parents and one for the child. But these are the same needs for a family of four, as the children can share a room. Thus, the numbers are not exactly scalable in all instances, and each family structure's minimal needs must be considered individually. But, because LISEP is seeking to determine the average cost-of-living change, the population proportions for each family type were determined and used to weigh the differing family type's costs and these cost's respective impact on the aggregate.

Definition of Families

Use the ACS data from the census website.[19] We use the following variables in our sorting procedure. "Household" in the definitions below refers to the ACS definition of a household unit.

rt: Record type (used to differentiate between person and housing unit records).

serialno: Serial number, a unique identifier for each person living in a given housing unit or group quarters.

division: Division code, used to define the geographic region.

type: Indicates the type of housing unit, such as institutional or non-institutional group quarters.

relshipp: Relationship of each person to the householder, crucial for defining family and household structure.

np: Number of persons in the household.

hugcl: Indicates households with grandparents living with grandchildren.

age: Age of individuals in the household.

Those living in institutions are disqualified[20] using the *gq* (group quarters) variable. Eight different types of families are then established without assuming the gender of the parent or the children for any of the eight family types.

The first four family types are based on a single-adult family. The first type is the single adult with no children. Second, is a single parent with one child. Third, is a single parent with two children; fourth is a single parent with three children[21]. An explanation for why families with more than three children aren't considered separately is found below.

[19] U.S. Census Bureau. (2022)

[20] Military barracks, retirement homes, mental institutions etc.

[21] For the purposes of expense calculations, LISEP considers only three children for the fourth and eighth family type. But for the purpose of aggregation, LISEP weights the expenses of three children family types by the representative population proportions of families with three or more children. We explain this decision more in the following sections.

The next set of four family types are based on couples. Couples aren't assumed to be married, but it is assumed they are both equally responsible for the children as well as the well-being of the household. The fifth family type is couples with no children. Sixth is couples with one child; seventh is couples with two children. Last are couples with three children.

Single parents or couples with more than three children are considered to have the same costs as singles parents/couples with exactly three children for two reasons. The first reason deals with robust data samples needed for making budgetary estimates. Three parts of the budget calculation are generated based on the spending of real households. These parts use the CE Survey, and this process is detailed in a later section. Grouping together CE-defined households with more than three children in the CE Survey leads to very small sample sizes that do not allow for robust cost estimates. For example, to obtain valid cost estimates for a family of seven children living in the northeast in 2018, one would need to use a sample of five CE-defined households from the entire CE Survey. In this calculation, if LISEP is too specific about the size of the family, then the values calculated from the CE Survey will be extremely inaccurate and vary widely from year to year. Further, the estimates of population family type proportions remain largely unchanged if you keep families with three children or three and greater in the sample. The percentage of families that are single parents with more than three children is 0.8% of the population. The percentage of families that are two adults with more than three children is larger, but still only 4.1% of the population. Further, there always would need to be a cutoff to the size of families considered because LISEP wouldn't be able to consider every single family in the hypothetical allotments. So, if the cutoff was to be four children, only 0.5% more single-parent families and 2.7% more two-parent families are accounted for.

Family Type	Description
1	**Single Adults**: Only one adult in the household without any children or other individuals. This includes households where the only adult may have adult children or other non-relatives living elsewhere.
2	**One Parent, One Child**: Households containing exactly one child (under 23 years old) with no couple present. This can include single-parent households or households where a grandparent or other relative is the primary caregiver.
3	**Two Children, No Couple**: Households with exactly two children (under 23 years old) without a couple.
4	**Three or More Children, No Couple**: Households with three children, with no couple present.

Family Type	Description
5	**Couple with No Children:**: Households consisting of a couple (either married or cohabiting) with either no children. This includes if the cohabiting couple is grandparents in a parental role.
6	**Couple with One or Three Children**: Households with a couple and one child (either married or cohabiting). This includes if the cohabiting couple is grandparents/step-parents in a parental role.
7	**Couple with Two Children**: Households with a couple and two children (either married or cohabiting). This includes if the cohabiting couple is grandparents/step-parents in a parental role.
8	**Couple with More than Two Children**: Households with a couple and three children (either married or cohabiting). This includes if the cohabiting couple is grandparents/step-parents in a parental role.

We use the above ACS variables, taken from the Public Use Microdata from the Census Website. Using these variables, we identify, within each ACS-defined household unit, each group of inhabitants who satisfy one of the above requirements for family types. We use these family types to determine the applicable weights needed for the aggregation of the final TLC metric. Although we sort those with 3 or more children into family types 4 and 8 (depending on if they have single or couple parental figures), when considering their costs, we conservatively estimate their costs at only 3 children. Had we chosen to expand this to 4 or more children (theoretically you could make estimates for each number of children applicable) then this would cause two complications. First, when trying to estimate costs for large families, some costs that scale more regularly with one or two children might not scale the same with the difference between 6 and 7 children[22]. Secondly, data availability is an issue. For some items, we base our cost estimates on what the relevant population spends on the category. But the sample gets smaller and smaller for each additional child past two children, thus making the estimates extremely volatile. For this reason, it is preferred to group these households together, and we accept the trade-off of lack of specificity for some categories for increased sample and less reliance on functionally constant scaling.

Table 2: Family types used to calculate the cost of living and their corresponding proportion of the U.S. population from the American Community Survey (ACS)

[22] Chanfreau and Burchardt (2008)

LISEP description	Proportion of total population
Single person	20.4%
Single parent one child	3.7%
Single parent two children	3.0%
Single parent three children	2.3%
Couple	28.3%
Couple one child	12.5%
Couple two children	17.1%
Couple three children	12.7%

While the Census Bureau defines a household as "all the people who occupy a housing unit … as their usual place of residence", LISEP's research design calls for a definition of a "LISEP household unit", which satisfies the following two conditions. First, all members of the LISEP household unit must occupy the same housing unit as their usual place of residence (said differently, they must belong to the same Census-defined household). Second, the LISEP household unit must correspond to one of the family types delineated above. For example, if a single person without a partner or children (e.g. a brother of the householder) lived in the same house as a couple with four children, this would be two LISEP household units: one of family type 1 and one of family type 8.

Necessary Assumptions

The family-type classified data are used to establish the relative prevalence of each family type in the United States. But because there are specific necessary purchases for different ages, especially childcare, a "standard family" for each type is set. For families that are couples, LISEP has assumed that each couple is made up of two adults that are both 40 years old. For families made up of one couple and one child, it is assumed the couple is 40 years old and the child is 4 years old. For families of a couple and two children, the couple is 40 years old, and the children are 4 and 8 years old. For families consisting of a couple and three children, the couple is 40 years old, and the children are 4, 8, and 12 years old. For the families of a single parent and one child, the single parent is 40 years old, and the child is 4 years old. For families of a single parent and two children, the parent is 40 years old, and the children are 4 and 8 years old respectively. For the families of a single parent and three children, the parent is 40 years old, and the children are 4, 8, and 12 years old. For the single adult, the person is 40 years old. This is summarized in Table 3.

Table 3: An outline of the age structure of family types used in the calculation of cost of living

Family Type	Age of Adult(s)	Age of Child(ren)
Single	40	

Single Parent with one child	40	4
Single Parent with two children	40	4, 8
Single Parent with three children	40	4, 8, 12
Couple	40, 40	
Couple with 2 children	40, 40	4, 8
Couple with 3 children	40, 40	4, 8, 12

An important feature is that these families are static, and these are the ages of their members for each year. LISEP is not trying to analyze these households' evolving costs throughout the period of interest. The goal of the exercise is to determine the change in the cost of these static needs every year of the period 2001-2020. Thus, any intertemporal saving/borrowing or any other time activity is null. Each year, LISEP reevaluates the costs of the household given that year's median income and starting from no assumptions about the previous year's saving or borrowing.

Implications of Necessary Assumptions

There are several implications for these age assumptions on the budgetary needs of each household. The first affected budgetary item is food. The average adult aged 40 consumes more calories than the average elderly adult. The same is true for the average male versus the average female. An older child also consumes more than a younger child. However, because the goal of this exercise is to determine the cost-of-living change for set family structures throughout time, these assumptions are not as crucial as if the main goal was to estimate the exact cost for a specific family. The number of calories needed by a 4-year-old child is the same in 2019 as it was in 2002. Where this will have a very slight impact, though, is on food price changes for a family. Because an older child will need more food than a younger child, if food prices increase, the family with an older child will face a larger budgetary strain. But LISEP argues that this is unimportant because the main goal of this exercise is to determine the change in the minimal needs for adequate living of a household throughout time. Because almost every household with an older child had to live through a point when the child was younger, the unequal effects of cost of living should cancel out throughout time. The converse is true for families with a younger child; they will most likely live through a time where they have an older child and need to meet the minimal needs for adequate living of that specific household composition. Thus, taking one set of ages and keeping them constant will provide an adequate metric for the change in cost of living no matter the age as long as the changes are relatively equal for each age group.

One exception, however, is sex. In a household made up of a same-sex, male couple, rather than a heterosexual couple, this "timing equalizer" will not come to fruition. Thus, for all periods of time, the family will have to meet a higher caloric need. This being said, the impact of this assumption regarding food should be negligible for three reasons. First, is that households have been stratified into eight different categories, so the overall impact of a family type will not affect the aggregate to any extreme. Second, each family still must meet a food requirement, and the difference in each sex's needs for food is small when compared to the baseline need, no matter the sex. Last, because same-sex couples are relatively evenly split between same-sex, female and same-sex, male couples,[23] the impact of this assumption is negligible. The extra cost needed to feed a same-sex male couple will be exactly made up by the lower cost needed to feed a same-sex female couple.

The second affected budgetary item is medical care. The assumptions regarding the ages of adults and children in the household affect the amount of aid from the Affordable Care Act (ACA), which is carefully considered in a later robustness check.[24]

Aggregation

The headline TLC metric is the annual percent change in the typical costs faced by a low- and moderate-income LISEP household unit living in the US who wants to meet their minimal adequate needs.

While there are many ways to capture the notion of typical growth in the costs faced by a family mathematically, LISEP has opted for a conceptually straightforward option:

1) Estimate the national average cost of the entire basket of goods (described in the next section) included in the TLC that a given LISEP household unit of family type f faces in year *t*.
2) Compute the year-over-year growth in that total cost between years *t-1* and *t* (beginning with *t* equal to the second year in the series, $t_0 + 1$).
3) Estimate the average percentage change across family types, taking into account the relative size of each population of family types across the years of change. This is the headline metric.

[23] (U.S. Census Bureau, 2021)

[24] Although the ACA forbids discrimination based on sex and age, there are still different premiums that are offered based on a person's age. Because we assume that the adult(s) in each family are 40 years old, this affects the health premium they will be offered, and the respective assistance offered by the ACA. Again, as the main thrust of this exercise is to determine the effect of changes in needs throughout time rather than precisely estimating the one-year need of a household, this will have a smaller effect on the deviation of the final estimates than if we were trying to present a precise budgetary amount. Furthermore, the amount paid for health insurance increases monotonically with age, but each age is based off the amount that is paid by a 21-year-old. Thus, assuming 40 years old will have no effect on the long-term price trend of medical care. The same can be said for any specific age if that age is held constant throughout the analysis.

4) To contextualize the headline metric, estimate the accumulated inflation over time by compounding the average percentage change across family types beginning with $t_0 + 1$ and ending with *T*.

It is difficult to interpret the average of costs, in dollar units, across family types, so LISEP computes the percent change for each family type (weighted appropriately) as an intuitive way of standardizing the inflationary burden and then reports the average across those percent changes. The drawback of this method is that the percent change function is not linear, so the final number may be mildly distorted by the aggregation, but the final estimate remains a robust and intuitive summary metric.

Estimating the cost of the basket at the national level

The input data for the TLC is the cost of each component *g* needed by a LISEP household unit of family type *f* in year *t* and reported at either the state, regional-referring to the four Census Northeast, Midwest, South and West regions-, or national level. In the data, all states' population of the number of LISEP household units corresponding to each family type sum to the encompassing regional population's corresponding number, and all regional populations sum to the national number of LISEP household units of each family type. Let G^R be the set of goods whose prices are reported at the regional level and let G^S be the set of goods whose prices are observed at the state level. Goods reported at the national level require no geographic aggregation.

Consider a LISEP household unit in year t living in state s in region r. This household requires an appropriate purchase of TLC component good (or service) *g* depending on their family type *f*. A superscript marks the geographic level at which the cost of *g* is reported: if the cost is reported by region, they face cost C^R_{ftgr}; if by state, C^S_{ftgs}. Let's also say that $n_{ftr}$is the number of LISEP household units of family type f in year t living in region r (n_{fts} for the state analog), and n_{ft} is the number of LISEP household units of family type f in year t nationally.

To get the total cost of all goods needed to meet the True Living Cost, LISEP aggregates to the national level the cost of any given good according to geographic weighted average. In the case of goods whose prices are observed at the state level, this is:

$$C^{S^*}_{ftg} = \sum\nolimits_{s \in S} C^S_{ftgs}\, w_{fts}$$

where $w_{fts} = \frac{n_{fts}}{n_{ft}}$.

The regional analog is:

$$C^{R^*}_{ftg} = \sum\nolimits_{r \in R} C^R_{ftgr}\, w_{ftr}$$

where $w_{ftr} = \frac{n_{ftr}}{n_{ft}}$.

The nationally typical total cost of goods necessary to meet the TLC by a household of family type f in year t is therefore:

$$C_{ft} = \sum_{g \in G^S} C^{S^*}_{ftg} + \sum_{g \in G^R} C^{R^*}_{ftg}$$

Year-Over-Year Growth

This step follows the canonical definition:

$$YoY(C_{ft}) = \left(\frac{C_{ft}}{C_{f(t-1)}} - 1 \right)$$

whenever both $C_{f(t-1)}$ and C_{ft} are available.

Estimating the average percentage change across family types

What remains is to aggregate some notion of the percent change in the total cost C_{ft} across the family types. To weight such an aggregation appropriately, LISEP takes into account the possibility of year-to-year shifts in the relative populations of LISEP household units of different family types by using the average of the population counts in years t and $t-1$:

$$w'_{ft} = \frac{n_{ft} + n_{f(t-1)}}{n_t + n_{t-1}}$$

And the year-over-year average change is given:

$$\sum_{f \in \{1,2,\ldots,8\}} \left(YoY(C_{ft}) \right) w'_{ft}$$

Estimating inflation over time

LISEP's method for estimating inflation over time is an adaptation of the concept of compounding growth. Researchers were faced with the choice of calculating the cost of living change by family type for the entire period and weighting by some combination of family type proportions, or more simply aggregating the average percent change in the cost of living across family types over time given accumulations of the one year average changes as defined by:

$$\sum_{f \in \{1,2,\ldots,8\}} \left(YoY(C_{ft}) \right) w'_{ft}$$

The main disadvantage to this method is that although intuitively it makes sense, if there are large changes in the household population composition over time, the final number may be unduly affected by the composition of the household population during years between the two endpoints of the time period. That said, although mathematically it's not possible to "cancel out" the

proportion of family types from the first and the last year nor the compounding percentages in the intermediate years, this aggregation method does in fact reflect the change in the country as a whole over this time.

The alternative to this would be taking each family type's change over the entire time period and then aggregating this overall change. This would be defined between t_0 for the initial period and T for the final period by:

$$Total\ Change\left(C_{ft}\right) = \left(\frac{C_{ft_T}}{C_{ft_0}} - 1\right)$$

and the final output being

$$\sum_{f \in \{1,2,\ldots,8\}} \left(Total\ Change\left(C_{ft}\right)\right) w'_{ft}$$

There are many problems with this alternative, which outweigh the advantages for the purposes of this analysis. First, it is not obvious which years would be used to weight the population to obtain w'_{ft}. Using the first and last periods in the sample would make sense:

$$w'_{ft} = \frac{n_{ft_2} + n_{ft_2}}{n_{t_2} + n_{t_1}}$$

but because LISEP wants to report this statistic for every year in between as well, then w'_{ft} would have to change year by year. But then the final aggregation would be almost impossible to determine methodologically from the reported headline data because w'_{ft} is unobvious. Unless the family type proportions remain completely steady, each report would necessarily not aggregate into a coherent picture. For example, when there is a 3% change in one year and then a 3% change in the next, one would think that this would result in a $1.03^2 - 1 = 6.09\%$ change. On the chosen method, this indeed would be the case. But if the family type weights are applied separately each year, and there was even a minute change in the composition of the US, then this would indeed never be the case.

If LISEP wanted to show the composition of family types throughout the sample, then another possible approach is aggregating each family type's cost increase through time using the compounding growth method and then combining these changes with some average proportion of the weights during the time period. Again though, given the end results of each year, this suffers from the same incomprehensibility to an observer as taking the family type changes over the entire time period. This also suffers from the mathematical problems as aggregating the average percent change in the cost of living across family types over time, and thus has both disadvantages.

LISEP chooses to present the headline full time-period change as the compounding aggregated growth of each year's previously published metrics. This shows the change that was experienced by the country's inhabitants over that time while also providing a series of year-over-year numbers that directly contribute to the entire period's change over time. The change in cost of living faced by each family type during the entire period is also reported.

Component-level Costs

In many cases, LISEP finds it useful to examine the price changes for individual components as well as the total basket of goods. For most goods and expense categories, this follows a procedure analogous to the above, bypassing only the step where the goods are summed together to create the cost of the total basket (using some combination of $C_{ftg}^{R^*}$, $C_{ftg}^{S^*}$ for the relevant goods g instead of C_{ft}).

However, for costs that are only relevant to families with children, i.e., childcare, the weights used to aggregate the percent changes across family types are recalculated to include only those LISEP household units who have children when these components or expense categories have their costs reported separately. Thus, when calculating the cost of childcare, observed at the state level, instead of:

$$\sum\nolimits_{f\in\{1,2,\ldots,8\}} \left(YoY\left(C_{ft}\right)\right) w'_{ft}$$

it would be computed as:

$$\sum\nolimits_{f\in\{1,2,\ldots,8\}} \left(YoY\left(C_{ftg}^{S^*}\right)\right) w_{ft}^{child\prime}$$

With:

$$w_{ft}^{child\prime} = \frac{n_{ft}^{child} + n_{f(t-1)}^{child}}{n_{t}^{child} + n_{t-1}^{child}}$$

where n_{ft}^{child} is the number of families of any type except 1 and 5 (and is undefined for families of type 1 and 5), and $n_t^{child} = \sum_{f\in\{2,3,4,6,7,8\}} n_{ft}^{child}$.

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II. Expenses

Housing

Aim

LISEP aims to include the dollar amount needed for adequate housing by family size. Adequate is defined using the definition of adequate housing by the United Nations (UN)[25] It states that "for housing to be adequate, it must, at a minimum, meet the following criteria:

- Security of tenure: housing is not adequate if its occupants do not have a degree of tenure security which guarantees legal protection against forced evictions, harassment, and other threats.
- Availability of services, materials, facilities and infrastructure: housing is not adequate if its occupants do not have safe drinking water, adequate sanitation, energy for cooking, heating, lighting, food storage or refuse disposal.
- Affordability: housing is not adequate if its cost threatens or compromises the occupants' enjoyment of other human rights.
- Habitability: housing is not adequate if it does not guarantee physical safety or provide adequate space, as well as protection against the cold, damp, heat, rain, wind, other threats to health and structural hazards.
- Accessibility: housing is not adequate if the specific needs of disadvantaged and marginalized groups are not taken into account.
- Location: housing is not adequate if it is cut off from employment opportunities, health-care services, schools, childcare centers and other social facilities, or if located in polluted or dangerous areas.
- Cultural adequacy: housing is not adequate if it does not respect and take into account the expression of cultural identity."

Critically, our estimation of costs for minimal adequate housing excludes those who are homeless, those who do not have adequate housing, and those who have adequate housing but additionally pay for housing goods that provide supernumerary benefits.

High-Level Methodology[26]

This level of housing is approximately equal to the Fair Market Rent (FMR) as determined by the U.S. Department of Housing and Urban Development (HUD). The HUD states that "the FMR for

[25] The UN provided an unbiased source that also had a very explicit definition for adequate housing. We thus could trust it and transparently compare its standards to our allocation.
(Office of the United Nations High Commissioner for Human Rights & UN Habitat, 2009)

[26] We used similar methodology to the MIT Living Wage Calculator and the EPI Family Budget Calculator (cited in footnote 6 and 7). We varied in the fact that we excluded the fair market rents that were not the 40th percentile.

an area is the amount that a tenant would need to pay the gross rent (shelter rent plus utilities) of privately owned, decent, and safe rental housing of a modest (non- luxury) nature with suitable amenities.... In addition, all rents subsidized under the HCV program must meet reasonable rent standards."[27]

By this definition, the FMR meets the first, second, fourth, and sixth criterion. The third criterion is met by nature of the FMRs being at the 40th percentile of housing prices, which is critical because affordability is at the heart of LISEP's investigation. The fifth and the seventh are not assured by this definition. But, for housing to be offered in the United States, it must satisfy the requirements of the Fair Housing Act, which "prohibits this discrimination because of race, color, national origin, religion, sex, familial status, and disability."[28] Thus, the FMR definition meets the adequate housing definition by the UN.

Mathematically, the FMR is roughly equal to the 40th percentile price for a specific sized unit (based on number of bedrooms). For the specific family types, Table 1 details what level accommodations are attributed to their needs.[29]

Table 1: Housing allocation for LISEP's eight family types used in the calculation of cost of living[30]

Family Type	**Housing Needed**
Couple	One Bedroom
Couple with One child	Two Bedroom
Couple with Two Children	Two Bedroom
Couple with Three children	Three Bedroom
Single	Studio/Efficiency

[27] (Regulations.gov, 2021)

[28] (U.S. Department of Housing and Urban Development)

[29] A different way of approaching this would be to use the Affordable Housing Online database that helps to connect low-income Americans seeking housing with HUD sponsored programs throughout different areas. We do not use this approach because often these programs have income qualifiers in which median earners would not be eligible. Second, there are often waitlists for these programs, and being on a waitlist for housing does not satisfy the minimal adequate need benchmark.

[30] The Affordable Housing Online approach would allow children of different sexes to have different bedrooms once they are of an older age. But we chose not to use it because this is not the baseline for every single program, so it is inconsistent. Second, we are taking a conservative approach, and allowing for more bedrooms depending on the sex of child raises the cost of living while also unnecessarily complicating the family types.

Single Parent with One child	Two Bedroom
Single Parent with Two Children	Two Bedroom
Single Parent with Three Children	Three Bedroom

Data

LISEP used the Fair Market Rents data by county found on the website for HUD's Office of Policy Development and Research (PD&R).[31] FMR is defined as "the 40th percentile of gross rents for typical, non-substandard rental units occupied by recent movers in a local housing market."[32] For each year, HUD publishes the county-level FMRs. Some FMRs are published for the metropolitan area, so the rate is shared by the counties encompassing the metro area For years 2001 and 2002, there are specific MSAs in which the HUD does not collect county data and only records that data at the MSA level. For these, we tracked the MSAs until 2003 FMRs and then connected the counties in the MSAs with the counties as they were listed for 2003. For state-level aggregation, the county intercensal population estimates on the Census Bureau website are used.[33] These provide population estimates year by year from 2001 to 2022.

Specific Calculation

a. Standardizing Fair Market Rents of the 50th Percentile to 40th percentile

An issue faced in constructing consistent housing cost estimates throughout time is that several counties and MSAs used the 50th percentile FMR for some years in the sample and then switched to the traditional 40th percentile used by a vast majority of counties and years in the sample. This was especially prevalent in early years.

Step 1: To correct for this variation in these counties, we take the 40th percentile FMRs for all of the years in which there was data for the 40th percentile. For the years in which the 50th percentile FMR was recorded, we have the advantage of knowing the 50th percentile FMR in at least two consecutive years, which allows us to extrapolate linearly into the years in which data for the 40th percentile was recorded. We make the assumption that during these years, the 40th and 50th percentile FMRs moved in parallel to each other. We apply this linear trend of the 50th percentile rents to the locality for each year in which the 40th percentile was not available.

To illustrate this calculation, this is an example from Kent County Michigan which switched from 50th percentile FMRs to 40th percentile FMRs in 2013.

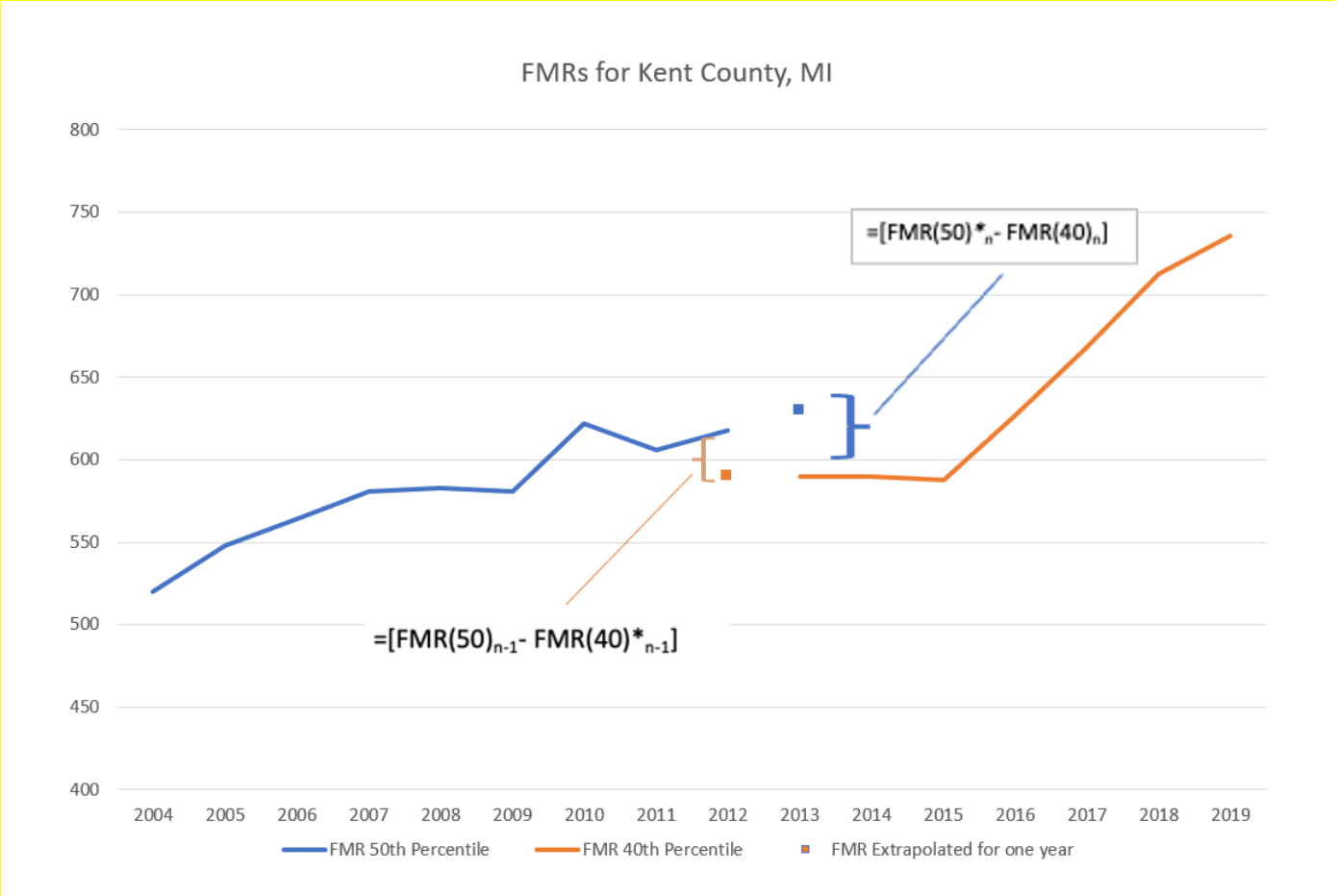
Table 1: Homogenization of FMR estimates for Kent County, MI

[31] Fair Market Rents (40th PERCENTILE RENTS) | HUD USER. (n.d.). U.S. Department of Housing and Urban Development. https://www.huduser.gov/portal/datasets/fmr.html

[32] https://www.huduser.gov/periodicals/ushmc/winter98/summary-2.html

[33] https://www.census.gov/programs-surveys/popest/data/data-sets.html.

Year	FMR 50th Percentile (step 1)	FMR 40th Percentile (step 1)	FMR Extrapolated one year (step 2)
2004	520		
2005	548		
2006	564		
2007	581		
2008	583		
2009	581		
2010	622		
2011	606		
2012	618		590 (extrapolated from 40th trend)
2013		590	630 (extrapolated from 50th trend)
2014		590	
2015		588	
2016		627	
2017		668	
2018		713	
2019		736	



Step 2: Following the extrapolation, we are still confronted with the problem of not knowing the first point of our constructed time series. In other words, what is the difference between the 40th and 50th percentile FMR during the years in which we only have the 50th percentile? Mathematically, there are two options. For simplicity, we will call the first year in which 40th percentile rents were recorded year *n*. First, we could extrapolate the time trend of the 40th percentile FMRs created in year *n* and year *n+1* to year *n-1* and then adjust further back in time (*n-2, n-3,* etc.) using the time trend of the 50th percentile rents as discussed above. This could be problematic if there was a shift in the FMR trend at year *n-1* or at year n. For example, if there was a peak at *n-1*, and we chose to linearly interpolate onto the year *n-1* using *n* and *n+1*, the assumed 40th percentile rent could be higher than the observed 50th percentile rent. For example, suppose that the 50th percentile rent is $500 for year *n-2*, $600 for year *n-1*, $500 for year n and $300 for year *n+1*. This would cause the assumed rent at *n-1* to be $700, higher than the observed 50th percentile FMR ($600) which is illogical.

To avoid this, we take a combination of the trends before and after the switch in percentiles of FMRs. We extrapolated the 50th percentile rent trend onto year *n* and took the difference between (FMR(50)*$_n$) and the observed 40th percentile FMR at year *n* [FMR(40)$_n$]. We also took the difference between the extrapolated 40th percentile trend at year *n-1* [FMR(40)*$_{n-1}$] and the observed 50th percentile recorded FMR at year *n-1* [FMR (50)$_{n-1}$]. We then calculated the average of this difference

and subtracted it from the observed 50th percentile FMR for year *n-1*. We used this point as an anchor and then applied the linear trends of the 50th percentile FMRs to this anchoring point to obtain our theoretical 40th percentile FMRs so that we could have a consistent time series. In the example, the anchor point would be 618 - [(630 - 590) + (618 - 590)] / 2 = 584.

Mathematically, the anchor point is defined as:

$$FMR_{anchor} = FMR(50)_{n-1} - [\,[FMR(50)*_{n} - FMR(40)_{n}] + [FMR(50)_{n-1} - FMR(40)*_{n-1}]\,] / 2$$

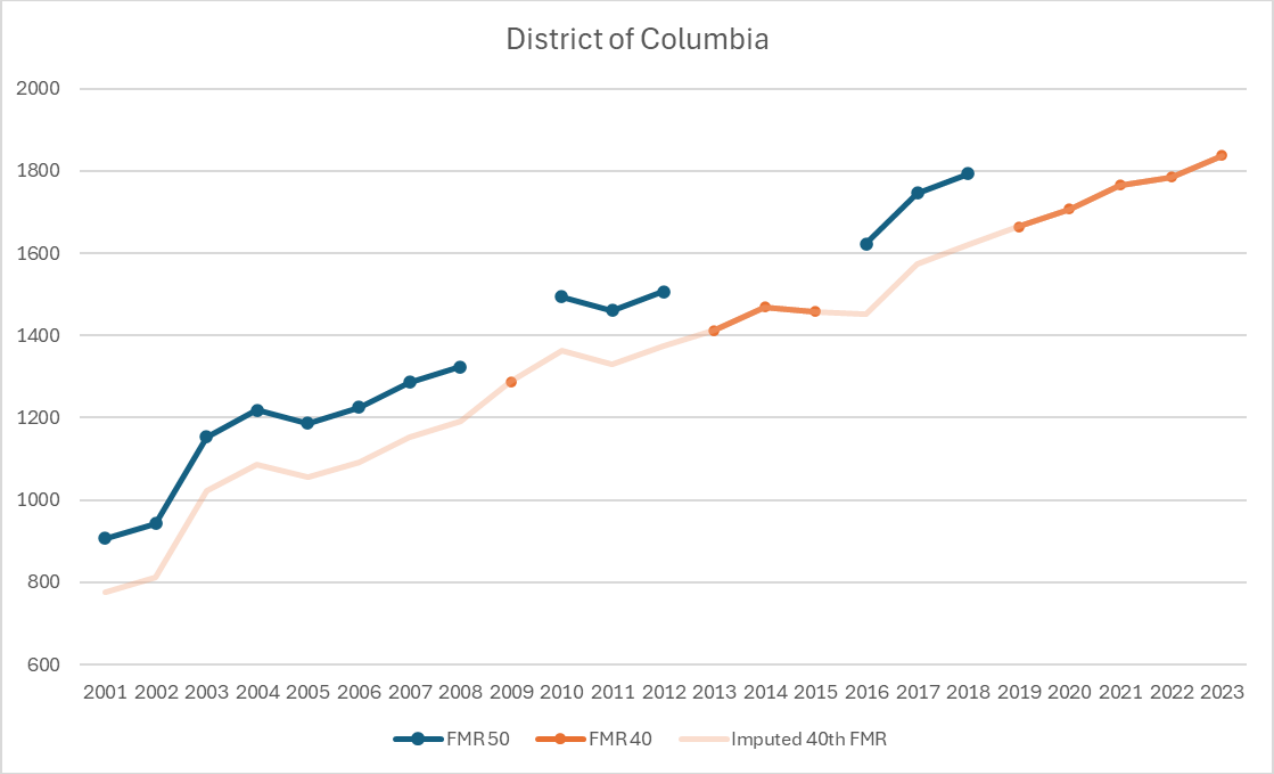
and the first point in the linear interpolation is:

$$FMR_{(n-1)} = FMR_{anchor} – (FMR(50)_{n-1} - FMR(50)_{n-2})$$

Special Cases

LISEP also imputes the 40th percentile FMR based on the 50th percentile FMR for counties that switch between using the 40th and 50th percentile multiple times since 2001. For ease of understanding, a period represents a series of consecutive years where a county uses the same FMR, so a new period begins in years where a county changes from using one percentile to another. In other words, these counties have multiple periods of using the 50th percentile FMR before switching to the 40th and eventually switching again to the 50th percentile rent, so a single anchor point cannot be used to estimate the 40th percentile rent for all the periods where the 50th percentile is reported. As a result, for each county with multiple periods of using the 50th percentile FMR, LISEP assigns a specific anchor point for each time the series switches from the 50th to the 40th percentile FMR and imputes the 40th percentile FMR for the period relevant to that anchor point as detailed above.

The only exception are counties where the 50th percentile series switches to the 40th percentile for only one year before switching back to the 50th FMR, which makes defining the anchor point based on a one-year trend for the 40th percentile impossible. In these instances, LISEP assigns the anchor point for both periods of the 50th percentile series as the next instance where the county switches from the 50th to the 40th percentile FMR,.The 40th percentile rent in years where the 50th percentile is reported is imputed using the anchor point determined by the one-year trends of the second 50th and 40th percentile periods. In the example below of the District of Columbia, the 40th percentile rent for 2001-2009 and 2011-2013 are imputed based on the anchor point from when the area switches from the 50th percentile to the 40th percentile rent in 2014:



Finally, the last special case are counties with sub-areas that have different FMRs. LISEP deals with these counties by calculating the population-weighted average FMR, based on the 2010 Census populations available on the HUD's Historical Fair Market Rent data, before aggregating to the state level. In some instances, sub-areas within the same county use different types of FMR at either 40th or 50th percentile rent. For these counties, a population weighted-average FMR percentile, between the 40th and 50th percentile by definition, for the county each year using the same population weights as to calculate the weighted average FMR. Finally, LISEP imputes the weighted-average 40th percentile FMR using the same strategy to estimate the 40th percentile rent from the 50th percentile rent as described above. Since the population weights for the subcounty areas remain the same for all years, and since the subcounty areas don't switch from using the 50th to the 40th, the population-weighted FMR percentile is the same across all years where the county-average is not the 40th or 50th percentile. As a result, LISEP is able to impute the 40th percentile rent using the anchor point determined by the 40th and non-40th percentile FMR series.

b. Aggregating Fair Market Rents to State Level and Applying to year

Next, we aggregate each county's fair market rent – for each sized apartment – to the state level weighted average using the housing unit total estimates from the United State Census Bureau Population and Housing Unit Estimates Dataset[34]. We use housing units as the best proxy for family types as we define them, but unfortunately the ACS PUMD does not provide county listings for the entire US, so we cannot use the PUMD to make this aggregation from county to state exactly in line with our definitions.

[34] US Census Bureau (2022)

We also apply the Fair Market Rents to the dates in which they are effective, which is the last three months of the prior year and the first nine months of the eponymous year. Thus FMR 2003 was effective from October 1, 2022 to September 30 2003. Thus, when calculating the yearly average FMR, we apply a 0.75 weight to the FMR that is named for that year and then a 0.25 weight for the FMR that is named for the next year. For the most recent year's FMR, we assume that the county housing unity totals are distributed in the same way for one year future, because the Housing Unit totals are published at a lag.[35]

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[35] For example, for the 2022 FMR calculation, because we need to apply a 0.25 weight to the FMR 2023 for the LISEP Housing allocation, we would need the breakdown of Housing Units by county for 2023. These are not yet published at the time of the 2022 release though, so we assume the same Housing Unit breakdown as 2022.

Food

Aim

LISEP sought to estimate the cost of food to meet a minimal adequate standard of living. For the definition of adequate diet, the definition of the Centers for Disease Control and Prevention (CDC)[36] is used. In its Dietary Guidelines for Americans, 2020-2025,[37] the CDC lists the key components of a healthy diet:

i. *Emphasizes fruits, vegetables, whole grains, and fat-free or low-fat milk and milk products*
ii. *Includes a variety of protein foods such as seafood, lean meats and poultry, eggs, legumes (beans and peas), soy products, nuts, and seeds.*
iii. *Is low in saturated fats, trans fats, cholesterol, salt (sodium), and added sugars*
iv. *Stays within your daily caloric needs*

Because the minimal adequate need of food is being estimated, LISEP wants to assure that the family is meeting the CDC guidelines. Groups of people that do not meet minimal adequate needs are also identified. First, individuals who do not adequately meet nutritional needs. This could be those who are not eating a healthy diet, do not have access to fresh foods, or are malnourished.

Second, individuals who do not spend minimally. The point is not an organic, locally sourced, or any other type of special diet that might be more expensive. Third, dietary restrictions are not taken into consideration. Unfortunately, these are too varied to be able to adequately account for all of them; further, some are more cheaply and easily accounted for, whereas others are more expensive and more difficult to account for.

High-Level Methodology

LISEP utilized the cost of the Low-Cost Food Plan as defined by the U.S. Department of Agriculture (USDA).[38] Each month, the USDA publishes four different levels of food plans. These plans are the Thrifty, the Low-Cost, the Moderate, and the Liberal. For reference, SNAP benefits are given to match the complete cost of the Thrifty plan, while the basic allotment of all U.S. servicemembers is the Liberal plan.[39] The second-cheapest plan was selected, as the cheapest plan may require families to travel to cheaper grocers farther away, thus requiring more travel than LISEP is allotting in the transportation budget. Research shows that SNAP benefits, formulated around the Thrifty plan, leads recipients to compromise on nutrition, and leaves some recipients in

[36] The CDC is recognized as a trustworthy source by academia and government. More information about CDC quality can be found on their website (https://www.cdc.gov/os/quality/support/info-qual.htm). They state that "CDC routinely seeks the input of highly qualified peer reviewers on the propriety, accuracy, completeness, and quality (including objectivity, utility, and integrity) of its materials."
[37] (Centers for Disease Control and Prevention, 2021)
[38] (U.S. Department of Agriculture)
[39] (U.S. Department of Agriculture, 2007)

need of frequenting food pantries.[40] The Low-Cost plan shows the monthly cost of eating for many different types of people based on age and sex. Data from Map the Meal Gap is used to determine regional differences in food prices. The average cost per meal for each region from 2009 to 2018 is compared and this proportional price difference between the different regions is applied to the Low-Cost plan. LISEP uses the average difference in the available years to adjust the years where there is no cost per meal available data by region. The final number is the necessary food expenditure to meet an adequate standard of living by family type.

This approach satisfies the requirements of minimal adequate needs of food. First, by design, the Low-Cost plan more than meets the less-stringent CDC nutrition guidelines. The USDA plans are designed to meet such standards. Those standards include "(1) the 1997-2005 Recommended Dietary Allowances (RDAs), Adequate Intakes (AIs), and Acceptable Macronutrient Distribution Ranges (AMDRs); (2) the 2005 Dietary Guidelines for Americans; and (3) the 2005 MyPyramid food intake recommendations."[41] The first standard above outlines specific macro and micronutrient needs for each sex and age group. This would satisfy the *iii* and *iv* points of the CDC list. The second and third USDA standards outline how Americans can meet their daily nutritional needs, satisfying point *ii* of the CDC guidelines.

The Low-Cost plan also meets the *minimal* aspect of minimal adequate needs in that it only provides a budget for foods cooked at home. Unlike the Thrifty food plan, though, (which is the lowest-cost USDA plan), the Low-Cost plan allows for prepared foods, such as "boxed macaroni and cheese, frozen fruits and vegetables, prepared sauces, ready-to-eat breads and cereals, canned soups, chicken parts, canned dry beans, boxed mashed potatoes, and stove-top meals."[42] Furthermore, the Low-Cost plan allows for 10% waste of foods. LISEP deems this a reasonable allotment for a budget-constricted family. Fresh foods expire, there will be accidental cooking mistakes, etc. Each successive plan increases the waste allotment by 10%. LISEP recognizes that this is a subjective judgment, so a robustness check is later conducted with the only other plan that is lower in cost, the Thrifty plan.[43]

Data

LISEP uses data from the USDA Center for Nutrition and Policy Promotion (CNPP) monthly Cost of Food reports. Each month the CNPP publishes the cost of food for the four different food plans: Thrifty, Low-Cost, Moderate, and Liberal. The food in each plan is set while the prices of the foods in the plan vary, thus giving different costs for the plans.[44] For reference, the U.S. Department of Defense uses the Liberal Food Plan, two steps above the one that we chose, to determine the

[40] U.S. Department of Agriculture, Food and Nutrition Service, Office of Research and Analysis, "SNAP Food Security In-Depth Interview Study," by Kathryn Edin, Melody Boyd, James Mabli, Jim Ohls, Julie Worthington, Sara Greene, Nicholas Redel, Swetha Sridharan. Project Officer: Sarah Zapolsky, Alexandria, VA: March 2013.
[41] (U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, 2007).
[42] (U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, 2007).
[43] See robustness checks at end of section
[44] More detailed information on the specific foods included in the Low-Cost plan can be found here: https://fns-prod.azureedge.net/sites/default/files/usda_food_plans_cost_of_food/FoodPlans2007AdminReport.pdf.

food budget needed to subsidize servicemembers.[45] The cost for the plan is determined from the average monthly expenditures on food for those in the second quartile, and then are adjusted to assure that adequate nutrition is met. The nutrition profiles are based on three different sources. Further information can be found in the CNPP's *The Low-Cost, Moderate-Cost, and Liberal Food Plans, 2007*.[46]

To account for regional differences in food prices, data is used from Feeding America's Map the Meal Gap database.[47] Using data for prices of food that were collected by Nielson, the Map the Meal Gap database calculates the average meal cost for a food secure person at the county level.

Specific Calculation

The annual cost of food included in each family type's budget is calculated using that specific year's June monthly report for the Low-Cost plan and then multiplying that cost by 12 to get the annual cost. For the couple without children, LISEP used the exact number listed for a male and female couple aged 19-50.[48] For the couple with one child, the respective amounts for a male aged 19-50, a female aged 19-50, and a child aged 2-3 (we are assuming that the child is aged 3) were used. The sex of the child does not impact food spending at all. LISEP multiplied this allotment by 1.05 to reflect the note in the USDA data that says: "The costs given are for individuals in 4-person families. For individuals in other size families, the following adjustments are suggested: 1-person—add 20 percent; 2-person—add 10 percent; 3-person—add 5 percent; 4-person—no adjustment; 5- or 6-person—subtract 5 percent."[49]

The couple amount for the first family type is already adjusted in the given data. For the family of four, the respective amounts for a male aged 19-50, female aged 19-50, child aged 3-5, and a child aged 6-8 were used. No adjustment is needed for families of four. For the single parent with one child, the average of the male and female aged 19-50 was taken and the child aged 3 was added to this sum, then adjusted by 1.1. For the single parent with two children, the average cost given for a male and female aged 19-50 was taken and a child aged 1-3 and a child aged 6-8 were added. No adjustment was needed. Finally, for a single adult, the average cost of a male and a female aged 19-50 was taken and adjusted by a factor of 1.2. For the families with three or more children (whether a dual- or single-parent household), the amount used for the family of four was used again, with the addition of a child aged 9-11 and then multiplied this by 0.95 as the given adjustment factor. All of these values were multiplied by 12 to get the average annual budget needed for each family to meet the minimal standard for adequate living.

To adjust these final numbers by region, Map the Meal Gap data was used. LISEP first calculated the average cost of a meal by region each year and then the average cost of a meal for

[45] (U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, 2007).
[46] (U.S. Department of Agriculture, Center for Nutrition Policy and Promotion, 2007).
[47] Feeding America is a leading researcher of hunger in America. They conduct research and advocacy around a variety of hunger related issues: https://map.feedingamerica.org/.
[48] See Section I, Part B.iii for impact of heterosexual assumption on the estimate.
[49] (U.S. Department of Agriculture, 2012)

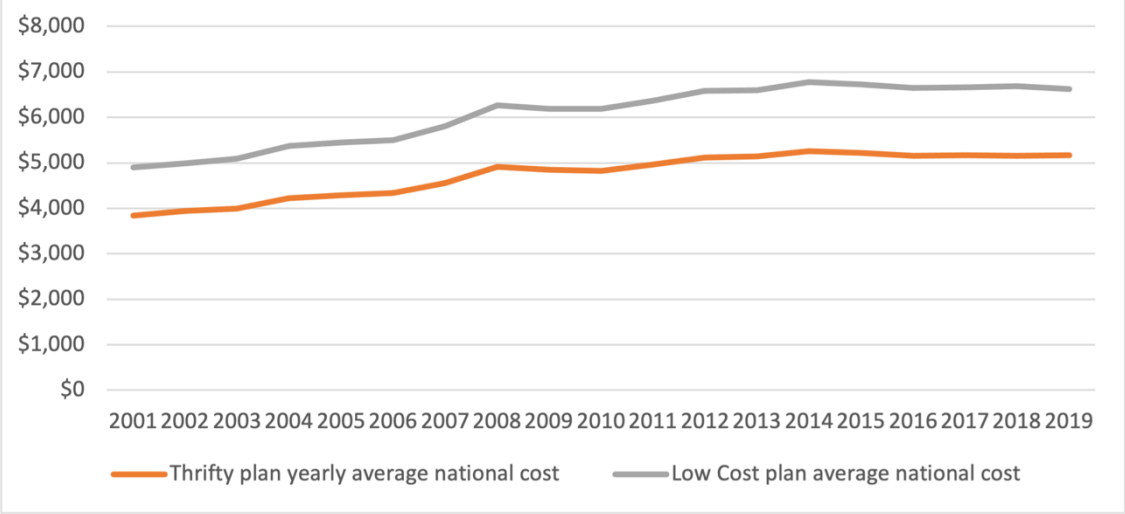
the nation as a whole. Using the available data from 2009 to 2019, we then calculated the proportion of a meal's cost for each of the specific regions compared to the nation for the entire sample. Each year was adjusted by this proportion. For 2001-2008, where the Map the Meal Gap data is not available, LISEP uses the average proportion from 2009 to 2019 to adjust the food cost regionally.

Robustness

LISEP compared the annualized food budget using the Low-Cost plan with the food budget using the Thrifty plan. To do this, the food cost is taken from the Thrifty report in June of a given year and then tracked throughout time for each of the representative family types. Thus, it is the same method used above for the regular index except with the Thrifty plan. We also did not adjust this using the Map the Meal Gap data because the adjustment would be the same for both the Low-Cost and the Thrifty plans.

Throughout the period, the Thrifty plan increased by 34.7% while the Low-Cost plan increased by 35.1%. The graph below compares these plans. Thus, the change in the Thrifty plan is 0.988 of the change in the Low-Cost plan. This difference is not statistically significant and thus our approach is robust.

Figure 1: Thrifty versus Low-Cost Food Plan annual prices



Source: Authors' calculations. Data source: USDA Food Plans: Cost of Food Reports (monthly reports) | Food and Nutrition Service. (n.d.). U.S. Department of Agriculture. https://www.fns.usda.gov/cnpp/usda-food-plans-cost-food-reports-monthly-reports

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Transportation

Aim

We aim to estimate a minimal adequate level of transportation that enables a median-wage worker to live a lifestyle that allows for a full-time job, access to childcare, and to purchase all needed food from the grocery store. LISEP argues that having a car in today's United States is not a luxury in most circumstances, and if a car is a necessity, those living in the middle class will purchase one. There is ample research evidence showing that public transportation is inadequate for many populations in the US, both based on ability and geography.

First, research has established that time scarcity means less time to follow a nutritious diet, exercise, and build relationships.[50] Second, time constraints significantly worsen mental health, leading to lower levels of subjective well-being. Researchers have found that "public transport users tend to be less happy with their commute than pedestrians, cyclists and car users" because of long waiting time, infrequent departure times and inefficient routes. [51] Third, parents with inflexible schedules who commute for long hours are significantly less likely to find adequate childcare options for their children, which can have serious developmental consequences. Regarding childcare arrangements, the Urban Institute established that "when weighing their options, most parents take into account the location, cost, quality, and availability or schedule of

[50] (Strazdins, L., Griffin, A. L., Broom, D. H., Banwell, C., Korda, R., Dixon, J., Paolucci, F., & Glover, J., 2011).
[51] (Lunke, E. B., 2020).

the provider, [and] their own employment schedules."[52] To avoid a paternalistic bend, we assume that households make productive decisions about their need for a car. Thus, we take the middle of the US income distribution by household (25th to 75th percentile) and allow households a car based on the proportion of households that buy a car in that specific family type.

High-Level Methodology

We determined the ratio of private transportation by the prevalence of vehicles[53] in the middle of the income distribution. For those who used public transportation to get to work, we added the cost of public transportation to their budget. This is because they still own a car for other means, and the costs of this ownership do not decrease based on the household's prevalence to drive to work. We did not allocate any transportation costs to children, given that we are not accounting for any recreation expenses. Thus, children are assumed to use free, district-provided transportation to get to school.

Data

Regional proportions of transit mode used

We used the ACS, to estimate the number of cars in a household as well as the household's place in the income distribution. The number of cars is coded under the variable *veh* and the income variable we used was personal income before taxes aggregated within the household, so the sum of all *pincp* in the household to get the households income. To determine the distribution of income for households at the MSA level, LISEP used the public-use microdata areas (PUMAs)[54] in the ACS data (*puma* variable) and linked them to specific MSAs for the years 2005 and onward using crosswalks between MSAs and PUMAs from IPUMS.[55] Before 2005, LISEP considers the middle of the income distribution at the national level.

Cost of car ownership

We used the data provided by the American Automobile Association (AAA) for the cost of owning a car by year. This data is published by the Bureau of Transportation Statistics (BTS).[55]

Cost of public transit

LISEP used the data provided by the BTS on the average cost of public transportation throughout time to estimate the cost of riding public transit to work.[56]

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[52] (Sandstrom, H., Giesen, L., & Chaudry, A., 2012)

[53] Defined to be a car, van, truck, or motorcycle.

[54] U.S. Census Bureau. *Public use microdata areas (PUMAs)*. U.S. Census Bureau. Retrieved December 16, 2024 from https://www.census.gov/programs-surveys/geography/guidance/geo-areas/pumas.html

[55] IPUMS USA. *MET2023: 2023 metropolitan and micropolitan area delineations*. Retrieved October 14, 2024, from https://usa.ipums.org/usa/volii/met2023.shtml#delineation-file
IPUMS USA. *MET2013: 2013 metropolitan and micropolitan area delineations*. Retrieved October 14, 2024, from https://usa.ipums.org/usa/volii/met2013.shtml

[56] (Bureau of Transportation Statistics)

Specific Calculation

To calculate the yearly cost of owning a vehicle, we assumed that people would drive 10,000 miles a year.[57] The BTS car ownership cost data assumes that a car is driven 15,000 miles annually. LISEP reasons that this mileage includes driving for recreation purposes and driving children to school occasionally. Since LISEP is concerned with the minimal adequate need for transportation, the assumption that the median-wage worker drives 10,000 miles annually is maintained, which is the lower end of the mileage for which AAA calculates driving costs.[58] LISEP reasons that if AAA considers this to be the minimum mileage an American could drive, then this is probably the minimum mileage required to satisfy basic needs. Thus, to estimate the cost of owning a vehicle, LISEP uses the fixed costs of owning a car from the BTS in addition to two thirds of the variable costs.[59] Since the choice of 10,000 miles annually might seem arbitrary, a robustness check is conducted later assuming 15,000 miles annually and assessing the comparability of the results.

To determine each household's number of cars and their necessary costs to apply to our basket, we first break the distribution into family types. We then take the middle 50% of each family type, from 25th to 75th percentiles as our sample. From 2001 to 2004, the middle 50% sample of each family type is determined at the national level since the geographic PUMAs from the ACS cannot be linked to specific MSAs. Starting in 2005, households in different PUMAs are assigned to their corresponding MSAs. Specifically, for the years 2005-2011, the 2000 PUMAs are linked to the 2013 MSA delineations and re-weighted based on 2010 population estimates from the Census. For the years 2012-2021, the 2010 PUMAs are linked to the 2014 MSA delineations and re-weighted based on 2010 population estimates. Finally, from 2022 onward, the 2020 PUMAs are linked to the 2023 MSA delineations and re-weighted based on 2020 population estimates from the Census. For rural households, LISEP considers the income distribution of all households that do not belong to an MSA at the state level. For example, all households in Maryland that are not part of an MSA are

[57] The average car owner drives between ten and fifteen thousand miles per year. If we are not allowing for recreation or leisure activities, then we are assuming less than the average. In 2018 it was 13,476 miles per year (Bureau of Transportation Statistics: Federal Highway Administration)

[58] (American Automobile Association, 2020)

[59] This is the note from the BTS on the changes in the calculations of the fixed cost: Prior to 1985, the cost figures are for a mid-sized, current model, American car equipped with a variety of standard and optional accessories. After 1985, the cost figures represent a composite of three current model American cars. The 2004 fuel costs are based on average late-2003 U.S. prices from AAA's Fuel Gauge Report: www.fuelgaugereport.com. Insurance figures are based on a full-coverage policy for a married 47-year-old male with a good driving record living in a small city and commuting three to 10 miles daily to work. The policy includes $100,000/$300,000 level coverage with a $500 deductible for collision coverage and a $100 deductible for comprehensive coverage. Depreciation costs are based on the difference between new-vehicle purchase price and its estimated trade-in-value at the end of five years.
AAA's analysis covers vehicles equipped with standard and optional accessories including automatic transmission, air conditioning, power steering, power disc brakes, AM/FM stereo, driver- and passenger-side air bags, anti-lock brakes, cruise control, tilt steering wheel, tinted glass, emissions equipment, and rear-window defogger.

grouped together to determine the middle 50% of rural households in Maryland each year. For each household within the sample, we cap the cars in the households by the number of adults in the family type, either 1 for family type 1-4 or 2 for family type 5-8. We then take the average of each family type to get the average number of cars for each family type and we allocate this value and its applicable costs to the basket.

If the person takes public transportation to work, the public transit cost from the BTS is added to his or her budget. Because we assume so little driving in the first place, we keep the 10,000 mile per year assumption even for those commuters who use public transit.

Robustness Checks

Here, a robustness check is conducted assuming that LISEP's median-wage worker drives 15,000 miles. The difference is shown between LISEP's assumption, and the annual miles driven assumed by the BTS data. One could fear that if maintenance or fuel costs were particularly high at a certain point in time, for example in 2022, then the changed mileage assumption would cause a particular increase in costs that is statistically significantly different from the trend based on a different mileage assumption. While transportation costs are roughly 10% lower on average under the 10,000 miles assumption than under the 15,000 miles assumption, the trends over time only exhibit small differences. The year-over-year percentage change trend is greatly similar across the two assumptions at the national level (see Figures 1A – 1C) and for each of the four regions (see figures 2A-2C). At the national level, transportation costs rose 58.5% (or 2.02% per year) under the 10,000 miles assumption between 2001 and 2024 compared to 60.8% (or 2.09% per year) under the 15,000 miles assumption. Thus, LISEP concludes that the annual miles driven assumption does not alter trends in the data and that the transportation costs are robust.

Figure 1A: National Transportation Costs for Single Adult by Mileage

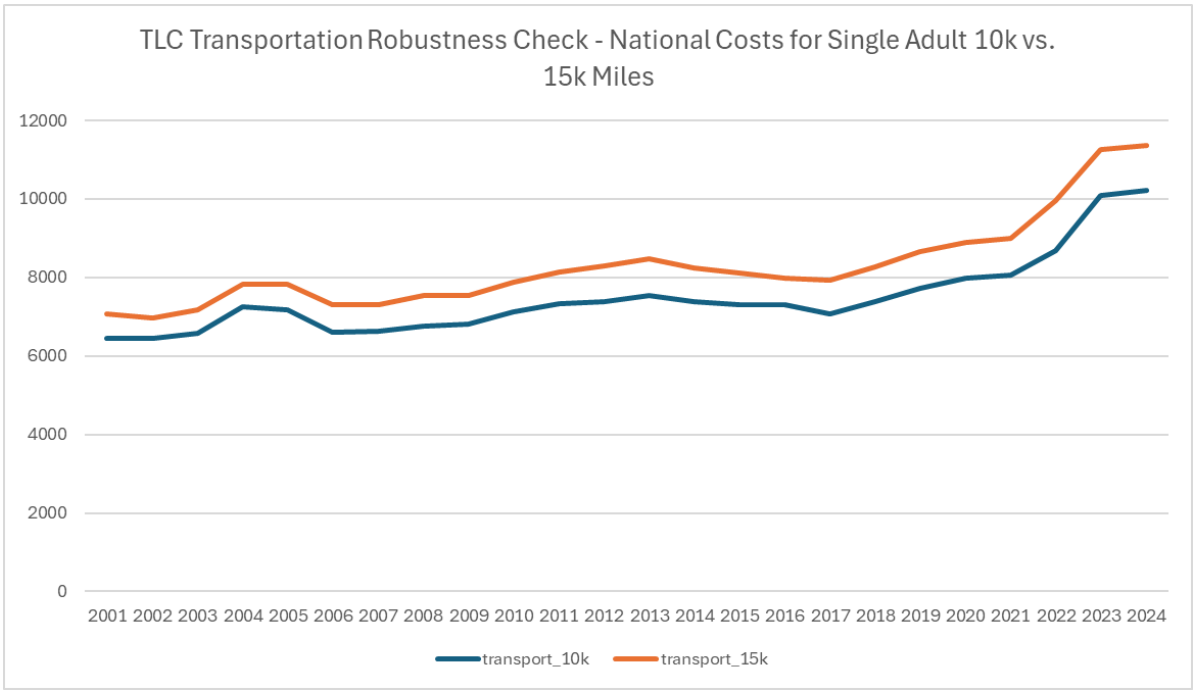


Figure 1B: Yearly Change in National Transportation Costs by Mileage

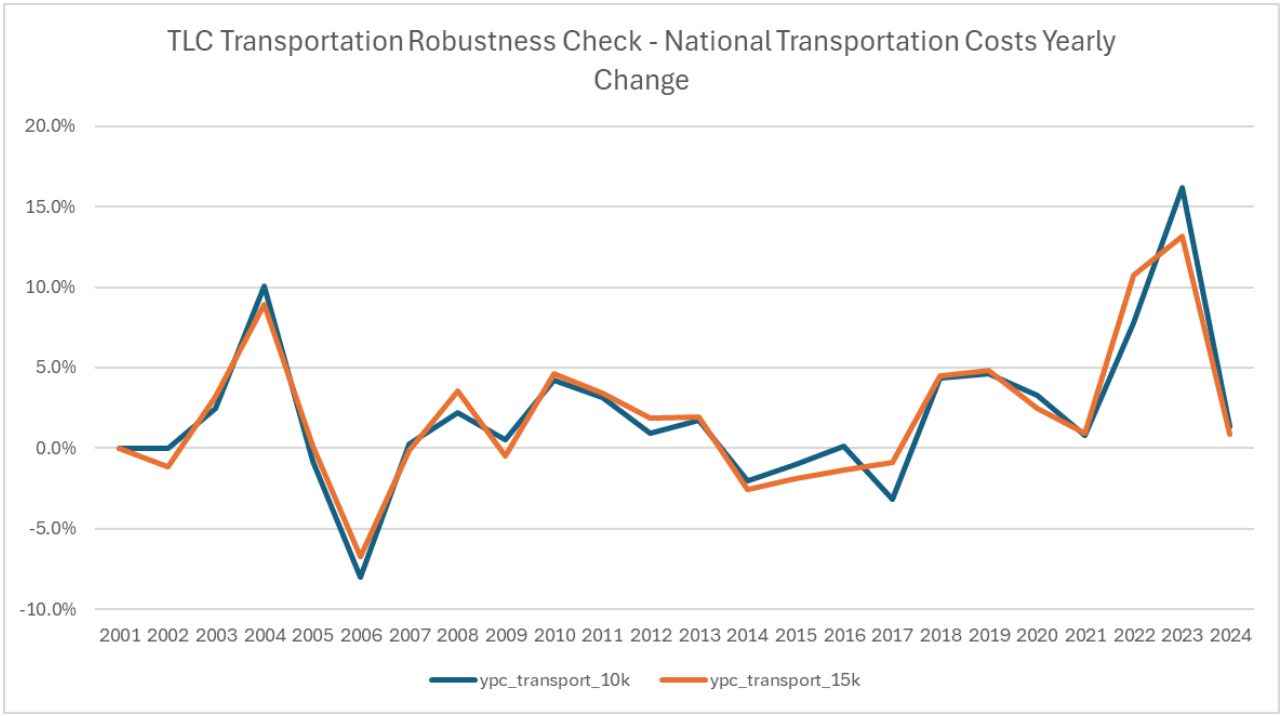


Figure 1C: Change since 2001 in National Transportation Costs by Mileage

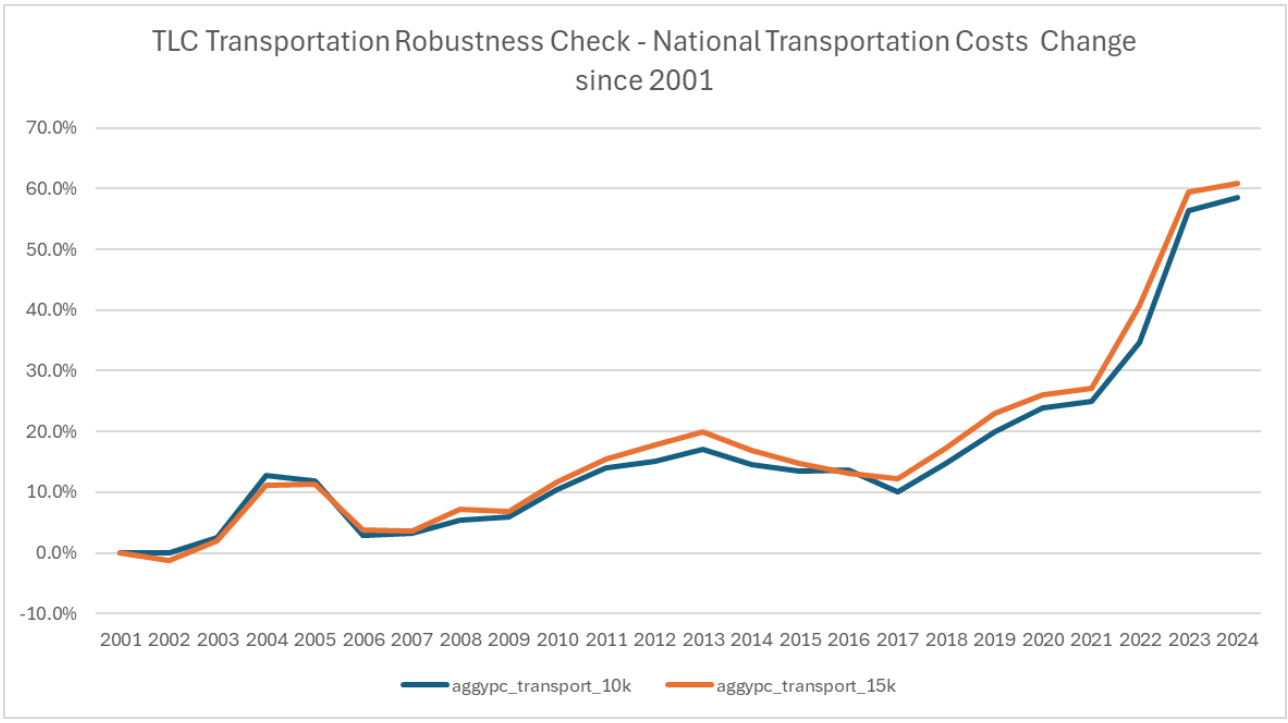


Figure 2A: Regional Transportation Costs by Mileage for Single Adult

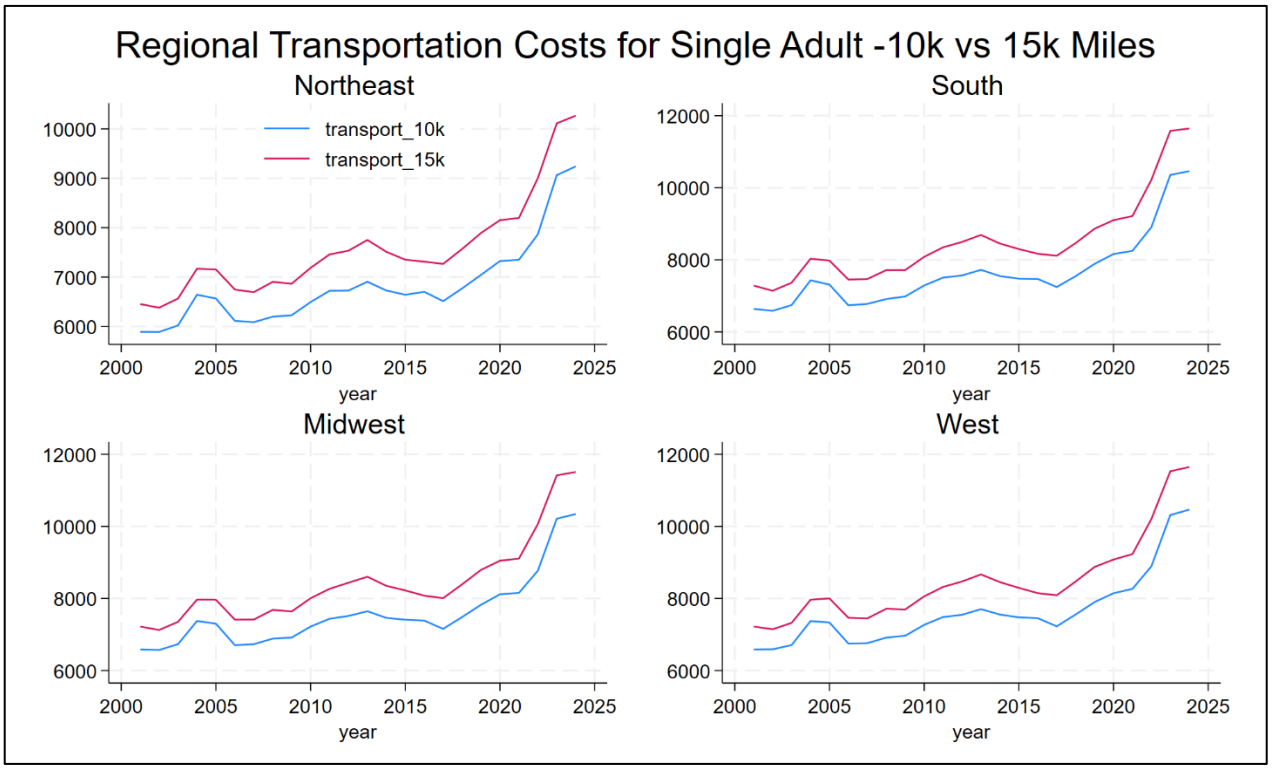


Figure 2B: Yearly Change in Regional Transportation Costs by Mileage

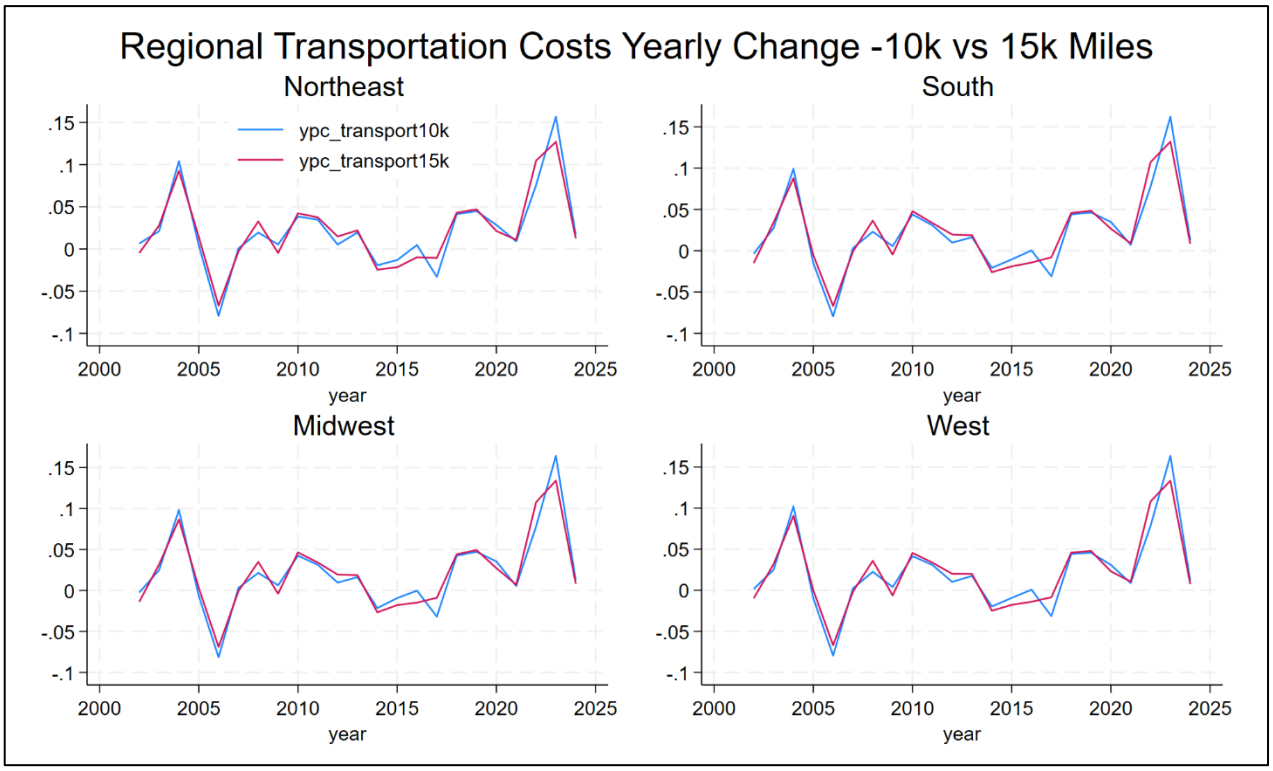
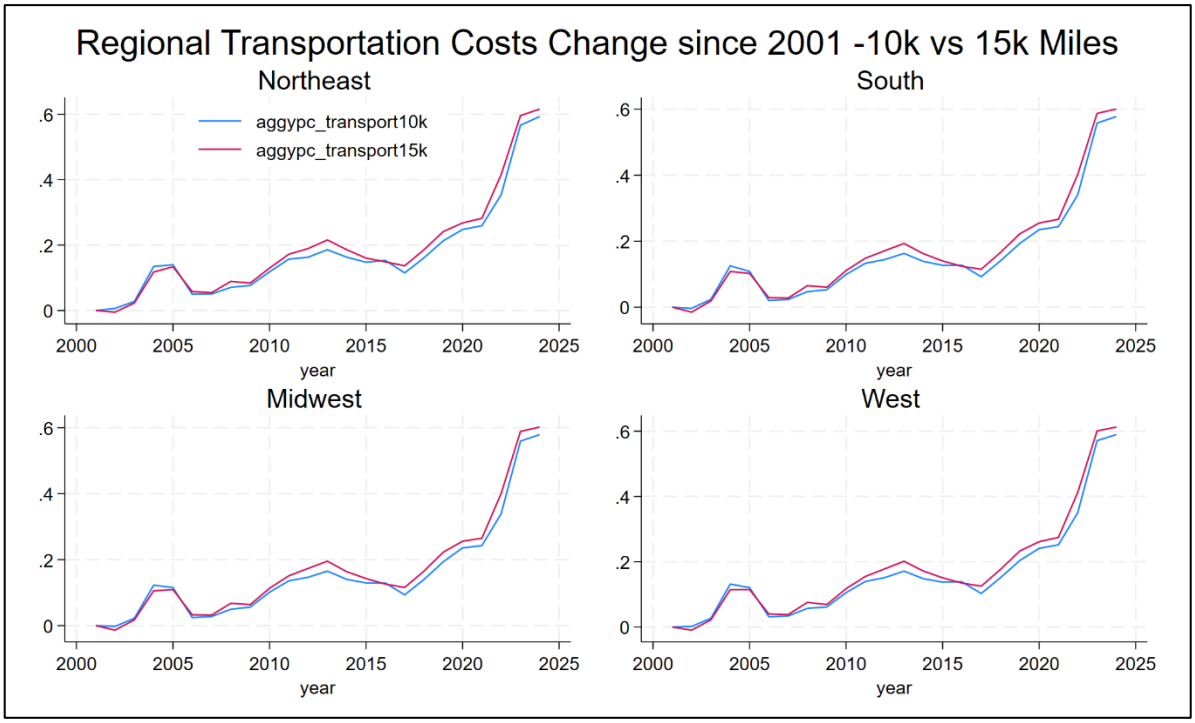


Figure 2C: Change since 2001 in Regional Transportation Costs by Mileage



Here, LISEP compares the effect of sampling the middle 50% by family type at the MSA level rather than at the national level to determine car ownership and public transportation needs. For each LISEP family type, LISEP determines the middle 50% of the income distribution at the national level before computing the average number of cars and reliance on public transportation by family type at the Census Bureau Region level for this subset. Finally, LISEP computes the national average of the regional transportation costs by family type and the family type-weighted percentage change in overall costs at the national level in accordance with the TLC Aggregation methodology. As Figure 3 shows, the choice of stratifying the middle 50% of income at the MSA level rather than at the national level has a negligible impact on the measured cost change since 2001, and for each year, with the increase in transportation costs from 2001 to 2024 being 58.8% under the national stratification compared to the 58.5% under the MSA stratification. Between 2004 and 2024,[60] the difference in the increase in transportation costs is also of 0.3 percentage points. In terms of total costs by family type, determining the middle 50% at the MSA rather than at the national level has the largest impact for a single-adult households with three children in 2024, with their transportation costs being $114 or 1.13% lower than under the national stratification.

[60] LISEP is able to track transportation needs at a more granular geographic level with ACS data from the year 2005 and onward, so comparing the aggregate increase in costs with 2004 rather than 2001 as the base year is most relevant. Regardless of the base year, the annual percent change in transportation costs under each stratification is extremely similar and results in small aggregate difference.

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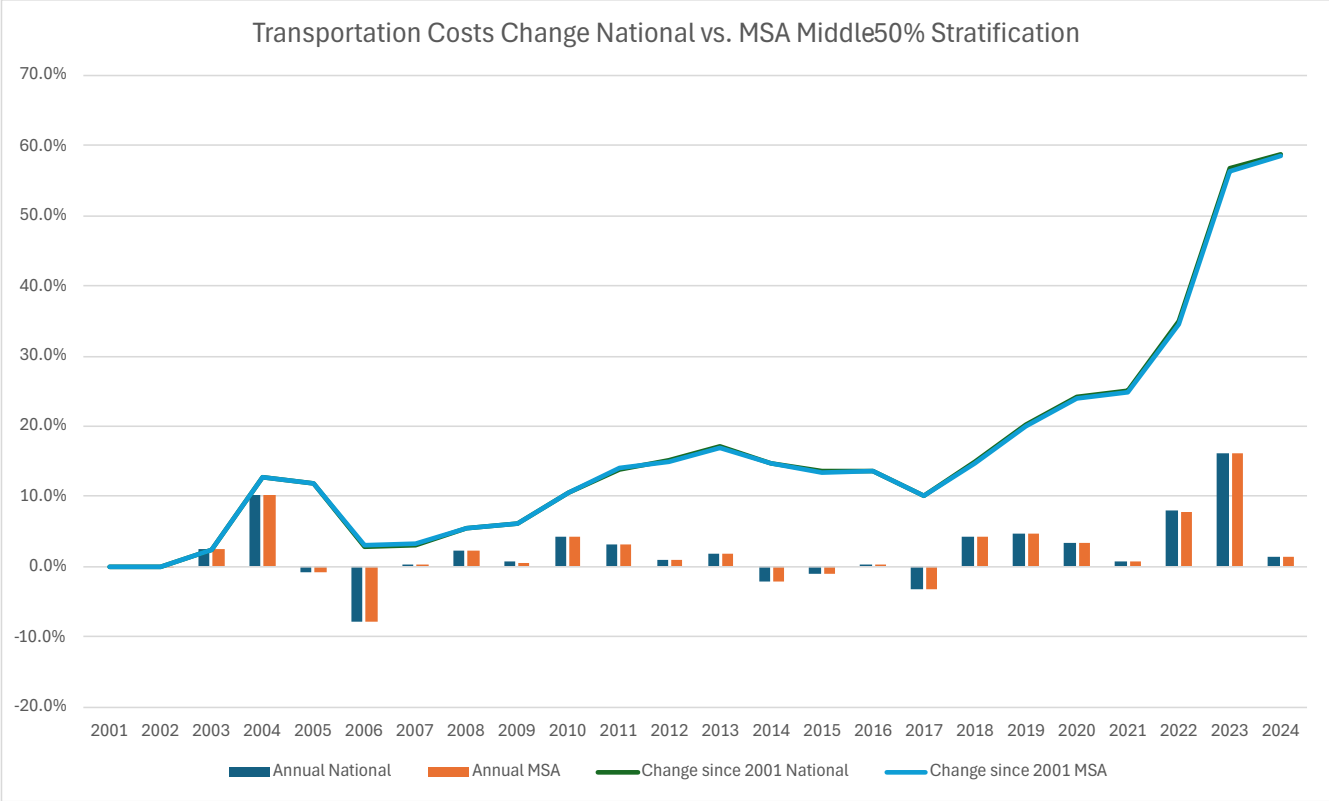
Figure 3: Transportation Costs Comparison National Middle 50% vs. MSA Middle 50% Stratification



Year	Family Type	Transportation Costs National Middle 50%	Transportation Costs MSA Middle 50%	Difference	% Difference
2024	Single with No Child	10249	10212	36.73	0.36%
2024	Single with 1 Child	10332	10332	-0.08	0.00%
2024	Single with 2 Children	10317	10340	-22.21	-0.21%
2024	Single with 3 Children	9989	10103	-114.25	-1.13%
2024	Couple with No Child	20321	20234	87.39	0.43%
2024	Couple with 1 Child	20611	20600	11.37	0.06%
2024	Couple with 2 Children	20965	20954	11.20	0.05%

2024	Couple with 3 Children	20791	20787	3.54	0.02%

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Healthcare[61]

Aim

LISEP's aim for healthcare is to provide adequate healthcare both through insurance and out-of-pocket expenses. Adequate healthcare is defined as not being underinsured. LISEP is interested in working families that are socioeconomically in the general middle class. Taking this

[61] The MEPS microdata that LISEP uses to estimate out-of- pocket expenses is typically released at a two-year lag. Until the data becomes available, the TLC assumes the year-over-year growth of out-of-pocket expenses for medical care is equivalent to the year-over-year growth of medical premiums, and analogously for dental out-of-pocket costs and dental premiums. While not a strong predictor historical predictor of out-of-pocket cost growth, a different prediction approach risks introducing spurious distortions into the overall cost growth estimation.

into consideration, the healthcare allocation should not leave these people underinsured and without adequate health coverage.

The definition provided by the Commonwealth Fund defines "underinsured". The Commonwealth fund is an unbiased source that promotes independent research. Furthermore, it provides explicit definitions of the meaning of underinsured, a useful and transparent comparison tool for the TLC Index.[62] The Commonwealth Fund defines someone as underinsured if:

1) their out-of-pocket costs, excluding premiums, over the prior 12 months are equal to 10 percent or more of household income; or

2) their out-of-pocket costs, excluding premiums, over the prior 12 months are equal to 5 percent or more of household income for individuals living under 200 percent of the federal poverty level; or

3) their deductible constitutes 5 percent or more of household income.

It is important to note who is excluded from the TLC Index. LISEP does not intend to capture the medical expenses of those who have government-subsidized insurance. The qualifications for the Affordable Care Act (ACA) are that a household must be 400% above the poverty level and not have access to employer-provided insurance. Because LISEP is most focused on people with approximately median-wage, full-time jobs, employer healthcare is allocated to the families included in the TLC index, a decision explained in more depth later. LISEP also does not include those who have extremely comprehensive private insurance, as this would not meet the "minimal" qualification. LISEP is much more focused on the working-class American family facing stricter budgetary limitations than those who can afford very comprehensive private insurance. Lastly, LISEP excludes the uninsured, nor underinsured, as they do not meet the "adequate" criteria of minimal adequate needs.

For the purposes of the TLC, LISEP determines adequate healthcare as not being underinsured when covered by a healthcare plan offered by an employer. Employer-sponsored coverage is frequently the only viable form of health insurance available to working families who do not qualify for government-subsidized insurance under the Affordable Care Act (ACA). As a result, the TLC allocates a budget that captures the employee's contribution to premiums when enrolled in a private, employer-sponsored health insurance plan. It also allocates the average non-premium out-of-pocket costs for medical care that are not covered by that insurance plan. As the TLC aims to estimate the cost of living for a median-wage earner, the employer-sponsored health insurance plan must be similar in coverage to those available to the median-earning adult, and it must not

[62] (Collins, Aboulafia, Gunja 2020)

leave the family with out-of-pocket costs that render it underinsured. Healthcare includes both medical and dental care.

This framework reflects the TLC's focus on estimating the costs for a median-earning, actively employed worker, but even many middle-income workers simply do not have access to employer-sponsored healthcare. The TLC does not account for the difficulty of finding a position with employer-provided health insurance, which can vary by occupation or part-time status.[63] Nonetheless, employer-sponsored insurance is assumed for the median worker because it is the most viable and typical option. Among full-time workers above 400% of the federal poverty line, 83.9% had employer-sponsored private insurance in 2023 compared to 65.4% of full-time workers between 139% and 400% of the poverty line.[64]

Since information on the coverage details of different employer-sponsored plans is limited, it is assumed that earned income serves as an adequate proxy for a health insurance plan's comprehensiveness and cost-efficiency. LISEP assumes that workers in roughly the middle of the wage distribution, who are privately insured through their employer, have plans that are most similar to the insured median-wage worker. As a result, the TLC focuses on expenses of middle-income workers as a cohort, with the specific cohort determined by the available data for each component. While LISEP does not define a formal threshold for being "overinsured", plans held by individuals well-above the middle of the wage distribution may, in some cases, represent extremely comprehensive private insurance which are inaccessible to the median worker. Coverage for earners well-below the middle of the wage distribution may also result in situations that do not reflect the median-earner's situation in ways that are difficult to detect from the available data, such as if inadequate coverage leads individuals to forgo necessary care for financial reasons.

A final challenge is that improvements in medical technology and medical care make it difficult to compare the past and present over long periods of time. From the perspective of measuring productivity, utility, and public health, it is important to adjust for improvements in medical care over time; however, LISEP does not attempt to discount the price of healthcare in this way for two reasons. First, the TLC aims to focus on the impact on a household's budget over time. Families have little say in the quality or advancement of care included in their insurance plan, and not purchasing insurance is not a real option. Any cost increase, whether it is tied to an increase in the quality of care, will fall on a household's budget and necessarily take purchasing power from other areas of spending. Second, holding the standard of care constant over time does not make sense from the perspective of minimal adequacy: the standard for minimally adequate healthcare should keep up with advancements in medicine. If income-constrained families are spending more on

[63] Ketema, H. Y., Martinez, A., & Bunch, L. N. (2025, September 9). *Health insurance coverage varied significantly by occupation*. U.S. Census Bureau. https://www.census.gov/library/stories/2025/09/health-coverage-by-occupation.html

[64] SHADAC analysis of the American Community Survey (ACS) Public Use Microdata Sample (PUMS) files. State Health Compare, SHADAC, University of Minnesota. Retrieved, February 25, 2026, from statehealthcompare.shadac.org

healthcare because the quality of care has improved, then a reasonable cost-of-living metric should reflect that as healthcare is non-discretionary.

High-Level Methodology

LISEP defines minimally adequate health coverage as the cost of medical and dental premium contributions and non-premium out-of-pocket (OOP) expenses for which a household insured under the kind of private, employer-sponsored insurance plans that are typically accessible to workers in the middle of the income distribution would be financially responsible. Each of these four elements (medical premium contributions, medical OOP expenses, dental insurance premiums, and dental OOP expenses) is subject to different data limitations during the estimation process. The high-level estimation strategy is as follows, and the detailed sections and the overview Tables further below describe necessary modifications to the conceptual framework where applicable.

To estimate the cost of minimally adequate health coverage, the first step is to characterize insurance plans similar to those that would be accessible to a middle-income worker, subject to the constraint that the plans not leave the worker or their family underinsured. For this, LISEP uses a worker's wages as a proxy for the comprehensiveness and cost-efficiency of the plans they have enrolled in, i.e., LISEP assumes that workers with similar wages have similar coverage options. Since the TLC is constructed for full-time workers, LISEP's aim is to focus on the median-wage worker regardless of insurance status. However, there are data limitations that make it difficult to focus only on the median worker, so LISEP instead uses an average of costs across a cohort of workers assumed or observed to have wages not far from the median.

Worker Cohorts

When estimating medical premiums, the cohort is determined by the aggregation level of the published data, as data is published for workers who have been grouped based on the average wage at their place of work rather than their individual wage. Workers enrolled in health insurance plans at establishments in the second average wage quartile, meaning establishments whose average per-employee payroll falls between the 25th and 50th percentile, in their state are assumed to have access to coverage that is roughly similar to that of the median earner. While the employee contribution is higher under the second average wage quartile than under the third or fourth average wage quartile, the series trend similarly over time with the premiums under the second average wage quartile increasing more slowly than the third wage quartile in percentage terms since 2001 but at a similar rate since 2003; further information is provided in the robustness section.[65]

When estimating medical out-of-pocket costs, wage-cohort averaging helps account for variation in individuals' costs and healthcare utilization, and to stabilize the estimate, since the point estimate of the median may be volatile. The 25th-75th percentile earners for each Census Region, ordered by wage after subsetting to workers with private, employer-sponsored insurance,

[65] On average, the national average contribution under the second quartile for a family-, employee-plus-one-, and single-plan is 9.3%, 10.4% and 6.2% greater than the overall national average respectively. Under the third quartile, these plans are 1.8%, 2.1% higher and 2.1% lower than the overall average respectively while under the fourth quartile, these plans are 6.9%, 8.2% and 8.2% lower respectively.

are assumed to have access to coverage that is roughly similar to that of the median earner. After the representative income cohort has been identified, LISEP further restricts the sample to individuals who do not live in underinsured families by applying the first criterion of the Commonwealth definition that their out-of-pocket costs excluding premiums over the past year do not exceed 10% of their income. Medical spending by individuals in these families is not used for estimating the total cost, as these individuals do not have minimally adequate healthcare. This results in a lower estimate of average non-premium out-of-pocket costs.[66] Dental out-of-pocket costs are estimated using nearly the same framework, except that workers are subset to those with any private dental insurance, whether or not it is obtained through an employer.

For dental premiums, sample size constraints limit the ability to restrict the sample based on wages or income without compromising the stability of the estimate, but averaging premium spending across the dental plans reported, for each Census Region, is still used to account for the stability concerns.

Estimating Costs

LISEP determines the typical cost of healthcare premiums that a worker in the sample identified above would pay to insure their family through one of the plans offered by their employer, noting that the appropriate plan will depend on their family's size and composition. Since premiums are determined by the plan type, separate premium costs for individual adults and children are not estimated. Adults are identified as anyone age 16 or older; children as anyone age 15 or younger.

However, LISEP does estimate the separate OOP costs for adults and children at the individual level, ensuring that potentially outlying OOP expenses from individuals in underinsured families are excluded from the estimate. Adults' individual OOP costs are computed from the costs of all working adults who are not underinsured and whose wages are in the wage-cohort described above. Children's individual OOP costs are estimated using the sample of children who are privately insured and are part of a family that is not underinsured. Since it is not possible to determine whether the child's insurance plan is employer-sponsored, to be considered the child must have at least one middle-earning adult in their family who is enrolled in private insurance through their employer through whom the child most likely accesses medical insurance. Because the microdata used to estimate the OOP costs is released one year after the TLC's release, the current OOP costs must be projected forward one year from their latest available estimate.

To determine the last criteria for including a child in the sample, LISEP reasons as follows. First, it is assumed that families enroll their children in employer-sponsored plans rather than private insurance plans not sponsored by an employer even if such a plan is available to the family. Second, if wages are an effective proxy for plan quality, in a family where two (or more) adults have private, employer-sponsored insurance, the adult with the higher wages will likely have access to more comprehensive and cost-efficient plans. Therefore, it is assumed that the family will opt to insure the child through the employer of the maximally earning of these two adults. As a result,

[66] See Robustness section for further discussion of the impact of this choice.

LISEP focuses on the maximal earner among all adults who have private, employer-sponsored insurance to identify the most likely source of a child's insurance. To restrict the sample of children to those who are insured through plans similar to those typically accessible to the median worker, LISEP requires that this maximal earner qualify as middle-earning as defined above. LISEP tests this choice in the Robustness section and shows that the impact on average OOP costs for children is negligible.

The household's total estimated expenses are the employee's contribution to the premium for the health insurance plan corresponding to the family's composition and assigned at the family level, plus the estimated out-of-pocket costs assigned to each adult and child at the individual level. This calculation is performed for each LISEP family type at the most granular geographic level available, determined by data granularity and sample size constraints and aggregated to a national average. For each family type *ft,* region *r* and year *y* , out-of-pocket expenses are determined as:

$$OOP_{ft,r,y} = \gamma\_Adult_{r,y} \times N\_Adult_{ft} + \gamma\_Child_{r,y} \times N\_Child_{ft}$$

Where *Y* indicates the average out-of-pocket expense per adult/child, and *N* indicates the number of adults/children.

Data

LISEP uses two surveys for the estimation of healthcare costs. The Medical Expenditure Panel Survey (MEPS) from the Department of Health and Human Services Agency for Healthcare Research and Quality provides aggregated summary tables from the Insurance/Employer Component of the survey for the estimation of employee contributions to medical premiums. It also publishes microdata from the Household Component of the survey for the estimation of medical out-of-pocket costs and dental out-of-pocket costs. Because the MEPS data used to estimate out-of-pocket costs is released at a year's lag relative to the TLC, LISEP imputes the out-of-pocket costs, described below.

The Consumer Expenditure Survey's Public Use Microdata provides microdata for estimating consumer-unit-level spending on specialized insurance plans. LISEP uses this to estimate dental insurance premiums.

Medical Premiums

The data for insurance premiums was taken from the MEPS, which is published by the Department of Health and Human Services Agency for Healthcare Research and Quality. The data used to obtain the premium calculation is taken from the Insurance/Employer Component of the survey, which asks establishments and governments the amount they pay for their employees' insurance. [67] LISEP used the summary level tables by state and quartile of earners (the microdata was not available) found in tables VIII.C.2, VIII.D.2, and VIII.E.2, which are the employee

[67]Agency for Healthcare Research and Quality (AHRQ) (n.d.). *Insurance Component (MEPS-IC). Tables VIII.C.2, VIII.D.2, and VIII.E.2*. Medical Expenditure Panel Survey. Data for 2001-2024 retrieved on December, 2025.

contribution to the premium for single coverage, family coverage, and employee-plus-one coverage respectively.

The MEPS Insurance/Employer Component (MEPS-IC) surveys "private and public sector employers to collect data on the private health insurance plans offered, benefits, annual premiums, annual contributions by employers and employees, eligibility, and employer characteristics", available at the state level.[68] MEPS-IC questions are asked at the establishment-level, surveying "a nationally representative sample of employers, developed from Census Bureau list frames for the private sector and State and local governments".[69] Establishments are asked about the four largest health insurance plans offered, with estimates reported for active employees (including e.g., part-time, temporary, or off-site workers but excluding, e.g., former employees, external contractors, and retirees), including the "typical employee" contribution under single, employee-plus-one, and family insurance plans, respectively as well as the number of employees enrolled in each plan.[70] This information is used to estimate the total employee contribution per enrolled employee across the most popular four plans offered at each establishment.[71]

Microdata are unavailable for the sample for confidentiality reasons, and because questions are asked at the firm-level, rather than the individual level.[72] Instead, MEPS produces summary statistics of the establishment-level data by "Average Wage Quartile", where establishments are "[ordered] from lowest to highest average payroll per employee" and grouped into quartiles using the cumulative sum of employees to determine each quartile threshold.[73]

The estimates summarized in the tables apply to workers who are currently active employees and currently enrolled in their employer's health insurance plan, by state and by their establishment's relative average wage. The plans which the survey focuses on are distinguished by coverage type (Single, Employee-Plus-One, or Family) and were necessarily provided by an employer.

Out-of-Pocket Expenses

The second source of data from the MEPS was the Full-Year Consolidated Data file for each year from 2001 to 2023.[74] This provided the out-of-pocket spending data at the person level.

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[68] See https://meps.ahrq.gov/mepsweb/survey_comp/Insurance.jsp

[69] MEPS Insurance Component: Technical Notes and Survey Documentation. Agency for Healthcare Research and Quality, Rockville, Md. http://www.meps.ahrq.gov/survey_comp/ic_technical_notes.shtml

[70] See https://meps.ahrq.gov/mepsweb/survey_comp/survey_ic.jsp

[71] Sommers, J. P. Methodology Report #14: Estimation of Expenditures and Enrollments for Employer-Sponsored Health Insurance. March 2003. Agency for Healthcare Research and Quality, Rockville, MD. http://www.meps.ahrq.gov/mepsweb/data_files/publications/mr14/mr14.shtml

[72] MEPS-IC Sample Design and Data Collection Process. Agency for Healthcare Research and Quality, Rockville, Md. http://www.meps.ahrq.gov/survey_comp/ic_data_collection.jsp

[73] See https://meps.ahrq.gov/data_stats/summ_tables/meps-ic-table-series.shtml and https://meps.ahrq.gov/survey_comp/ic_ques_glossary.pdf

[74] Agency for Healthcare Research and Quality (AHRQ) (n.d.). *Household Component Consolidated Files (MEPS-HC).* Medical Expenditure Panel Survey. Retrieved December 2025, from https://meps.ahrq.gov/data_stats/download_data_files.jsp.

Included is everything paid by the family, be it deductibles, copayments for over-the-counter drugs, copayments for services, etc. Because the MEPS data for out-of-pocket costs has a two-year lag, the data for the latest year of the TLC is not available at the time of release. For the new year, LISEP imputes the out-of-pocket costs by applying the percent increase in medical and dental premiums to the respective out-of-pocket expenses. When the MEPS data for the new year is released, LISEP revises the data for out-of-pocket expenses.

The MEPS Household Component (MEPS-HC) surveys "individual household members to collect nationally representative data on demographic characteristics, health conditions, health status, use of medical care services, charges and payments, access to care, satisfaction with care, health insurance coverage, income, and employment." The Household Component selects a new panel of respondents every year, interviewed multiple times over two or more years.[75] Microdata at the individual person-level is available through the Full-Year Consolidated Data files. Because of the MEPS-HC panel structure, the microdata includes some individual-level variables that correspond to specific survey rounds and some that correspond to an entire year generally, and this is reflected in variables names. LISEP uses the convention "yy" to denote year-specific variables and "rr" to denote survey-round-specific variables.

The MEPS-HC microdata provides extensive information about individuals surveyed and the medical insurance plans in which they were enrolled, including whether an individual was employed or had a job waiting in each round of the survey, was enrolled in private coverage, and was enrolled in an employer-provided plan at their current main job. It also provides an individual's wages (if any) and family identifier, family income, and total medical expenses for which the family was responsible.

The MEPS Household Component is used to estimate non-premium OOP costs for both medical and dental care. The information on dental insurance coverage is slightly more limited than the information for medical coverage as MEPS-HC does not directly report the channel through which an individual obtained dental insurance coverage. However, the survey does distinguish whether an individual was insured privately, their total number of dental visits during the year, dental expenses covered by many public insurance programs (e.g., Medicaid, Tricare, Veterans' Affairs, etc.), dental expenses for which they were responsible, and total dental expenses.

Dental Premiums

To calculate the dental premiums, the detailed data interview files from the Consumer Expenditure Survey's Interview Program were used.[76] A respondent from each Consumer Unit (CU), which is conceptually similar to a household, is asked to report purchases made at any time during the three months prior to the month of their interview; this three-month period serves as the reference period. Data files containing the results from the interview are grouped and released according to the calendar quarter in which the interview took place (e.g., an interview occurring in

[75] MEPS-HC Panel Design and Collection Process, Agency for Healthcare Research and Quality, Rockville, Md. https://meps.ahrq.gov/mepsweb/survey_comp/hc_data_collection.jsp

[76] *Consumer Expenditure Surveys (CE) Public Use Microdata Home*. (n.d.). Bureau of Labor Statistics. Retrieved December 22, 2025, from https://www.bls.gov/cex/pumd.htm.

February of 2019 would include information on purchases from November 2018, December 2018, and January 2019, and its results would be found in the detailed data files corresponding to Quarter 2 of 2019).[77] Each observation in the detailed data files corresponds to a good or service purchased by the CU, with additional information available about the category of the purchase, and characteristics of the CU.

The Interview Survey asks respondents about single-service plans health insurance purchased by members of the CU. The survey records the type of care covered (e.g., dental, long-term care, prescriptions, vision care, etc), the number of CU members covered by the plan, whether the plan was obtained individually or through an employer or other group, and information on the frequency and amount of payments made by the household. This information is reported in the IHB detailed data interview files for reference years 2001-2017, and in the HHP detailed data interview files for reference years 2017 through 2024.

The CE microdata provides information on the cost for single-service dental insurance plan premiums given the number of people enrolled in the plans. It also provides estimates of household income, but sample size constraints make a restriction to the middle of the income distribution infeasible.

Specific Methodology

Medical Premiums

To determine the typical employee contribution to medical premiums under plans accessible to the middle-income worker, LISEP applies estimates from the MEPS Summary Tables from "Table Series VIII. Private-Sector Data by Average Wage Quartiles and State" to the family types as specified below, focusing on "Premiums, employee contributions, and enrollment tables for [single/family/employee-plus-one] coverage plans":

- (Single Coverage): "Table VIII.C.2 Average total employee contribution (in dollars) per enrolled employee for single coverage at private-sector establishments that offer health insurance by average wage quartiles and State: United States".
- (Family Coverage): "VIII.D.2 Average total employee contribution (in dollars) per enrolled employee for family coverage at private-sector establishments that offer health insurance by average wage quartiles and State: United States".
- (Employee-Plus-One Coverage): "Table VIII.E.2 Average total employee contribution (in dollars) per enrolled employee for employee-plus-one coverage at private-sector establishments that offer health insurance by average wage quartiles and State".[78]

LISEP uses the average employee premium contribution from establishments in the second average wage quartile for each state. Although this smaller series introduces some noise to the

[77] See https://www.bls.gov/cex/pumd-getting-started-guide.htm#section3
[78] See MEPS-IC Technical Notes and Survey Documentation http://www.meps.ahrq.gov/survey_comp/ic_technical_notes.shtml

individuals state series, because the firms are ranked based on aggregating their employees' wages, the third quartile of wages likely includes individuals whose insurance plans are more comprehensive than the middle-wage section of privately-insured, employer-insured workers.

Because MEPS-IC reports premium contributions by plan, the estimates are directly assigned to each family type as follows, rather than computing costs separately for adults and children:

Family Type (LISEP)	**Insurance Coverage Type for Premium**
1	Single
2	Employee-plus-one
3	Family
4	Family
5	Employee-plus-one
6	Family
7	Family
8	Family

Because microdata is not available, the computation based on the summary tables will inevitably not adhere to the general framework described in the High-Level Methodology. First, seeking the middle of the income distribution based on the average wage per employee across establishments may yield different results from an employee-level ordering due to aggregating prior to sorting; e.g., a small percentage of extremely high-paid or low-paid employees at a given firm could act as outliers, pulling the firm's ranking up or down relative to where most of its employees would land in an individual ranking. Second, the procedure does not include a way to exclude premiums for plans which provide inadequate coverage, although accounting only for enrolled employees does remove those who are uninsured entirely. Nonetheless, the state-level proxy wage distribution offered by the summary tables permits a relatively clear link between LISEP's conceptual framework and the computation described above.

Medical Out-of-Pocket Costs

Because the MEPS-HC data used for medical OOP cost estimation is available as microdata at the individual level, LISEP estimates out-of-pocket costs by estimating the typical cost for one adult and one child and then scaling these quantities to the match the composition of each LISEP family. Costs are computed by Census region (Northeast, Midwest, South, and West).

To estimate typical out-of-pocket medical costs for an employer-insured adult, we restrict attention to individuals age 16 and older[79] (*AGE*[yy]*X*) with employer-sponsored private insurance throughout the year, determined as being employed in every survey round (*EMPST*[rr]H) and as reporting employer-sponsored coverage in every round (*HELD*[rr]*X*). Because information on private

[79] In the U.S., individuals can begin working full-time hours at the age of 16. A 16-year-old working full-time would be considerably more likely to be offered employer-sponsored health insurance. See U.S. Department of Labor. (n.d.). *Age requirements*. https://www.dol.gov/general/topic/youthlabor/agerequirements

insurance coverage status (*INSCOV*[yy]*X*) is collected once per year rather than in each survey round, individuals who report private insurance during the year and employer-sponsored insurance in every round are treated as having employer-sponsored private insurance throughout the year.

Individuals meeting these criteria are ordered by earned wages, and those in the 25th-75th percentiles of the resulting wage distribution (*WAGEP*[yy]*X*) are identified. The total cost of non-dental medical expenses for which these respondents were responsible during the year are then averaged at the individual level across non-underinsured adults. This represents the total cost of medical expenses for the individual *(TOTSLF*[yy]*X)* less the medical spending dental expenditures recorded under *DVTSLF*[yy]*X*. Underinsurance is defined at the family level (identified by *DUID* and *FAMIDYR*) as total annual OOP medical and dental spending (total of *TOTSLF*[yy]*X* for each family) exceeding 10% of total family income (*FAMINC*[yy]*X* for years 2007 onward, or total of *TTLP*[yy]*X* for each family in years prior). Families with negative total income are excluded. Individuals in underinsured families are excluded from the final average calculation after wage ranking is used to determine the sample of adults.

Children's OOP costs are estimated separately and are defined for children who are privately insured (*INSCOV*[yy]*X*); are part of a family that is not underinsured; have at least one adult in their family who is enrolled in private, employer-sponsored insurance; and whose most likely access to medical insurance is through such an adult earning wages in the 25th-75th percentiles of the wage distribution identified above. The OOP spending for a child is estimated by averaging total non-dental expenses (*TOTSLF*[yy]*X* less *DVTSLF*[yy]*X*) of each child who meets those criteria.

The estimates described above are produced by Census Region, but family size is not considered when estimating the costs of individual adults and children due to sample size constraints, discussed further in the Robustness section. In order to project the OOP costs for the year in question, LISEP computes the most recent year-over-year increase in medical premiums and assumes that OOP costs grew at the same rate until the data for the corresponding year is released.

Dental Out-of-Pocket Costs

Dental out-of-pocket spending is measured using individual-level data MEPS-HC. The estimation closely parallels the approach used for medical out-of-pocket costs, with a key modification to the definition of the eligible population: in order to be considered eligible for the subset, individuals must report holding private health insurance during the year (*INSCOV*[yy]*X*), but are not required to have employer-sponsored coverage or continuous coverage in every survey round. This broader definition reflects data limitations specific to dental coverage and utilization, which are not consistently tied to employer-sponsored plans or observed in every interview round. Additionally, an individual is assumed to be employed if they report non-zero wages (*WAGEP*[yy]*X*, which cannot be negative).

Within this sample, individuals of age 16 and older (AGE[yy]X) are ranked by earned wages, and the middle 50 percent of the wage distribution (and privately-insured children who live with an adult qualifying for this sample) are retained. Underinsurance is defined at the family level using the

same procedure defined for identifying underinsurance when estimating OOP medical costs, and individuals residing in underinsured families are excluded after wage ranking. Dental OOP costs, defined as dental expenditures for which the respondent was financially responsible (*DVTSLF*[yy]X), are then averaged at the individual level separately for adults and children, following the procedure used for medical OOP costs.

Dental Premiums

LISEP uses the Consumer Expenditure Survey's Public Use Microdata to estimate the annual total employee contribution to three kinds of dental plans: those covering 1 person, 2 people, or 3 or more people. Each LISEP family type is assigned the relevant dental premium budget based on the defined number of people in the household.

In the detailed data interview files, CUs report goods and services purchased during the reference period, as well as the cost and other characteristics of each item. In the questionnaire, single-service dental insurance plans are reported as separate items for each plan, such that each observation in the data is inferred to correspond to one health insurance plan. However, if a household is recorded as purchasing multiple plans, LISEP aggregates that spending to the CU level, under the assumption that if a household is spending on two dental plans, then one plan must not supply sufficient coverage.

From 2001 to 2017, the *qhi3mcx* variable, which records the cost spent on premiums for each plan over the previous three months, is used to estimate annual spending. Because the expenditures reported by CU in the Interview Survey can overlap two distinct years, *qhi3mcx* may include expenditures that were made outside of the year in question. As LISEP was unable to determine in which month the dental insurance expenditure was paid, *qhi3mcx* was scaled according to the number of months in scope, corresponding to the month in which the CU was interviewed. For example, if a CU reported a *qhi3mcx* value of $90 during a February 2019 interview, LISEP would allocate $60 to the 2018 premium expenses (for November and December 2018) and $30 to the 2019 premium expenses (for January 2019). To ensure that plans with pay periods larger than one quarter were not in the sample, the variable *hhirpmpd* was used to restrict the sample to those whose plans whose pay period was one quarter or shorter. When a new classification was introduced for bi-monthly payments, those plans were also excluded.

Because *qhi3mcx* records spending on any health insurance premium, LISEP filters the sample using the *hhispect* variable. The *hhispect* variable identifies the form of single-service insurance (not medical health insurance) such as dental, vision, dread disease, etc., taking only the premium costs pertaining to dental insurance. The sample is then further filtered using the *hhigroup* variable that determines the channel through which insurance is obtained; only plans obtained through an employer group are used for estimating the cost of dental insurance premiums.

With this sample, the cost of the premium to the household (the employee-contribution portion) is calculated. To cater this calculation for LISEP's family types, the *hhicovq* variable is used. This variable specifies the number of people within the household covered by the insurance. If the plan covers only one person, then it is single coverage; two people for employee-plus-one

coverage; and three or more people would be family coverage. Lastly, these costs are sorted by region using the *region* variable and applied to the specific family type for each region.

For the years from 2017 onward, the HHP file from the Consumer Expenditure Survey is used. The approach was identical to the IHB file, but the variables are just renamed in later years. The equivalent variable for the HHP for the *qhi3mcx* variable is the *qhhp3mx*. For the IHB's *hhispect*, the HHP had *sstype*. Both the early and later years report the variables *hhirpmpd*, *hhigroup*, *region*, and *hhcovq*.

Robustness Checks

Comparison of Medical Premiums by Wage Quartiles

LISEP compares the costs and trends of the national averages, weighted by LISEP's family type proportions, for the state-level wage quartile series of the average premium contribution by employee and type of plan under tables VIII.C.2, VIII.D.2, and VIII.E.2 from the MEPS Insurance/Employer Component (MEPS-IC) surveys. For each family type, the TLC tracks the national average of the second wage quartile, which is larger than the average for all quartiles and for the third and fourth quartile. Between 2001 and 2024, the second quartile's average contribution for family plans was 9.3% higher than the overall average, 10.4% higher for employee-plus-one plans and 6.2% higher for single plans. While there are fluctuations on a yearly basis, this relationship is generally stable (see figures below). In terms of percentage change, the premium contributions by the second wage quartile have increased more slowly between 2001 and 2024 than both the national average and the third wage quartile although much of this differential is reflective of the premium increases in 2001-2002 and 2002-2003. The years 2001 and 2002 are problematic given the linear extrapolation for nine states with missing values in 2001 and 2002.[80] The average annual rate of change between both 2001-2024 and 2001-2023 is presented in the table below:

Table 1: Average Annual Growth Rate by Wage Quartile

Average Annual Rate of Change 2001-2024	Coverage Type	Overall	Q1	Q2	Q3	Q4
	Family	6.30%	6.07%	5.83%	6.42%	6.59%
	Employee-plus-one	6.56%	6.34%	5.61%	6.83%	6.99%
	Single	5.72%	4.72%	5.44%	5.83%	6.52%

[80] In 2001, the states of Kansas, Montana, Nebraska, New Hampshire, New Mexico, West Virginia and Wyoming had missing data. In 2002, the states of Alaska, Arkansas, the District of Columbia, Idaho, North Dakota, Rhode Island and Vermont had missing data. North Dakota and South Dakota had missing data in both 2001 and 2002.

Average Annual Rate of Change 2003-2024	Coverage Type	Overall	Q1	Q2	Q3	Q4
	Family	5.59%	5.53%	5.49%	5.58%	5.72%
	Employee-plus-one	5.34%	5.39%	5.28%	5.37%	5.43%
	Single	5.29%	4.62%	5.26%	5.28%	5.62%

Figure 1A: Average Annual Growth Rate by Wage Quartile

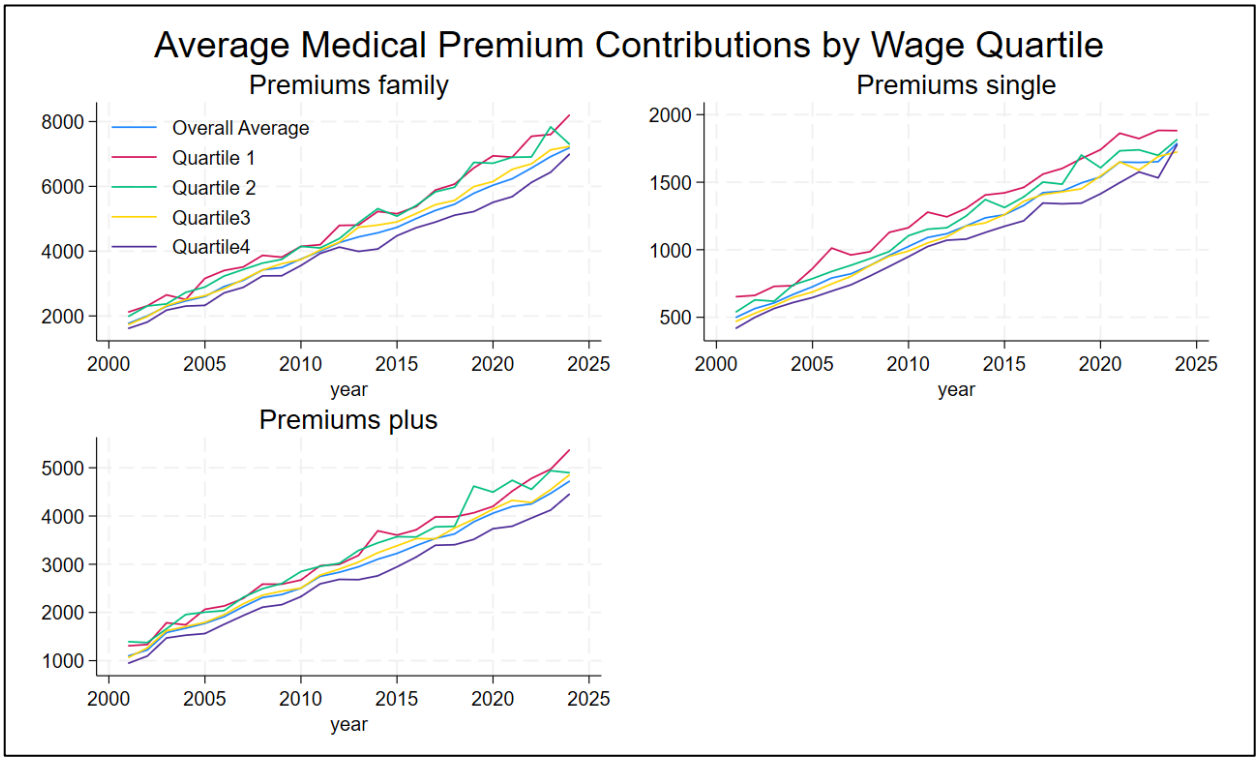
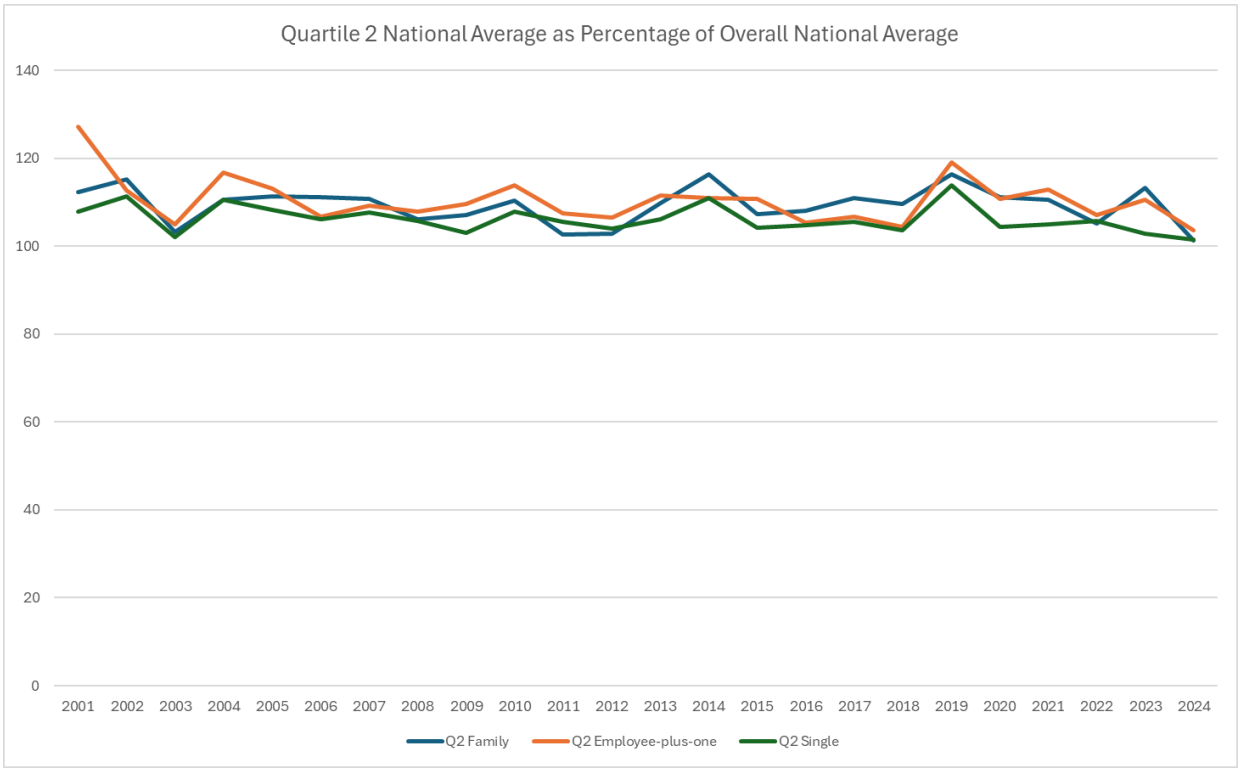


Figure 1B: Second Wage Quartile National Average as Percentage of Overall Average



Middle-Income Designation

In the main method, the middle-wage cohort for estimating out-of-pocket costs from the MEPS-HC survey is determined first by restricting the sample to workers privately insured through their employer, then determining the middle of the wage distribution for this cohort, and finally removing individuals in underinsured households from the sample before estimating the average spending on medical costs other than dental expenses. This procedure was designed to capture the costs faced by a population analogous to those whose costs were available from the MEPS data, namely, workers who were privately insured. However, another justifiable procedure would have been to first determine the middle-wage cohort among all employed workers, regardless of their insurance status; then, restrict that sample to those with private insurance who were not in underinsured households.

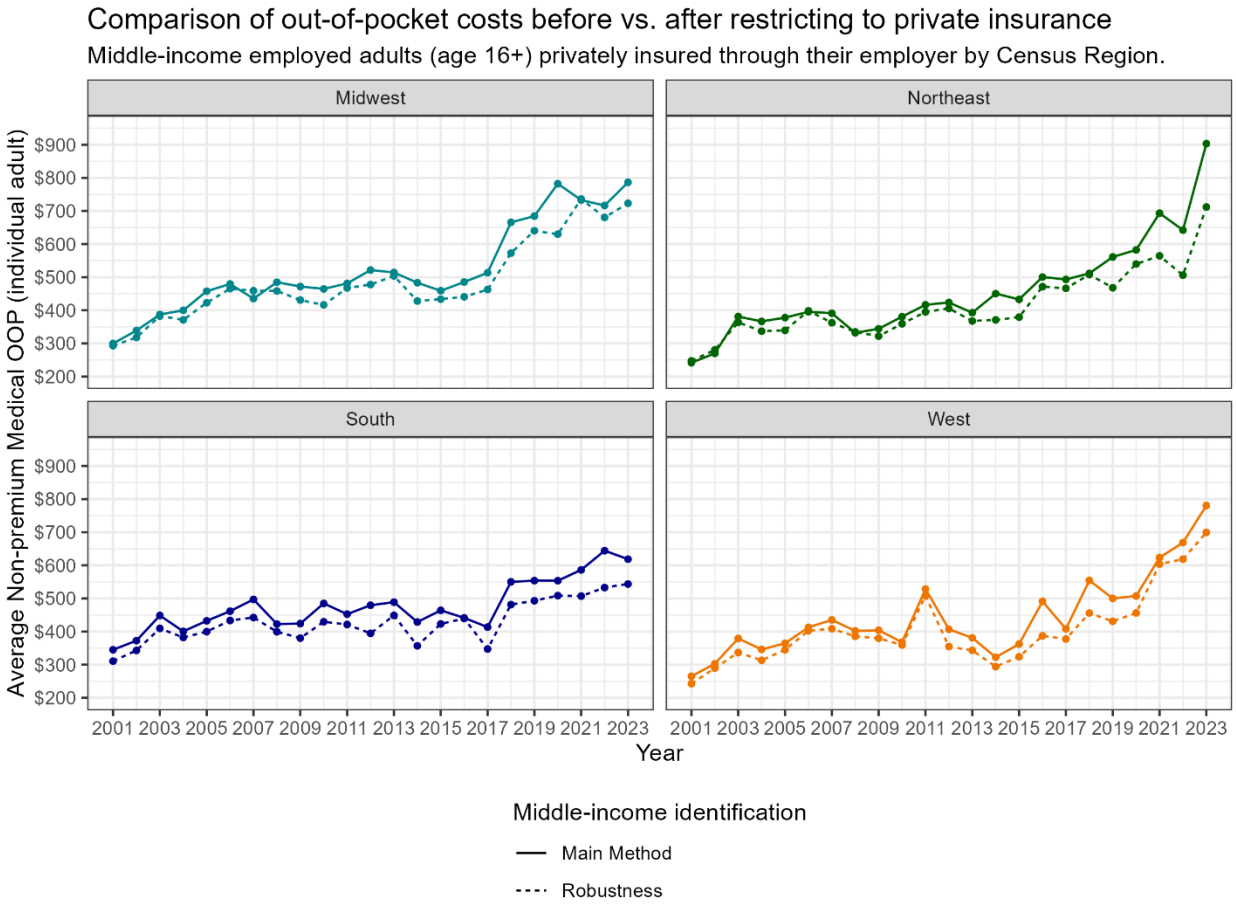
The advantage of the procedure selected in the Main Method is that it may be more representative of health benefits that are competitive with plans that other employers would offer, so it may track more closely with general expectations for what an employer-provided plan would typically include. However, because the stated objective of the TLC is to focus on the median worker, it is important to discuss both procedures. This is especially true because out-of-pocket spending may be impacted by an income effect (whereby higher-income individuals are able to afford more expensive or more frequent care), and because the median wage among privately-insured-through-employer workers may be higher than the median wage among all workers

generally, LISEP considers the impact of this estimation decision on the estimates of out-of-pocket inflation.

For brevity, this section focuses on the costs for non-dental, medical non-premium expenses for adults only, and it maintains consistent definitions of "employed", "privately-insured through employer", and "underinsured family" between the Main Method procedure and the Robustness procedure (see "Specific Calculation"). The sample used for the Robustness procedure, then, is all workers age 16 or older (AGE[yy]X) who are employed in all rounds of the survey taking place during the reference year (EMPST[rr]H). The 25th and 75th wage percentiles are determined among this cohort (WAGEP[yy]X), and workers with wages in that interval are identified as middle-income. Finally, the sample of middle-income workers is further restricted to those who are privately insured through their employer (INSCOV[yy] and HELD[rr]X) and who are not in underinsured families (FAMINC[yy] or TTLP[yy]X, TOTSLF[yy], DUID, and FAMIDYR), and the mean of their non-dental medical costs (TOTSLF[yy] less DVTSLF[yy]) is computed.

In most years, the results from the Main Method and the Robustness procedure are reasonably similar. Consistent with the income effect, the Main Method estimates consistently higher costs, typically between $6.87 and $84.6 higher (the 10th and 90th percentiles, respectively, the range is $23.75 lower to $191.42 higher). Higher discrepancies tend to occur later in the series, from 2020 onwards, as shown in the figure. In particular, the Northeast estimates for 2021, 2022, and 2023 suggest a more-recent regional divergence between the two calculations, which warrants continued monitoring. When combined with the medical premiums and aggregated to the national average, the Robustness calculation would estimate an increase in the average national cost of 187% from 2001-2023, compared with 193% under the Main Method.

Figure 2: Out-of-Pocket Costs by Middle-Income Identification



Impact of Maximal Earner for Out-of-Pocket Costs

This check evaluates LISEP's procedure to determine whether a child's out-of-pocket (OOP) spending counts towards the cost estimate when computing the region-level average, when the child has private insurance and is in a family where there is more than one adult with employer-provided insurance. LISEP chooses to only consider children where the maximal earner of all adults in the family falls into the middle 50% wage cohort as they most likely have the most comprehensive insurance. One concern is that this introduces an income bias that affects children's average OOP expenses. LISEP conducted an analogous region-level average OOP computation when considering only those children where the minimal adult earner was in the middle 50% wage cohort as well as another where either adult earner was in the middle 50% wage cohort. Both average medical and dental OOP expenses are computed following the procedure for medical OOP spending. While the dental OOP costs computation in this case is not the same as in the main method, it is still useful for understanding the impact of the maximal earner choice.

As the figures below show, all approaches yield a very similar average OOP estimate at the regional level even though the adults' wages in the considered subset are slightly higher under the minimal-earner subset. While the average OOP estimates do not seem to exhibit a systematic bias,

in general maintaining children where the maximal earner falls into the middle 50% results in lower average OOP costs. On average, medical and dental expenses under the maximal earner subset were 2.2% lower and 2.9% lower than under the minimal earner subset. Medical and dental average expenses under the maximal earner subset were greater or equal than under the minimal earner subset 32.6% and 28.3% of instances.

Figure 3A: Children Medical Out-of-Pocket Expenses by Earner Subset

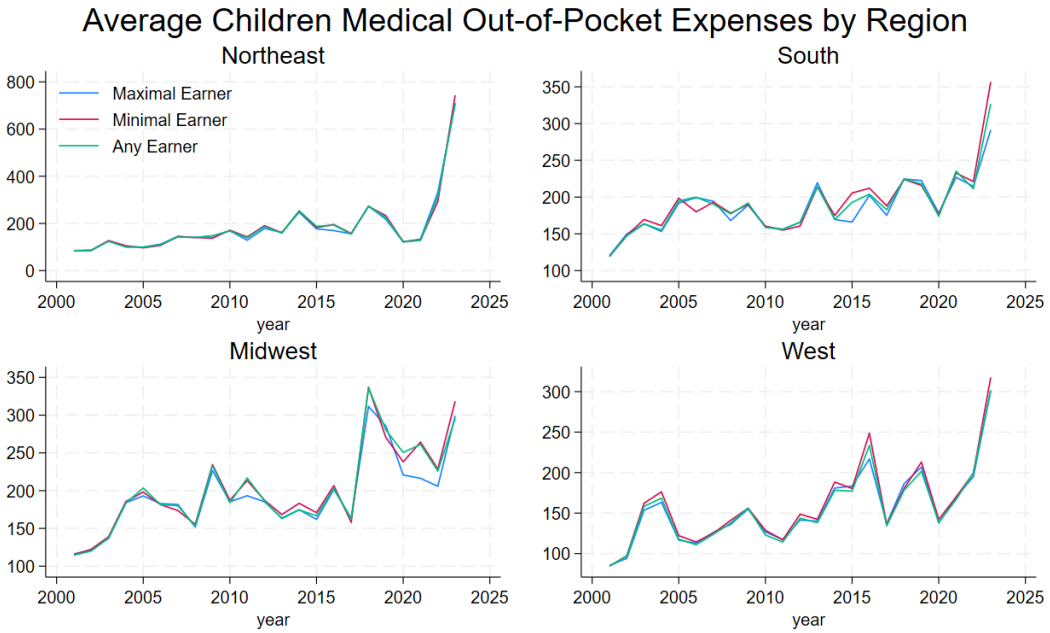


Figure 3B: Children Dental Out-of-Pocket Expenses by Earner Subset

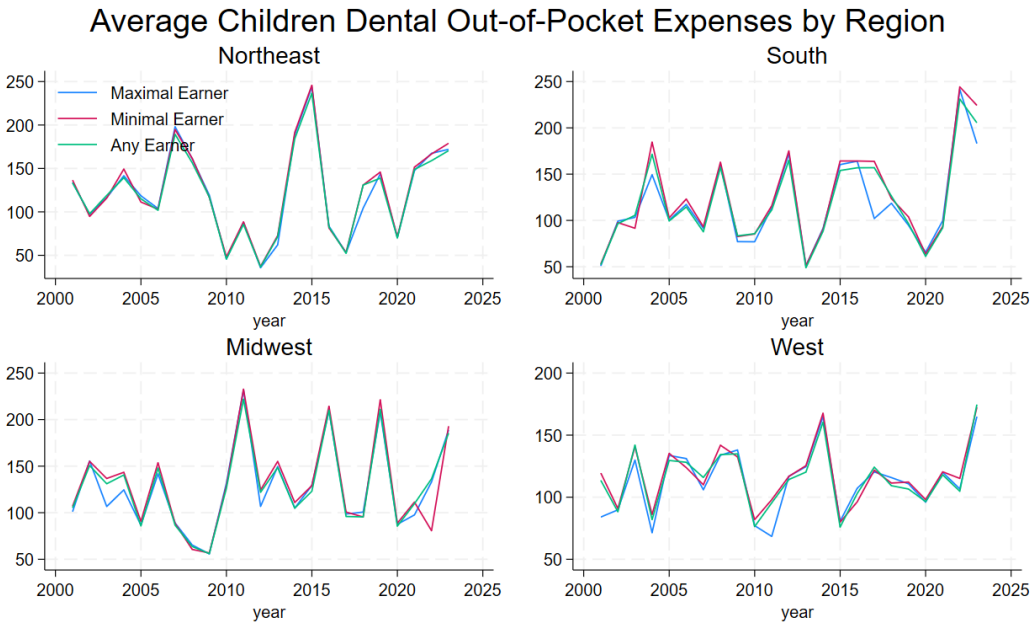
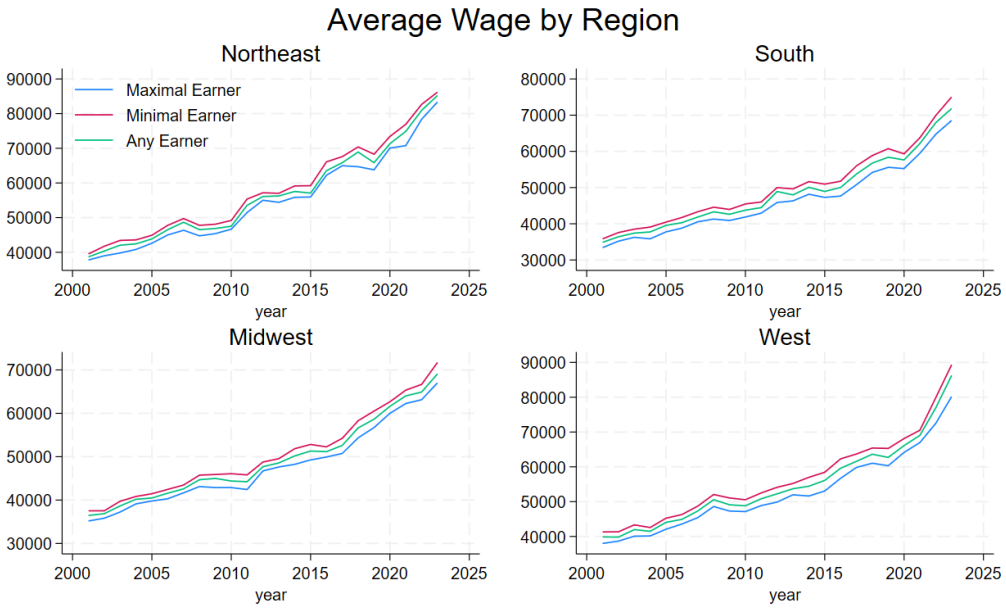


Figure 3C: Adult Earner Average Wage by Earner Subset



Impact of Household Composition on Medical Out-of-Pocket Costs

LISEP decides to allocate the budget for medical out-of-pocket spending to family types by scaling the average adult's and average child's spending based on the number of adults and children in the family. An alternative approach would have been to compute average spending based on the household composition rather than scaling the individual averages for adults and children. While this alternative can be conducted using the MEPS household survey microdata, it yields more unstable outputs at the regional level for families with children given the limited sample size. Following the same procedure for subsetting eligible adults and children under the medical OOP costs methodology, LISEP determines the 25th and 75th percentile cutoffs among wage earners based on the number of children in their family. For each year, region and household composition based on the number of children, a middle 50% cohort of wage earners is determined. In the figures below, the regional OOP estimates by family type are computed based on the middle 50% of wage earners for families with zero, one, two and three children. The regional OOP estimates by family type under the main method are also provided. While in general families with children spend more than families without children, this varies substantially from year to year which complicates analysis over time. Further, the differences across family compositions may not be reflective of the actual needs of family types if their consumption of healthcare is influenced by financial constraints. Scaling the average spending per adult and child, regardless of the family composition, helps navigate both issues.

Figure 4A: Average Medical Out-of-Pocket Costs - Family Composition Check

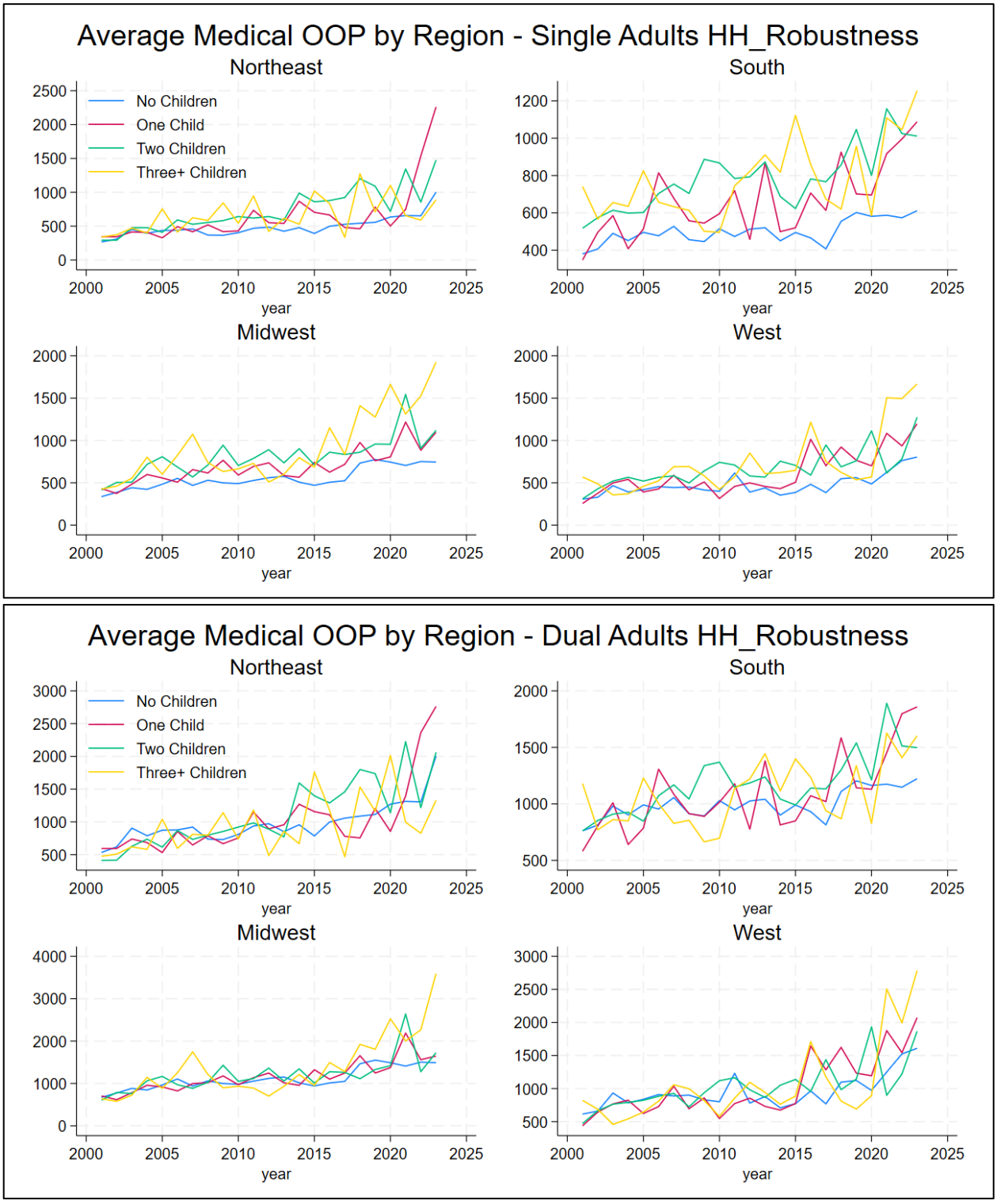
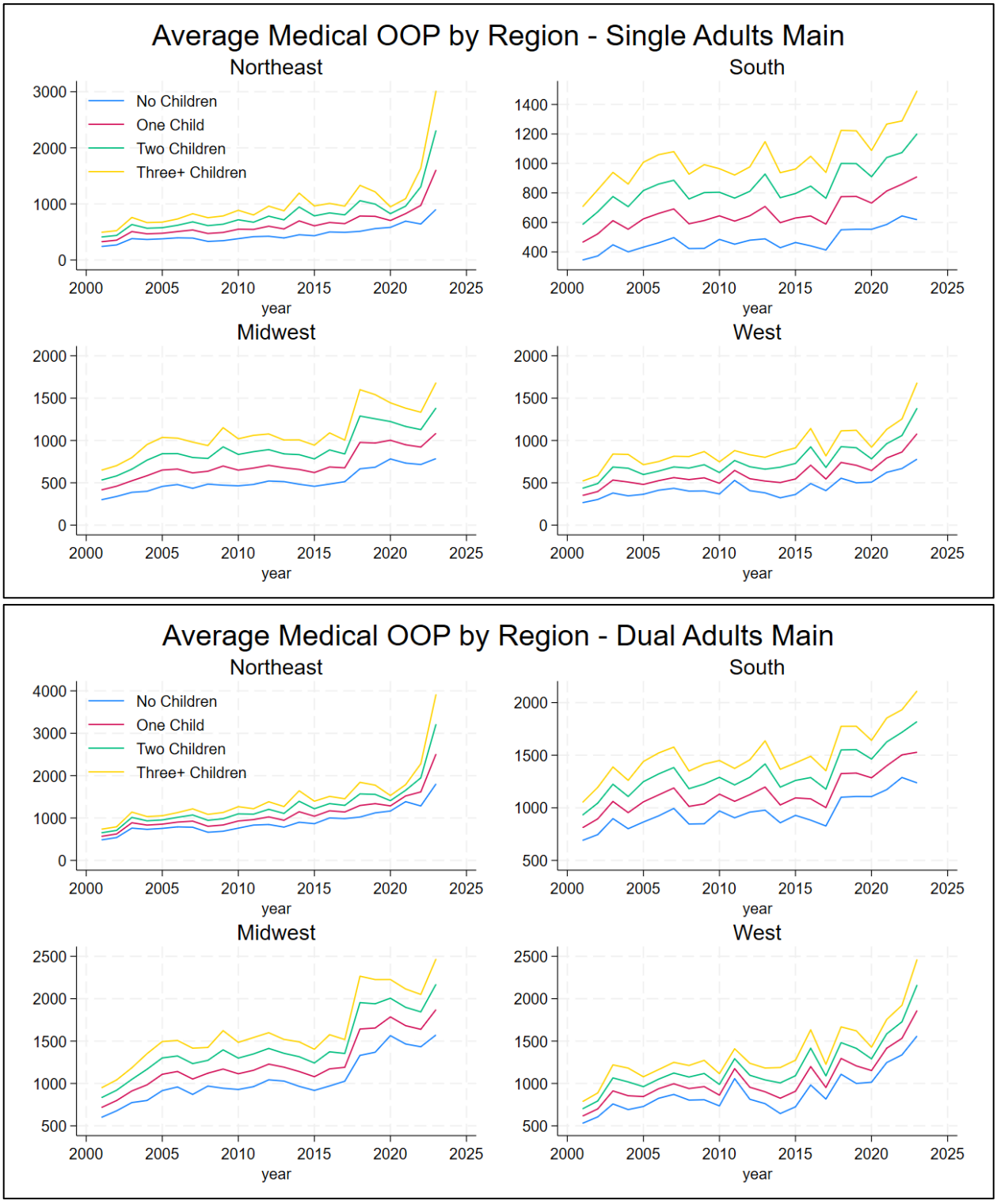


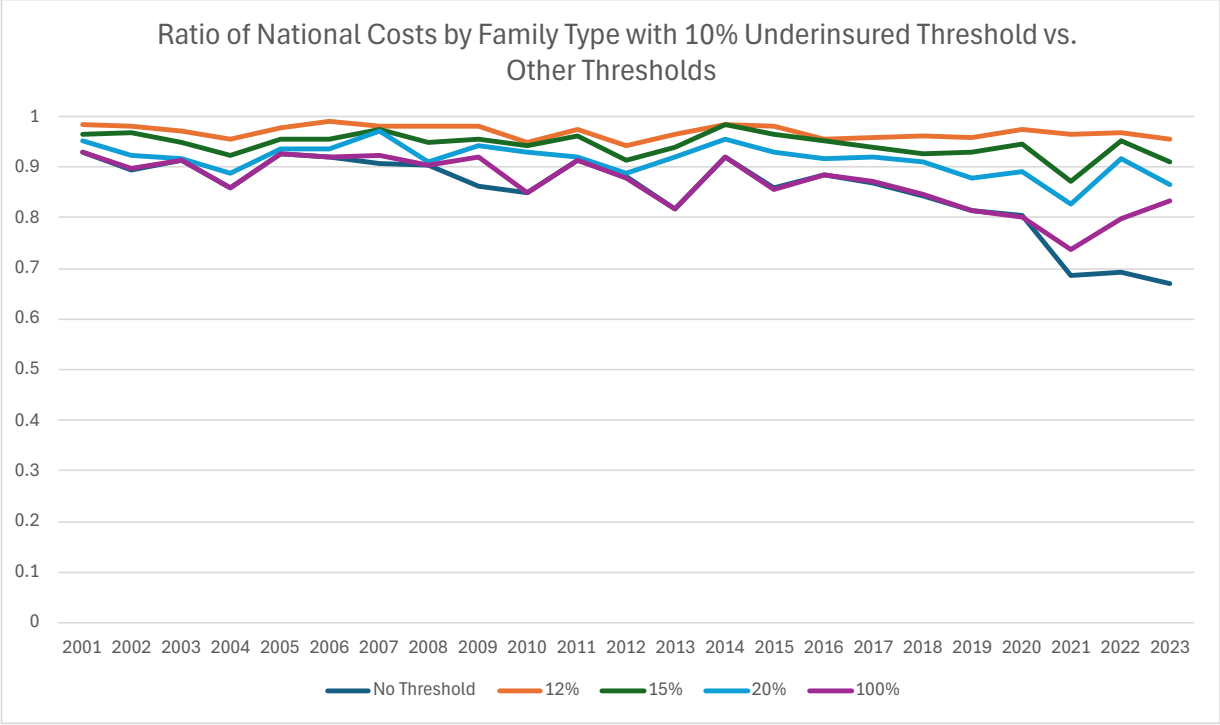
Figure 4B: Average Medical Out-of-Pocket Costs – Main Method



Impact of Underinsurance Income Threshold Choice

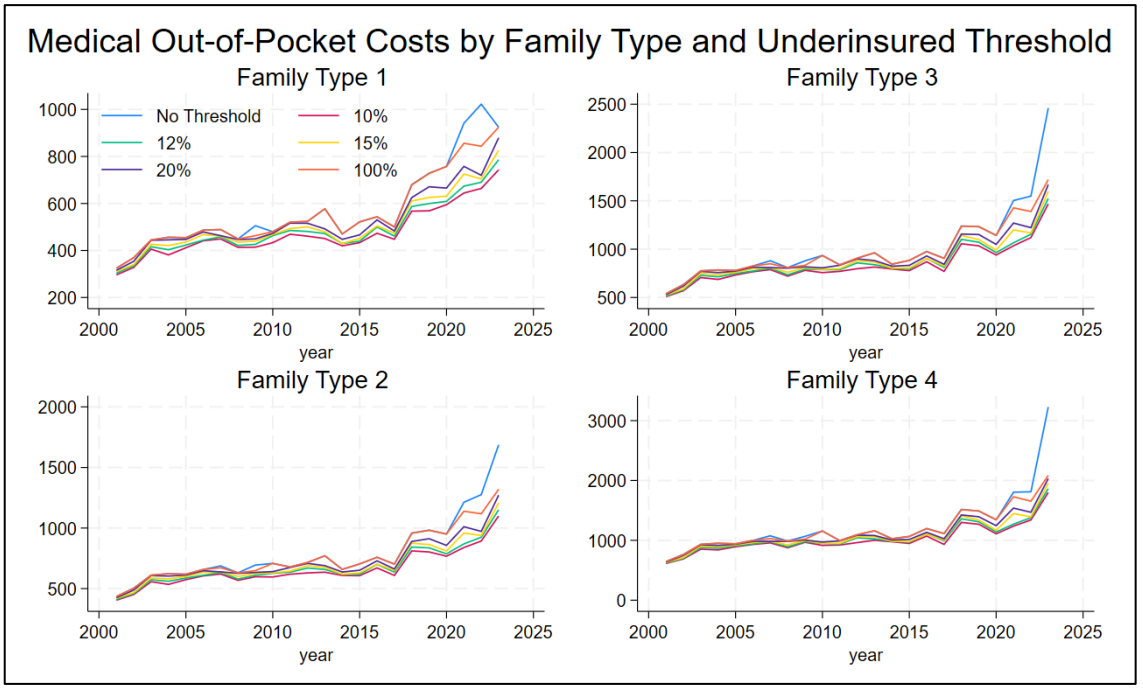
The figures below detail the effect on the national-level average medical out-of-pocket costs by family type based on the income threshold chosen for determining a family's underinsured status. When excluding families whose out-of-pocket costs exceed 10% of income, average costs are lowest for each family type. Costs rise as the threshold becomes less stringent. One cause of concern is that the ratio of costs using the 10% underinsurance threshold to no threshold has declined over time, from 90% of costs in the 2000s to below 70% since 2021.[81] While this suggests that the underinsurance threshold is preventing extremely large values from skewing the costs estimates, the gap with other less stringent thresholds has also widened, albeit to a lesser extent. Overall, the 10% underinsurance threshold helps minimize the out-of-pocket costs allocation, but it may understate the increase in healthcare costs as families spend more of their income on healthcare.

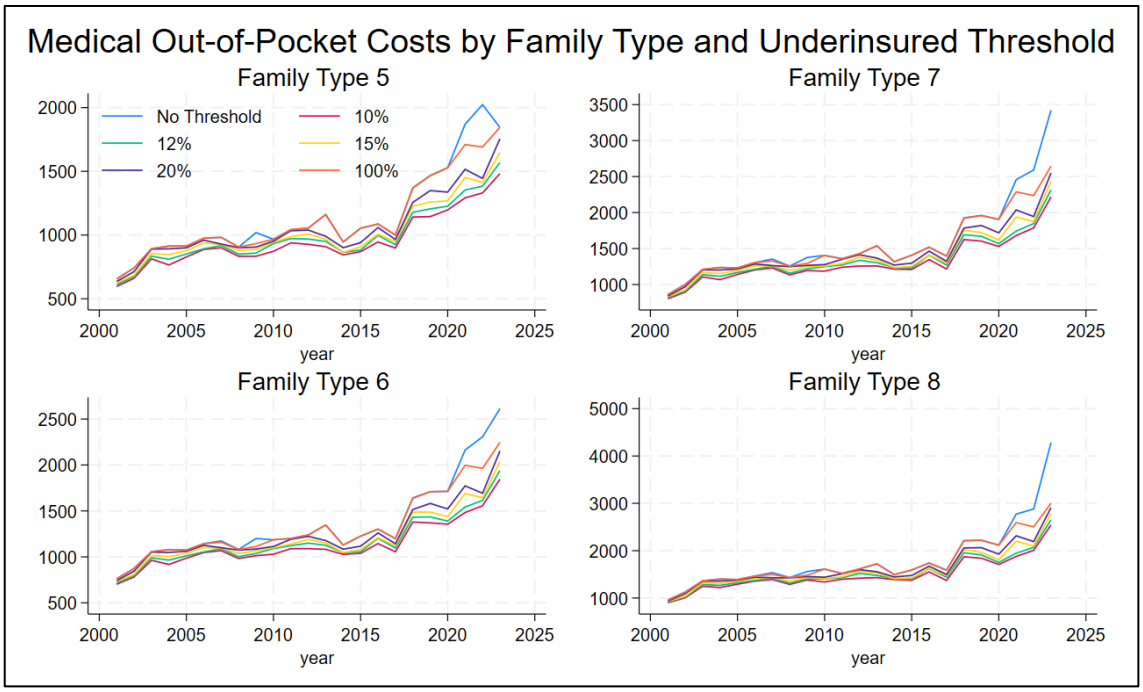
Figure 5A: Comparison of 10% Underinsured Threshold vs. Other Levels



[81] The ratios of every family type's out-of-pocket medical expense at the national level is averaged, without weighting for their respective population proportions.

Figure 5B: Medical Out-of-Pocket Costs by Family Type





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Childcare

Aim

The aim of this section is to present the minimal cost for adequate childcare for each type of family. We assume that starting at the age of 6, when the child can attend kindergarten, the child no longer needs daycare. But before- and after-school care are needed, as well as summer programming. At age 12, no childcare is needed. Thus, childcare costs only apply to families with children aged 11 or younger.

The standard for minimal adequate needs that LISEP uses is defined by Childcare.gov, which sets and reports standards for childcare centers based on group sizes, safety, and development.[82] Childcare.gov states: "Children need care that keeps them safe, healthy, and learning. And you need a childcare provider that supports you as your child's most important teacher and works with you to ensure your child's healthy development and learning." Thus, a minimally adequate childcare arrangement should aim to support these goals.

Certain groups are excluded. First are children who are not in licensed childcare centers. Because we assume that both parents are working, children in non-licensed centers would be either under no adult supervision or under supervision of another adult or family member. But this arrangement is not an option for many families, and if it is, it may not be adequate given the Childcare.gov definition above. Second, those who exceed the *minimal* adequate need are excluded. Some highly advanced childcare facilities are extremely expensive and thus don't fit the aim of this project.

High-Level Methodology

LISEP uses a similar approach to the Economic Policy Institute Family Budget Calculator to estimate the childcare needs of a 4-year-old. The data from Child Care Aware of America (CCoA), an organization focused on access to quality, affordable childcare, is used. This data gives accurate cost measurements by state from 2010 onward. The CPI price trend specific to childcare is then used to adjust the cost closest to the start of the sample for each year in which we did not have relevant data.

This approach would meet the qualifications set forth by Childcare.gov. Because LISEP is only using costs for licensed facilities, some type of oversight is assured. Each state has different childcare licensing requirements, but in general "Licensing agencies set basic rules that must be followed to legally run a childcare program."[83] These set regulations pertain to:

- *Safety in the building and physical environment*
- *The number of children and childcare providers on site*
- *Preventing the spread of infectious diseases*

[82] (Childcare.gov)
[83] (Chidlcare.gov)

- *Staff qualifications and training*[84]

Furthermore, Ceglowski (2004) suggests that all the stakeholders of childcare–from children, staff of facilities, parents, and officials that make and enforce the requirements–have similar preferences and consideration.[85][86] Because of this, using licensed childcare facilities meets the adequate need set forth above. The best available source (Childcare of America, discussed in detail later in this section) for this data only provides the average cost of childcare, though, not the median. Thus, LISEP does accept that there could be some upward biasing with the inclusion of very expensive facilities, but the data is collected at the state-level, which means that the high number of centers will mitigate the effect of the outliers.

For before and after school costs, LISEP aims to track median prices at licensed centers at the state level. LISEP uses licensed center price data from various sources to get the most reliable estimates by state. From 2008 to 2022, LISEP aggregates the state-level median price rates from the county-level rates at the National Database of Childcare Prices (NDCP) published by the Women's Bureau at the Department of Labor.[87] From 2023 onwards, LISEP uses price data from market rate survey (MRS) reports from states to determine state-level average median price estimates of the cost of school-aged childcare at a licensed center or average price data from Childcare Aware of America. The NDCP estimates are derived from market rate survey reports.[88] Childcare Aware of America surveys state agencies responsible for administering federally-funded Child Care and Development Block Grants on topics including childcare prices, and it gathers price data from publicly available MRS reports when it cannot be gathered from CCoA's survey.[89] Finally, LISEP imputes data for missing years through a mix of linear interpolation and tracking costs with the CPI for childcare. If there are two end years for costs from the market rate survey or the CCoA data, then we use linear interpolation. If we are extrapolating, we use the CPI.

For the summer costs, Afterschool Alliance research data is used. Surveys by after school alliance are not conducted every year, so there is state-by-state data covering two specific years for summer programming costs (2013, 2019). Using this data also meets the minimal needs aim. Parents are 94% satisfied with their afterschool program, contingent on the fact that their child is in an afterschool program.[90] Parents are 95% satisfied with the summer program that their child is in, given that their child is in a summer program.[91] Because of the alignment of the parent, licenser, child, and facility operator mentioned above in Ceglowski (2004),[92] LISEP surmises that this

[84] (Chidlcare.gov)
[85] (Ceglowski, D., 2004)
[86] These include Professionalism and Training, Caring and Stable providers, communication with families, and enjoyment of children.
[87](U.S. Department of Labor, Women's Bureau). https://www.dol.gov/agencies/wb/topics/featured-childcare
[88] (U.S Department of Labor, Women's Bureau, 2024). See "Appendix A: Data Collection and Data Entry Protocol" in the September 2024 Technical Report. https://www.dol.gov/agencies/wb/topics/featured-childcare.
[89] (Child Care Aware of America, 2025) https://www.childcareaware.org/ccaoas-methodology-2025/.
[90] (Afterschool Alliance, 2020)
[91] (Afterschool Alliance, 2020)
[92] (Ceglowski, D., 2004)

approval rating is a good approximation that parents are getting the minimal adequate need for afterschool care at the centers covered by this data. LISEP estimates costs in the missing years with a mix of linear interpolation and tracking the costs using the CPI for childcare and applies these costs to the relevant families.

One avenue that LISEP chose not to take was to allocate some portion of the population lower childcare costs because they had family members who could assist with care. This is because LISEP viewed it unreasonable to assume that family members have the means (both timewise and financially) to be able to take care of the children of a separate family member without payment, or that it would be offered even if time or finances weren't at issue. Further, the data from the Census Survey of Income and Program Participation (SIPP) shows that the share of children in organized facilities increases with household income. In contrast, the share of children being taken care of by relatives decreases as household income increases.[93] These findings suggest that relatives taking care of children is an only option for low-income households rather than a choice. This complements research showing that organized childcare is beneficial for the growth and development of children.[94]

Data

CCoA's database titled "The US and the High Price of Childcare" is used to estimate the cost of childcare by state for daycare centers and before and after school care.[95] This data is available starting from 2010 onward. Unfortunately, prior to 2010, there is no available data. So, using the data from 2010, LISEP adjusted the cost data using the CPI for childcare back to 2001. This Elementary Level Index (ELI) was EB03 and can be found on the Consumer Price Index database on the BLS website[96].

LISEP uses the National Database of Childcare Prices published by the Department of Labor to estimate the cost of care for school-aged children at licensed centers by state. The NDCP data is derived from each state's childcare MRS report and is available at the county-level from 2008 to 2022.[97] It provides weekly rates for care at different categories of facilities at the mean and at multiple percentile levels. LISEP also uses state specific MRS reports to fill gaps in the data for some years.[98]

LISEP uses the Afterschool Alliance data for the costs for summer programs. It provides average costs by state for families who participated in any of these programs.[99]

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[93] (Census.gov)

[94] (Afterschool Alliance, 2020)

[95] The Child Care Aware of America organization publishes the cost data for the current year. We were able to contact them, and they graciously gave us the data from 2010 onward: (Child Care Aware of American, 2021)

[96] (Bureau of Labor Statistics)

[97] (U.S Department of Labor, Women's Bureau, 2024). See the September 2024 Technical Report. https://www.dol.gov/agencies/wb/topics/featured-childcare.

[98] See table on sub-section *2. Childcare Costs for 8-year old* under *iv. Specific Methodology*

[99] Afterschool Alliance generously provided their data on afterschool care costs for 2009, 2014 and 2020 and on summer programming costs for 2013 and 2019: (Afterschool Alliance, 2021)

Specific Methodology

Childcare Costs for the 4-year-old

To calculate the cost of childcare for the 4-year-old, the cost given by the CCoA is taken and applied to families with a child. Each family type that has at least one child has, by definition, exactly one child in 4-year-old childcare. To obtain the cost of daycare for each year in the period of interest, LISEP took the state breakdown of data provided by the CCoA and adjusted each of these costs by the national ELI for childcare for each year prior to 2010. The ELI nationally is also used to extend the Montana values for 2017-2019 because no Market Rate Survey for childcare costs was conducted by the Montana legislature in any of these years. For Arkansas, their first year recorded by the CCoA was 2013, so the value from 2014 had to be used to estimate costs from 2001 to 2013. The CCoA annualized costs for 4-year-old care assume 52 weeks of care in a year. These costs were then aggregated to the regional level using the state populations in the respective regions.

Childcare Costs for the 8-year-old

The Afterschool Alliance provides snapshots for the summer care costs for 2013 and 2019. For 2019, state-by-state costs for both "voluntary summer programs" and "non-STEM specialty camps or programs" were available. LISEP used the cheaper of these two options on a state-by-state basis and then linearly interpolated the costs from 2013 to 2019 to fill in the missing years. For the years prior to 2013, the summer costs were adjusted using the CPI index for childcare.

For the before and after school care costs, LISEP tracks the 50th percentile of licensed centers at the state level using data from the NDCP, from CCoA, and directly from states' market rate survey reports. In general, LISEP prioritizes using data directly from the MRS reports and the NDCP since it is most reliable for measuring the average median price over time. LISEP uses the CCoA estimates to fill in gaps in recent years when other data is unavailable and when the CCoA data is consistent with 50th percentile price for school-aged children at licensed centers for the year. Finally, LISEP completes estimates for missing years using linear interpolation if possible, and if not using the CPI index for childcare. For specific notes on the methodology for each state, please reference the table below.

These costs are then applied to all families with an 8-year-old assuming that they spend 39 weeks in school-age care and 13 weeks in summer care.

Notes for imputing 50th percentile school-age center-based care for selected states (2024 Release):

Before and After school Centers	Notes	Source
Alaska	Imputed 2023 and 2024 values based on Child Care Aware data.	Link
Alabama	Imputed 2023 value based on Table 11 statewide estimate from the 2024 MRS report with data collected in the second half of 2023. 2024 value was extrapolated with CPI.	Link

Arkansas	Imputed 2023 value based on Table 1a from 2023 MRS report with data collected in September. Computed the average mean of the regional median daily price for school-age children center-based care, weighted by the number of slots. 2024 value was extrapolated using CPI	Link
Arizona	Imputed 2024 value based on the 2024 MRS report using the statewide median daily rate for school-age care. All surveys needed to be submitted between April 23, 2024 and May 7, 2024. 2023 value was imputed through linear interpolation.	Link
California	Extrapolated 2023 and 2024 values with CPI.	
Colorado	2016-2021 values were imputed through linear interpolation. 2023 and 2024 values were based on Child Care Aware data.	Link
Connecticut	Imputed 2023 value based on 2024 MRS report (Table 6) with data collected between October and December 2023. 2024 estimate comes from Child Care Aware of America.	Link
District of Columbia	Imputed 2023 and 2024 values based on state's cost of childcare reports' reported value for average cost of school-aged care at large centers given the lack of data for Washington DC across sources. The values from 2013-2022 were imputed through linear interpolation between the 2012 NDCP estimate and the 2023 DC cost-report estimate.	Link
Delaware	Imputed 2024 value based on Table 14 on the state's 2024 MRS report. Imputed 2023 value through linear interpolation.	Link
Florida	Imputed 2023 value based on FY22-23 MRS report and 2024 value based on FY23-24 MRS report. Specifically, the weighted median daily rate for school-age center-based care (non Gold-Seal).	Link
Georgia	Extrapolated 2024 with CPI. Computed annualized rates from 2001-2023 using Georgia's MRS reports for available years, and imputed the rates for in-between years through linear interpolation. The NDCP data for afterschool costs in Georgia showed a large decline in costs from 2017 through 2022, which was inconsistent with the MRS data and the NDCP data for school-age costs for Georgia.	Link
Hawaii	Computed 2023 value based on table 3 from Hawaii's MRS report. Extrapolated 2024 value using CPI.	Link
Iowa	Extrapolated 2023 and 2024 values with CPI.	

Idaho	Estimated the 2024 values for the 50th percentile for the county clusters from the corresponding MRS reports, weighting by the 2022 county population weight available on the NDCP file. The 2023 value was imputed through linear interpolation.	Link
Illinois	Estimated the 2023 value from Table 18 on the 2023 MRS report and extrapolated the 2024 value with CPI. While the table is titled as "part-time rate", the full-time rate annualized estimate based on the daily part-time rate of $18.50 would be considerably larger ($7,215) than recent estimates from the NDCP, Illinois MRS report, and Childcare Aware data. The 2018 and the 2021 Illinois MRS report listed Table 18 as reporting full-time daily rates for school-age children. Further, Appendix C in the 2023 MRS report details the full-time daily rate for school-age children at license-exempt centers would result in a slots-weighted-average median rate of $12.60, which would be almost three time smaller than the daily full-time rate at licensed-centers of $37 (twice the part-time rate as listed on Table 18). Overall, this suggests that the 2023 MRS median part-time daily rate for school-aged children is inconsistent with other estimates. As a result, LISEP takes the Table 18 value as a full-time rate and annualizes the median cost of before- and after-school care by multiplying the rate by 5 days and 39 weeks (so daily rate*185). Given the inconsistency in the MRS report, LISEP's imputation prioritizes consistency with previous estimates and underestimating the minimally adequate cost of childcare in Illinois rather than overestimating it.	Link
Kansas	Imputed 2024 value based on Table 22 on the state's 2024 MRS report. The median hourly rate for each cost area was annualized by multiplying by 1560 hours (8 hours / day * 5 days * 39 weeks). Then, the state average was computed by averaging the cost area median rates weighted by their 2022 population (taken from the NDCP data). Imputed 2023 value through linear interpolation.	Link
Kentucky	Imputed 2023 and 2024 values based on Child Care Aware data.	
Louisiana	Imputed 2023 value based on the state's 2023 MRS report. The median daily rate for each center-Type was used to compute the statewide average, weighted by the center Type's enrollment of school-aged children. The 2024 value was extrapolated using CPI.	Link
Massachusetts	Extrapolated 2023 and 2024 values with CPI.	

Maryland	Imputed 2024 value based on 2024 MRS report. Computed the statewide average, weighted by the region's population in 2022 from the NDCP data, of the 50th percentile weekly rates at centers based on the regional costs tables. Imputed the 2023 value through linear interpolation.	Link
Maine	Imputed 2023 value based on Table A1 under Appendix A in the 2024 MRS report whose survey was conducted between October 2023 and February 2024, with a request to complete responses by December 2023. The 2024 value was extrapolated using CPI.	Link
Michigan	Imputed 2023 and 2024 values based on Child Care Aware data.	
Minnesota	Calculated 2024 value based on 2024 MRS report. The statewide average of the county price-clusters median was computed by weighting using the 2022 population estimates from the NDCP data. While the survey was conducted between October 2023 and February 2024, an supplemental survey of certified school-age providers was conducted in March 2024, so LISEP assigned the cost estimate for school-aged children to the year 2024. The 2023 value was imputed through linear interpolation.	Link
Missouri	Extrapolated 2021-2024 values with CPI.	
Mississippi	Imputed 2024 values based on Table 4 from the 2024 MRS report. The 2023 value was imputed through linear interpolation.	Link
Montana	Extrapolated 2023 and 2024 values with CPI.	
North Carolina	Extrapolated 2023 and 2024 values with CPI.	
North Dakota	Imputed 2023 value based on Table 11 from the 2024 MRS report. The survey was launched on October 23, 2023 and closed January 22, 2024, so LISEP assigned the cost to 2023. The 2024 value was imputed through extrapolation with the CPI.	Link
Nebraska	Imputed 2024 value based on Tables 1, 2 and 5 from the 2025 MRS report. The survey was conducted over a 90-day-period beginning on January 12, 2024. The 50th percentile full-day rates for the urban and rural counties were aggregated to the state level weighting by total enrollment of school-age children at center-based providers. Total enrollment at each geography was imputed by multiplying the average school-age enrollment at center-based providers by geography times	Link

	the number of full-day center-based providers respondents for school-age children. The 2023 value was imputed through linear interpolation.	
New Hampshire	Extrapolated 2023 and 2024 values with CPI.	
New Jersey	Imputed 2023 value based on Table 4 from the 2023 MRS report. LISEP verified that the jump in rates in New Jersey in 2021-2022 from the NDCP data compared to 2023 based on the MRS report is consistent with data from the 2021 New Jersey MRS report. To annualize the full-time median rates, LISEP took the monthly rate (multiplied by 9 months) as it yielded the lowest total cost compared to the weekly rates (multiplied by 39 weeks) and the daily rates (multiplied by 195 days). The 2024 value was extrapolated using CPI.	Link
Nevada	Extrapolated 2023 and 2024 values with CPI.	
New York	Imputed the 2023 value based on Tables 5 and 2 from the 2024 MRS report, with data collected between September and November 2023. The median weekly price for DCC/SACC providers for school-age care in each cluster was aggregated to a statewide average using the number of DCC and SACC providers with completed responses in each cluster as weights. Given the proximity of the median rate across clusters, alternative approaches of computing a simple average ($17 less after annualizing) or using the total number of DCC and SACC providers by cluster ($10 less after annualizing) yielded very similar results.	Link
Ohio	Imputed the 2024 value based on Table 11 from the 2024 MRS report. Imputed 2023 value through linear interpolation.	Link
Oklahoma	Imputed the 2024 value based on Appendix A from the 2024 MRS report. The median daily rate for all child care centers providing school-age care (Totals) was taken. The 2023 value was imputed through linear interpolation.	Link
Oregon	Imputed the 2024 value based on Table B2 under Appendix B in Oregon's 2024 MRS reported. Specifically, the monthly median rate for school-age care during the school-year weighted by capacity was taken as it yielded a lower annualized cost than taking the weekly median rate. The 2023 value was imputed through linear interpolation.	Link

Pennsylvania	Extrapolate 2021-2024 values with CPI.	
Rhode Island	Imputed 2021 value based on table 16 from the 2021 MRS report. The 50th percentile cost estimates from 2019-2022 for RI from the NDCP data differed significantly both in trends and size from those in the 2018 and 2021 MRS reports. For example, the 2021 median cost estimated from the NDCP data was $2,478 compared to the $6,084 estimate from the 2021 MRS report, which would have indicated a 53% fall in before- and afterschool-costs since 2018. As a result, 2018 is the last year for which LISEP uses NDCP data for RI where the NDCP estimate of $5,231 is consistent with the 2018 MRS report annualized median estimate of $5,265 (from table 14c). Consequently, the values for 2019 and 2020 were imputed through linear interpolation. Finally, since the 2024 MRS report only reports the 75th percentile estimate for full-day care for school-age children (rather than only before and afterschool), LISEP extrapolates the values from 2022-2024 through CPI. Another possibility was to impute the cost through 2024 based on the 15% increase from 2021 to 2024 in the 75th percentile estimate for full-day care for school-age children detailed in the 2024 MRS report, but this would have been similar to the 15.7% increase in the CPI for childcare over the same period.	Link
South Carolina	Extrapolated 2023 and 2024 values with CPI.	
South Dakota	Imputed 2024 value based on 2024 MRS report. Computed the statewide average of the 50th percentile rate, weighted by the 2022 counties population from the NDCP data, based on the "Age 6 & Over" table under Licenses Child Care Programs Market Rates. The hourly rate was annualized by multiplying by 1560 hours (8 hours per day, 5 days a week, 39 weeks). The 2023 value was imputed through linear interpolation.	Link
Tennessee	Imputed 2024 based on Table 3 in the 2024 MRS report. The 2023 value was imputed through linear interpolation.	Link
Texas	Imputed 2024 based on Table 9 in the 2024 MRS report. While survey data was collected between September 2023 and May 2024, LISEP decided to assign the cost to 2024. The 2023 value was imputed through linear interpolation.	Link

Addendum 2026 Edition

In the TLC update for the 2024 data release (2026 edition), LISEP switched to tracking the 50th percentile for school-aged childcare prices at licensed centers rather than the 75th percentile with the extension of the NDCP data from 2018 to 2022. This change resulted in a 1.8 percentage point lower increase in childcare costs between 2001 and 2023. In the previously published edition, the TLC estimated that childcare prices rose 106.4% (or 3.35% per year) between 2001 and 2023 compared to 104.6% (or 3.31% per year) under the current edition (Figure 1). The national average cost of childcare for family types with a school-aged child under the current edition is between 6.6% and 6.9% lower depending on the family type, or between $1,440 and $1,553 lower (Table 1).

Figure 1: Effect of methodological changes on overall childcare prices 2001-2023

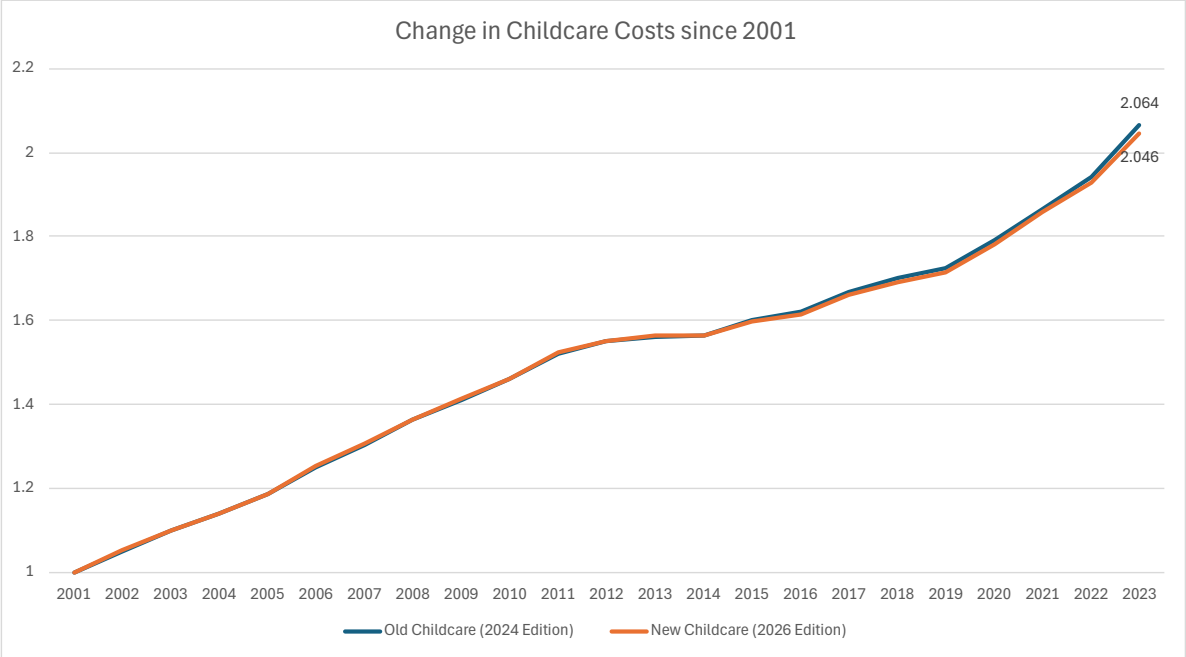


Table1: Effect of methodological changes on overall childcare prices 2001-2023

Year	Family Type	Old Childcare (2024 Edition)	New Childcare (2026 Edition)	Difference	Percent Difference
2001	1	0	0	0	
2001	2	5103	5103	0	0.0
2001	3	11318	10699	-619	-5.5

2001	4	11281	10657	-623	-5.5
2001	5	0	0	0	
2001	6	5088	5088	0	0.0
2001	7	11310	10690	-619	-5.5
2001	8	11380	10751	-629	-5.5
2023	1	0	0	0	
2023	2	11779	11815	36	0.3
2023	3	22115	20598	-1517	-6.9
2023	4	21732	20292	-1440	-6.6
2023	5	0	0	0	
2023	6	11937	11977	40	0.3
2023	7	22453	20900	-1553	-6.9
2023	8	21963	20494	-1469	-6.7

Addendum 2023 Edition

Below, we show the effect of the change in data sources, annualizing of costs and of taking the 75th percentile for afterschool costs. Most notably, the impact on overall inflation since 2001 is negligible with a 4 percentage point difference in 2021 (Figure 1). In particular, the change is smaller since the new cost of childcare, especially afterschool costs, is higher as a result of the changes, ranging from $2.3k more expensive in 2001 to $3.7k-$3.8k more expensive in 2021 for each family type with a school-aged child (Figure 4).

Figure 1: Effect of methodological changes on overall childcare prices since 2001

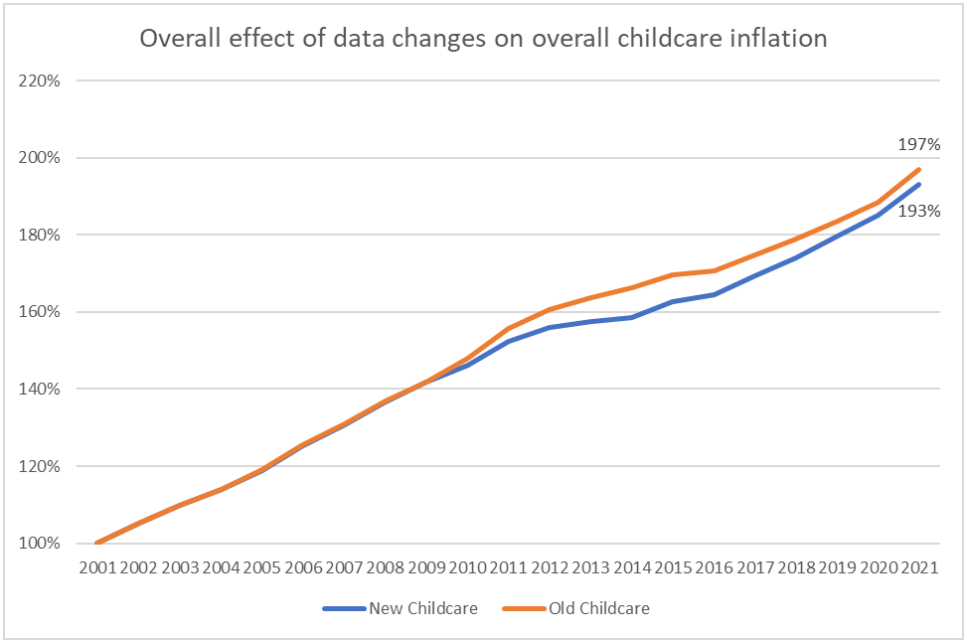


Figure 2: Effect of methodological changes on overall childcare prices for family type 4

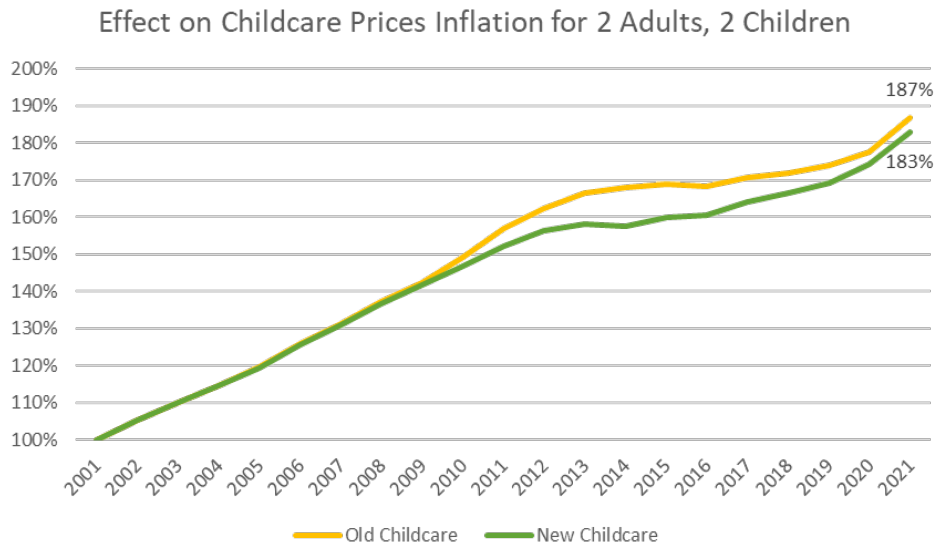


Figure 3: Effect of methodological changes on overall childcare prices for family type 4

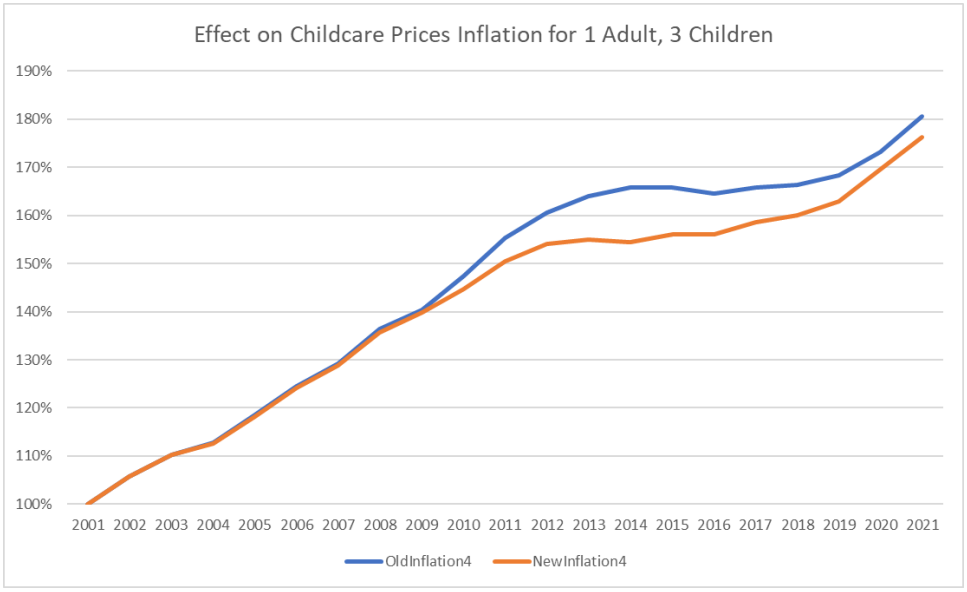
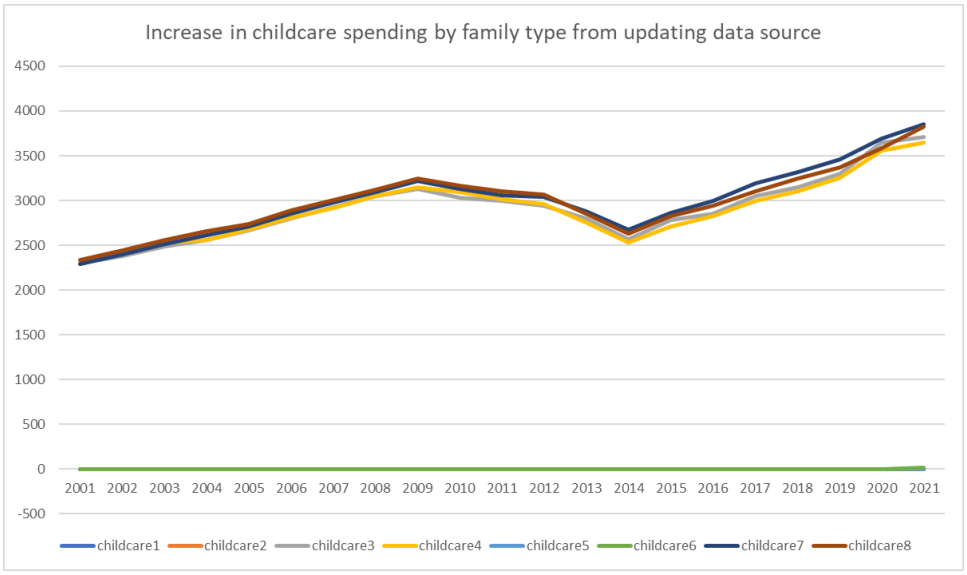


Figure 4: Increase in costs for necessary childcare by family type because of methodological changes



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Technology

Background

Decades of research make clear that unequal access to new and emerging technologies often serves to exacerbate inequality in society. Our entrance into the 21st century coincides with a period of rising digital connectivity in the United States that remade how Americans access and interact with key social institutions and spaces. "Digital connectivity" refers to the ability to use

computers, laptops, tablets, smartphones, or other "connected" devices to access the Internet.[100] Thus, digital connectivity is a function of both device ownership and the ongoing ability to reliably connect that device to the Internet.[101] Much previous research documents that by the early 2000s, access to digital connectivity was a critical factor shaping social inclusion in the United States.[102] This work shows that digital connectivity was necessary to access activities that are considered basic to social life, such as education, employment, and access to government.[103] Indeed, research has uncovered a clear "divide" in which those with access to reliable digital connectivity had--and continue to have--better access to these fundamental social goods than those without it.[104] For this reason, a central assumption that underlies this index is that access to reliable digital connectivity was--and is--essential in 21st century life for all Americans.

Defining the Basket for "Digital Connectivity"

Given the definition of "digital connectivity," above, LISEP carefully considered the minimum basket of devices (computers, mobile phones, tablets, etc.) and access points (dial-up or broadband Internet access) that could produce a level of digital connectivity that would have provided essential digital access for most Americans during the period 2001-2020; digital infrastructure, and the tools used to access it, evolved rapidly during this period.

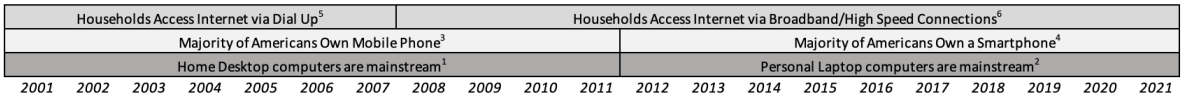
The final basket of goods: Regardless of the number of adults, every LISEP household is allocated one personal computer and a budget for computer repairs estimated from the spending of households whose income is between the 10th and 25th income percentiles of the income distribution. Then, based on the number of adults in the household, each LISEP household is assigned a budget for internet prices (dial-up in earlier years and broadband later), cell phones, and cellular service, also derived from the spending of households in the lower and middle parts of the income distribution. It is assumed that cell phones are the main source of a household's communication, so landline costs are only included insofar as they support access to dial-up internet.

Defining an Innovation as Mainstream.

Research on emerging innovations often differentiates between a period of "early" adoption, when the innovation is purchased or used by a small niche, to a "mainstream" period, when most people in a society have adopted an innovation.[105] LISEP defines "mainstream adoption" as the point when more than 50% of the American population adopted the innovations that underlie digital connectivity. Figure 1 summarizes the devices and access points required for essential digital connectivity, as well as the timing of their entrance into mainstream American life:

[100] (DiMaggio et al. 2001)
[101] (Powell, Bryne and Daily 2010)
[102] (DiMaggio et al. 2004; DiMaggio et al. 2001; Powell, Bryne and Daily 2010)
[103] (Powell, Bryne and Daily 2010)
[104] (DiMaggio and Bonikowski 2008; Hargittai 2008; Powell, Bryne and Daily 2010; Rice and Katz 2002)
[105] (Rogers 1995)

Figure 1: Diffusion of Innovations Necessary for "Mainstream Connectivity" Among Households in the United States, 2001-2021



[1] Martin, Michael. 2021. Computer and Internet Use in the United States: 2018. *American Community Survey Reports* . U.S. Census Bureau, Washington DC.

[2] Zickhur and Smith, 2012.

[3] Tuckel, Peter and Harry O'Neill. 2005. Ownership and usage patterns of cell phones: 2000-2005. Paper presented at the Annual Conference of the American Association for Public Opinion Research, Miami Beach, FL.

[4] Pew Research Center. 2021. Mobile Fact Sheet. https://www.pewresearch.org/internet/fact-sheet/mobile/

[5] NTIA. 2002. A Nation Online. U.S. Department of Commerce; By September 2001, a majority of American households had dial-up Internet access.

[6] NTIA. 2007. Networked Nation. U.S. Department of Commerce; By October 2007, a majority of American households had broadband Internet access.

Dominant Internet-Based Devices: The Personal Computer and Mobile Phone

A solid evidence base supports the claim that "mainstream" digital connectivity requires access to both a personal computer (desktop or laptop) and mobile phone during this period.[106] Figure 1 illustrates that home computers (desktops or laptops) had reached a "mainstream" level of adoption by 2001, while the mobile phone was a mainstream device by 2001, with Smartphones as the dominant telephone device by 2012. For this reason, both personal computers and mobile phones are included in our calculations.

Accessing the Internet: From Dial Up to Broadband.

Dial-up, home internet connections were a majority access point for Americans from September 2001 through September 2007. By October 2007, the majority of U.S. households had a home broadband connection (See Figure 1). Home internet penetration moved above 50 percent (to 54 percent) of households in September, 2001[107] and broadband penetration in households reached majority penetration (50.8 percent) in October of 2007.[108] Maintaining landlines was critical as a source of dial-up connections, particularly prior to 2008, even among users of mobile phones. LISEP incorporates the costs associated with maintaining a reliable internet connection, drawing on the appropriate "mainstream" access point, dial-up versus broadband, in the index. For the period 2001 – 2007, LISEP assumes that a mainstream internet connection required a landline and dial-up subscription. After 2007, it is assumed that a mainstream internet connection required a broadband subscription.

Data Sources

LISEP draws on three publicly available data sources to generate device and internet prices used to estimate the annual costs of digital connectivity from 2001 to 2020.

A. The Consumer Expenditure Survey Public Use Microdata (CE PUMD)[109]

The central data source is historical consumer spending data drawn from the Consumer Expenditure (CE) Surveys. The CE PUMD "provides data on expenditures, income, and demographic

[106] (Hauge, Chiang and Jamison 2009; Martin 2021; Napoli and Obar 2014; Rainie and Wellman 2012; Rennhoff and Routon 2016; Tsetsi and Rains 2017).

[107] (National Telecommunications and Information Administration 2002)

[108] (National Telecommunications and Information Administration 2007).

[109](Bureau of Labor Statistics)

characteristics of consumers in the United States" at approximately the household level[110] (the CE uses the term "consumer unit" but to maintain continuity with other government data sources, we will use the term "CE household"). The CE PUMD is an ideal data source for this purpose because CE data are collected from a representative U.S. sample using two separate surveys, the Interview Survey and the Diary Survey. Data are available quarterly and integrated data from the Diary and Interview surveys provide a complete accounting of consumer expenditures over time, including expenditures related to technology and internet purchases. In general CE PUMD data are considered the "gold standard" dataset for estimating U.S. consumer spending on a variety of goods and services. The two surveys that comprise the CE PUMD contain a level of granularity in expenses that is unparalleled in any other publicly available dataset. Moreover, the Bureau of Labor Statistics (BLS) uses this dataset to calculate the Consumer Price Index (CPI).[111] Thus, we rely on the CE PUMD for being the most granular and comprehensive dataset on expenditure in the U.S. that is nationally representative.

LISEP's estimates of technology costs rely on two expenditure file series from the Interview Survey: the MTBI data and the UTA specialty file, as well as the household characteristics file, FMLI. LISEP uses the *finlwt21* variable to generate an annualized weighted spending according to the procedures specified on the CE PUMD site.

MTBI

The MTBI files report general spending across a variety of goods and services, including computer information services. The MTBI file reports monthly expenditures, by household, over one calendar quarter: summing all cost entries for any household in the sample gives the household's spending over the prior three months. After adjusting the values of *finlwt21*, the population weights, that correspond to households whose interview period overlaps two distinct years, these monthly expenditures can be used to estimate annual household spending.

UTA

The UTA files are specialty files reporting information from the "Utilities and Fuels for Owned and Rented Properties" section of the Interview Survey. LISEP uses the variables related to internet and cell phone costs, which are derived from all phone bills received by the CE household.

Stratification

[110] A consumer unit comprises either: (1) all members of a particular household who are related by blood, marriage, adoption, or other legal arrangements; (2) a person living alone or sharing a household with others or living as a roomer in a private home or lodging house or in permanent living quarters in a hotel or motel, but who is financially independent; or (3) two or more persons living together who use their income to make joint expenditure decisions. Financial independence is determined by the three major expense categories: Housing, food, and other living expenses. To be considered financially independent, at least two of the three major expense categories must be provided entirely, or in part, by the respondent. (https://www.bls.gov/cex/csxgloss.htm)

[111] (Consumer Expenditure Survey)

Income Groups. In LISEP's analysis, the respondents of the survey are sorted into six different income groups, using the *fincbtxm* variable, which records the "total amount of family income before taxes'' to develop six different income groups: 1) 0-10th percentile, 2) 10th to 25th, 3) 25th to 50th, 4) 50th to 75th, 5) 75th to 90th, and 6) 90th to 100th. These different groups are used because they provide a better view of the distribution without sacrificing the large sample size that helps to make a robust estimate. These bounds are the "quartiles and selected deciles" used in the Usual Weekly Earnings release by the BLS.[112]

The *fincbtxm* variable is not reported in all years: to estimate budgets from 2001-2003, LISEP uses the *fincbtax* and *respstat* variables to exclude all households which are incomplete income reporters from the analysis (https://www.bls.gov/cex/csxguide.pdf).

Household Types. In our analyses using the CE PUMD data in this section, consumption patterns across consumer units are examined using the *fam_type* variable: households[113] with a single adult and households with couples. This is to simplify assumptions about device ownership and access in families, conservatively assuming, for example, that only adults in a household require cell phones.

Household Sizes. Household size is denoted with *fam_size*, the number of people in the consumer unit, who may or may not be related. Household size is used to improve the quality of income strata, to avoid comparing large households which may have more earners to smaller households which may have fewer.

B. Archived Sources of Historic Technology Prices

The CE PUMD data and analyses are supplemented with historic archival sources that document pricing related to digital connectivity. Two archived sources of technology prices are used: 1) the monthly issues of *PC Magazine*[114] and 2) the *Wayback Machine*, an online Internet archive, to access historical pricing information from websites such as Walmart, BestBuy, and Nokia.[115] *PC Magazine* is a rich source of desktop prices for the period 2001-2005. LISEP found this to be the best, publicly available documentation of desktop prices for the aforementioned period before online shopping became mainstream. The *Wayback Machine* archive provided access to historic webpages of low-cost retailers and technology manufacturers for the period when online shopping became common practice (2006-2020).

Procedures for Generating Annual Price Estimates

Personal Computer Prices

As it is assumed that a computer is replaced every five years, each LISEP household, regardless of the number of adults, was assigned the one-fifth of the average prices of the three essential desktops.

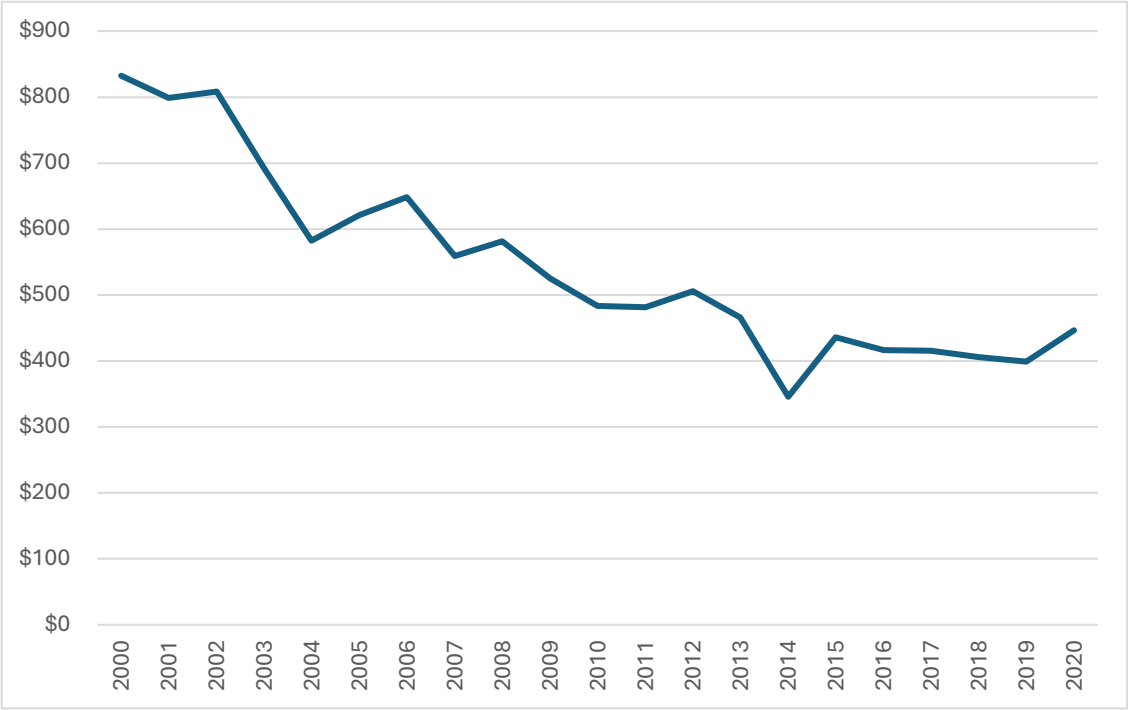
[112] (Bureau of labor Statistics: Current Population Survey)

[113] The CE uses the words consumer unit throughout their documentation. We will use "households" to refer to consumer units to maintain consistent with the rest of this methodology.

[114] (PC Magazine)

[115] https://web.archive.org/

Figure 2: Time Series of the Average Prices of Three Essential Desktops 2000-2020



Source*: Best Selling Computer Brands- 1999/2020*. (n.d.). Statistics & Data. Retrieved October 29, 2021, from https://statisticsanddata.org/best-selling-computer-brands-1996-2020/

For the period 2001-2005, LISEP draws on analysis by Statistics & Data, which identifies the five best-selling computer manufacturers by year. This allowed for a focus on key manufacturers combined with our archival sources of computer prices. Next LISEP reviewed the monthly issues of *PC Magazine* from 2001-2005, where desktop computer prices were identified by manufacturer (e.g., Compaq, Gateway) for desktops marketed as suitable for web surfing or otherwise identified as essential, such as when an advertisement by the manufacturer clearly labeled the desktop for essential home use. LISEP documented the prices of three desktops offered by manufacturers among the most popular five and calculated an average "essential desktop" price for each year.[116]

For the period 2006 onward, LISEP consulted archived websites of manufacturers or large stores that served home technology consumers (e.g., BestBuy, WalMart) to price essential desktops following a two-step process. Again, drawing on the list of the five top manufacturers in a given year (described above), three manufacturers were chosen, and their archived websites were reviewed for the year in question. The archived websites were visited in June of a given year, but if the June page was not archived, we selected a close date in July or August. The choice of three manufacturers depends on the availability of archived pages in a given year. If LISEP was unable to

[116] A list of the desktops' features (processor speed, monitor size and SDRAM) are available in Appendix 1.

access at least three manufacturers' websites, pricing information was reviewed on the websites of large consumer goods suppliers, such as Wal-Mart or BestBuy. Just as in the earlier period, LISEP uses prices associated with desktop computers that are marketed by the manufacturer as essential web-surfing devices that do not have any luxurious features such as a touchscreen and are generally the cheapest choice the manufacturer offered in that year.

For example, in 2014 the top desktop manufacturers were Lenovo, HP, Dell, Acer and Asus, in this order. Of all five websites, only the Dell and HP websites were archived for 2014. On BestBuy's website, LISEP was able to find a Lenovo desktop with analogous "essential" features given the sparse archiving of Lenovo's website for that year. LISEP was not able to find archived pages advertising Acer or Asus desktops on Walmart or BestBuy. Further, the Acer and Asus websites weren't archived, so LISEP did not select them. In sum, ability to document prices for the top five manufacturers in any given year was subject to available historic information.

It is worth noting that starting 2010, LISEP chose to include price estimates for all-in-one computers because in this year, they become widely available at prices comparable to desktops. The all-in-one computer ensures accounting for the cost of a mouse, a keyboard, and adequate speakers.

In all years, the desktop price is recorded before any discount or deal because LISEP does not assume that a median-wage worker has any specific subscriptions or otherwise privileged access to discounted prices. A desktop lifespan of five years is assumed. Research shows that typically 10% or less of users own a desktop that is more than five years old.[117] LISEP thus assumes that the user will need to purchase a new desktop every five years as an essential adequate need. Hence, the cost of a desktop is divided over five years to simulate a replacement rate and smooth the expenditure.

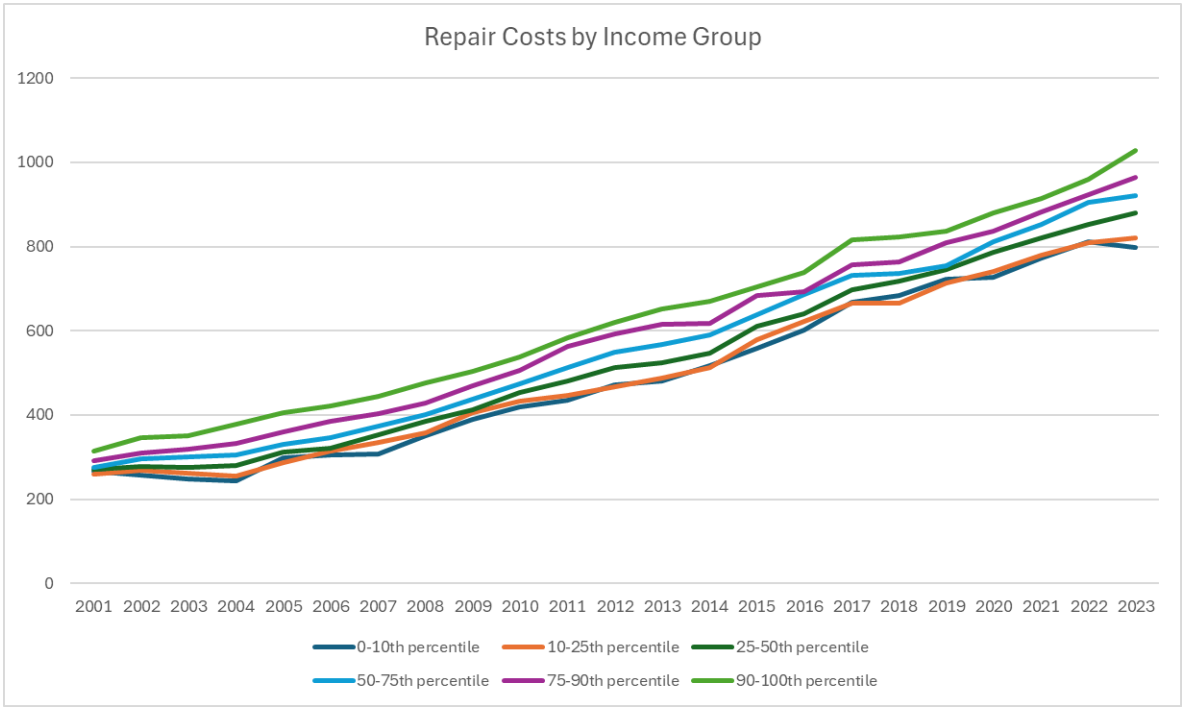
Ancillary Computer Costs

Personal desktop computer users also encounter maintenance costs to keep these devices functional over time, such as the costs of repairs or costs associated with consulting experts to troubleshoot common problems, such as a downloaded virus. Each LISEP household is assigned a computer maintenance budget derived from the average spending of households of any size between the 10th and 25th percentiles of the income distribution (income bounds are determined after stratifying by household size).

Estimates based on real spending in this area are used, drawn from the CE PUMD data, specifically the MTBI survey file. In this file, LISEP uses the Universal Classification Code (UCC) code 690114 for computer information services, distinguishing average spending per year across our six income groups for households of five or less. Figure 3 documents average spending on computer information services by income group from 2001-2023:

[117] (Gordon B. R. 2009)

Figure 3: Computer Information Services Spending by Income Group



Source: Consumer Expenditure Survey. (2024, October). *Consumer Expenditure Surveys Public Use Microdata*

The graph depicts a very tight grouping of spending changes by income group. In fact, the six income groups show average annual spending increases from 2001 to 2023 of 5.1%, 5.4%, 5.5%, 5.6%, 5.6%, and 5.5% in order of lowest income group to highest income group. By this change in spending, LISEP can assume that computer repair costs increase at roughly the same pace per year for each income group and takes a conservative 10^{th} to 25^{th} income range spending for the cost in the index (taking the 0-10^{th} and 50^{th}-75^{th} would have similar effects on inflation).

Internet Prices

To estimate household internet expenses, LISEP divides the time period into two segments: landline-based internet, from 2001-2006, and broadband-based internet, from 2007 onward. The CE PUMD data is used, specifically the UTA detailed data file from the interview survey. The internet budget is assigned according to the number of adults in the house: LISEP households 1-4 are assigned the average internet spending estimated from CE households consisting of only a single adult; LISEP households 5-8 are assigned the average internet spending estimated from CE households consisting of only couples as internet usage for children of 4, 8, and 12 years of age was not determined to be a minimal adequate need.

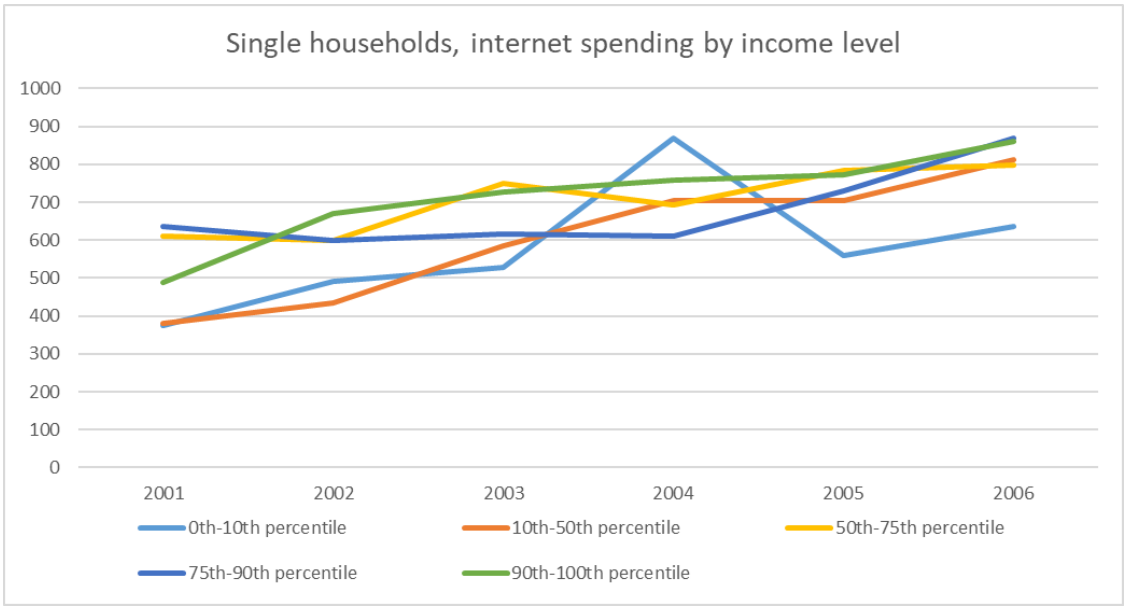
2001-2006

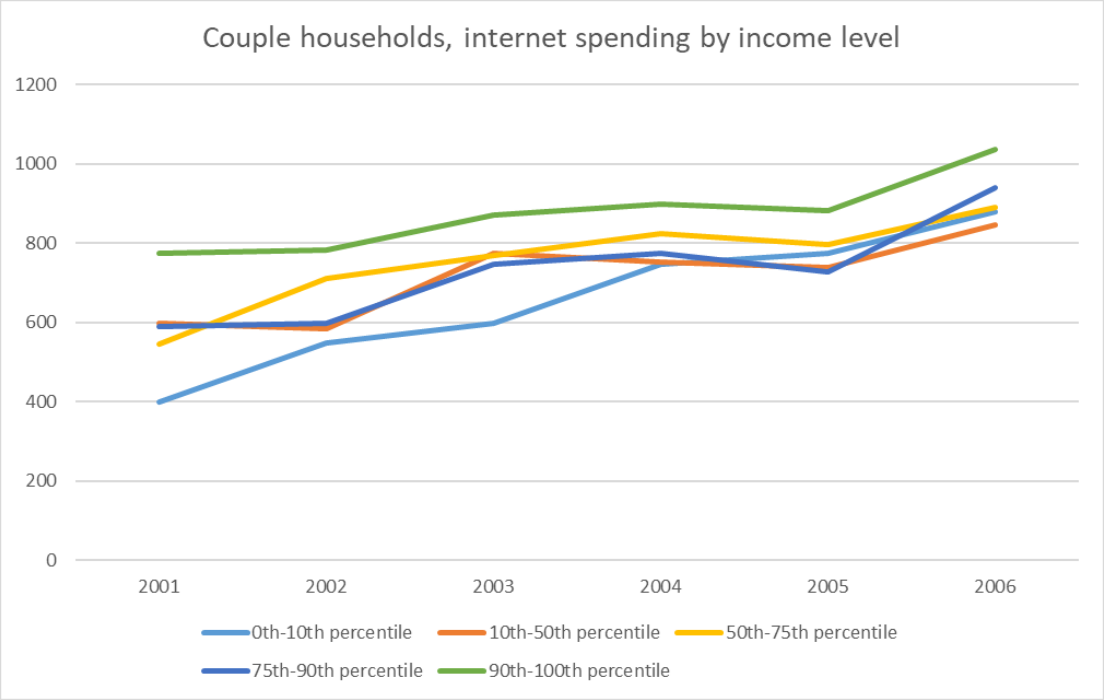
For this period, the unit of observation is the telephone bill by month for each CE household. Respondents are asked to report any telephone bills (not used entirely for business) the

CE household received, along with the month in which the bill was received (based on the context of the questions and the general nature of phone billing practices, we assume that each of these bill covers only one month of telephone service, though that is not stated explicitly). They are asked whether the phone bill covers a variety of expenses and, if so, the amount of the expense. Options for reporting internet services include "internet access or data services" and "DLS or ISDN". LISEP assumes that all expenses in the former category are dial-up subscriptions. Other parts of the survey (e.g., Section 4C) ask questions about additional kinds of internet and data access not already reported; we restrict our interest to internet expenditures appearing with a landline cost and therefore leave these out of our analysis.

For estimating the cost of dial-up, we use *telresdx* and *qadinetx*, total expense for residential service phone calls and total expense for internet access and data services, respectively, for the bill in question. To obtain a budget for landline that is more representative of landline subscriptions that are used partially or fully to support dial-up internet, LISEP restricts the sample to phone bills that report non-missing spending for both residential service and internet access. The CE household's dial-up budget is calculated as the sum of these two components. The bill is assigned to the calendar year in which it was received using the variable *telmo*, the month when the bill was received, with the FMLI variables *qintrvmo* and *qintrvyr*, which give the month and year when the household was interviewed. The middle-income budget is defined as households between the 10th and 50th income percentiles (the sample used to determine the income bounds is the sample of all CE households that received a phone bill in the calendar year, even if they did not spend money on a landline or internet, stratified by household size). While LISEP prefers to track spending for the 10th to 25th income percentile groups for technology costs to better address the minimal adequate needs stipulation, LISEP decided to analyze the 10th to the 50th for this specific expense to maintain a larger sample size. Average annual spending on residential service and internet is estimated as explained on the CE Getting Started Guide.

Figure 4: Internet spending by income level and number of adults (2001-2006)





Source: Consumer Expenditure Survey. (2024, October). *Consumer Expenditure Surveys Public Use Microdata*

2007 onward

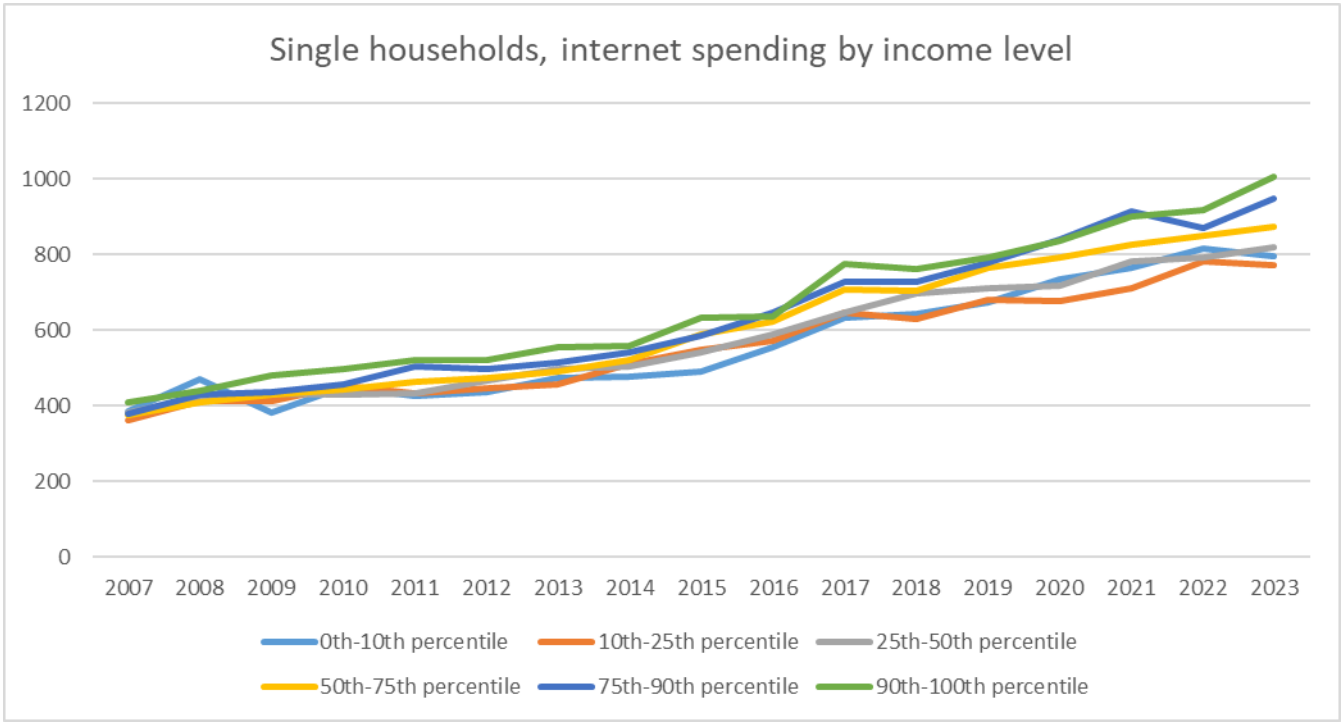
For this period, the observations report total expenditures on telephone and other services during the first, second, or third month of the reference period. Rather than reporting individual monthly bills, respondents are asked to report total expenses and expenses paid for each type of service during each month, along with the usual billing period for that type of service. Although the total billing period can be longer than one quarter, we do not try to reassign expenses by splitting them across periods or quarters. "Internet access" now includes expenses for DSL, broadband, and dial-up together, which LISEP considers acceptable as a reflection of actual adoption practices. Other sections of the survey (e.g., Section 4C) ask about other kinds of internet, e.g, internet purchases away from home; we neglect these. Spending is tracked using *qadine1x*, *qadine2x*, and *qadine3x* (total expense for internet access or data services from 3 month ago, 2 months ago, and one month ago, respectively.

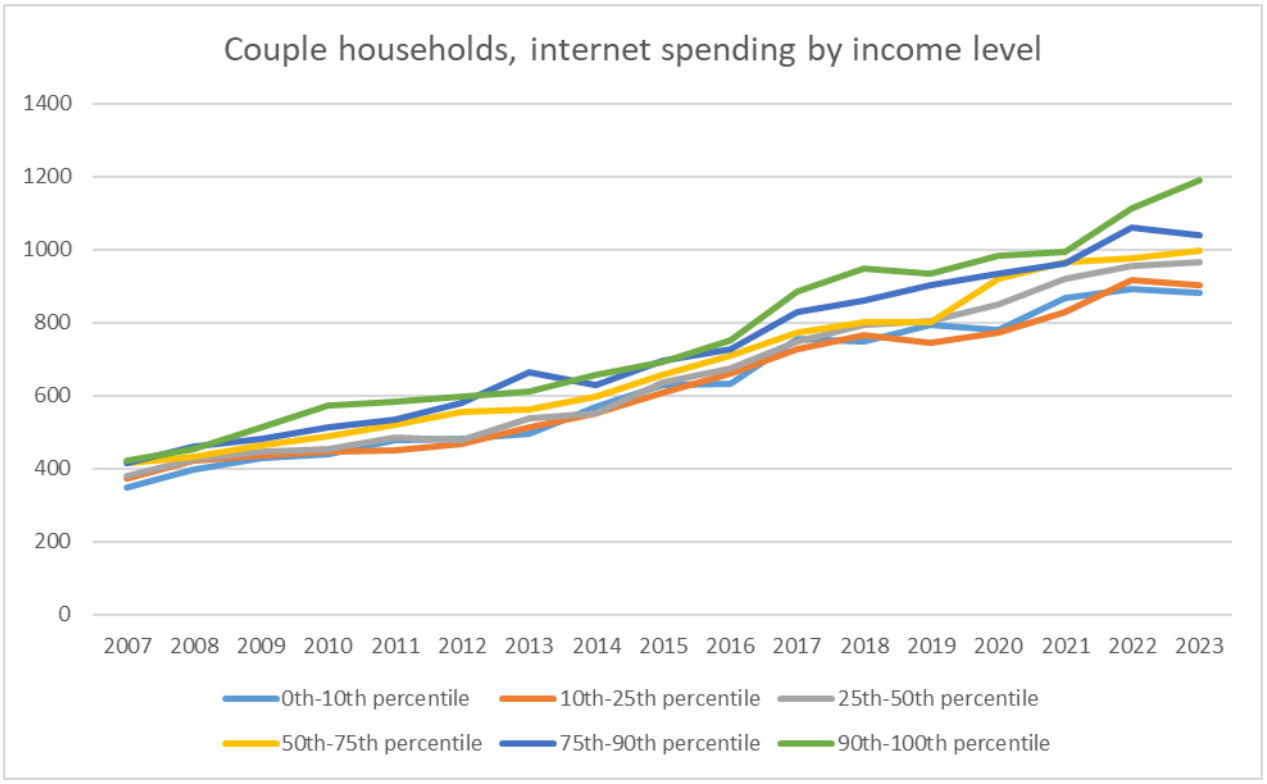
The sample is restricted to payments made during the year in question. When calculating the TLC for 2007, due to the change in the data reporting, the 2007 data only include interviews starting during or after Q2 of 2007.

The income subset is taken in the same way as for the years 2001-2006. Average annual spending on internet costs is estimated as explained on the CE Getting Started Guide.[118]

[118] https://www.bls.gov/cex/pumd-getting-started-guide.htm#section6

Figure 5: Internet spending by income level and number of adults 2007-2023





Source: Consumer Expenditure Survey. (2024, October). *Consumer Expenditure Surveys Public Use Microdata*

Mobile Phone Prices

To generate precise mobile phone pricing estimates, the 2001-onward period of interest is divided into two distinct time periods that require different pricing approaches: 1) 2001-2011, a period where cell phones were bundled with a plan (typically a two-year contract), making it difficult to isolate device versus connection costs, and 2) 2012-onward where users were required to purchase a cellphone and a cellular plan separately. These two periods were determined by analyzing historic product and pricing data on the websites of cellular service providers (e.g., AT&T, Horizon, T-Mobile) and mass market suppliers like Wal-Mart and BestBuy. Hence, for 2012 onward, each adult in the household is assigned one-third of the average depreciated price of the Samsung and Apple models that were released two years prior, assuming that a mobile phone must be replaced every three years.

For the period 2001-2007, an annual price is estimated that bundles the device cost into the overall cellular plan for a given year. Proof is provided from Nokia's archived website pages, indicating one could purchase a free phone with a cellular plan in that year. Nokia was chosen because it was the only important mobile phone manufacturer with a website that was archived in the early 2000's and because Nokia phones consistently ranked among the best-selling phones in the U.S. for this period.[119] For the period 2008-2011, LISEP provides proof that one could purchase a free phone with a cellular plan, but our estimates include price information on at least two different plans to suggest that at least two carriers offered a phone for "free" when purchasing a carrier's plan (see Appendix 1). This is because cell phone carriers only started advertising their plans with free phones on their websites in 2008. LISEP reasons that it is possible to purchase a free phone with a plan if at least two websites advertise such a bundle. In addition, LISEP pays attention to the availability of choice or carrier to ensure that a hypothetical user can purchase a plan that can operate in their area of residence.

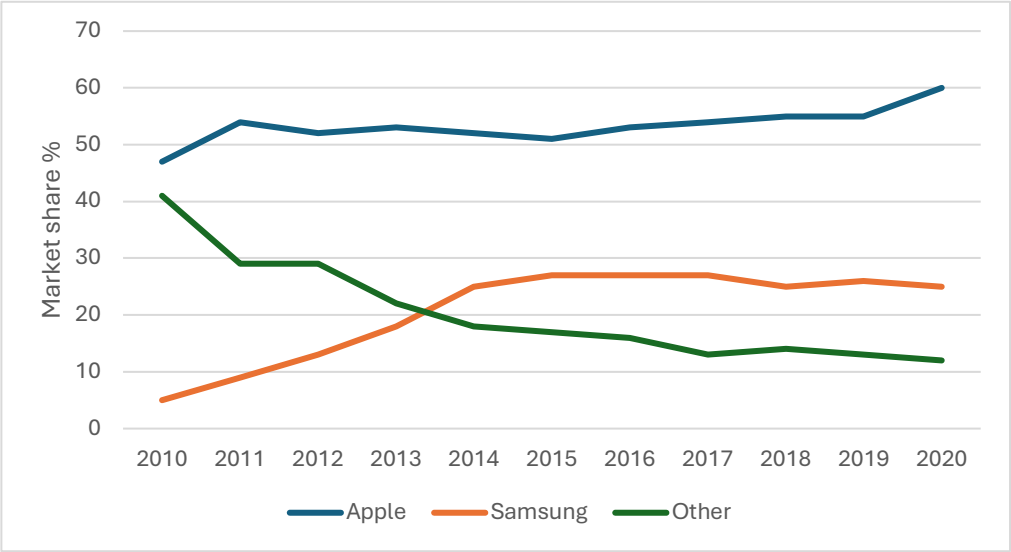
For the period 2013-2020, the cost of a mobile phone is estimated separately from the cost of a mobile phone plan. Evidence suggests that Apple and Samsung captured a clear majority of the cellphone market ranging from about 71% of U.S. sales in 2013 to 85% of sales in 2020 (See Figure 6). Given the dominance of these two manufacturers in the LISEP period of interest, annual prices for Apple and Samsung Galaxy S phones are averaged across these two prices to generate a single annual estimate. The Galaxy S Series of Samsung phones was chosen because it was ranked among the top-selling Samsung smartphones for each year in the period 2013-2020.[120] In each year, a price is estimated as follows: 1) take the phone's market price upon release, 2) depreciate the price by a two-year model-specific depreciation rate recorded by Decluttr, a tech buyback site and refurbished phone seller,[121] and 3) average the iPhone and Samsung depreciated prices to create a single annual estimated cell phone cost (see figure 7 for how the Samsung and iPhone depreciated prices compare to the composite average annually).

[119] List of best-selling mobile phones

[120] List of best-selling mobile phones

[121] (Smith C. 2017)

Figure 6: U.S. Mobile Phone Market Share for Apple, Samsung, and Others, 2010 – 2020)



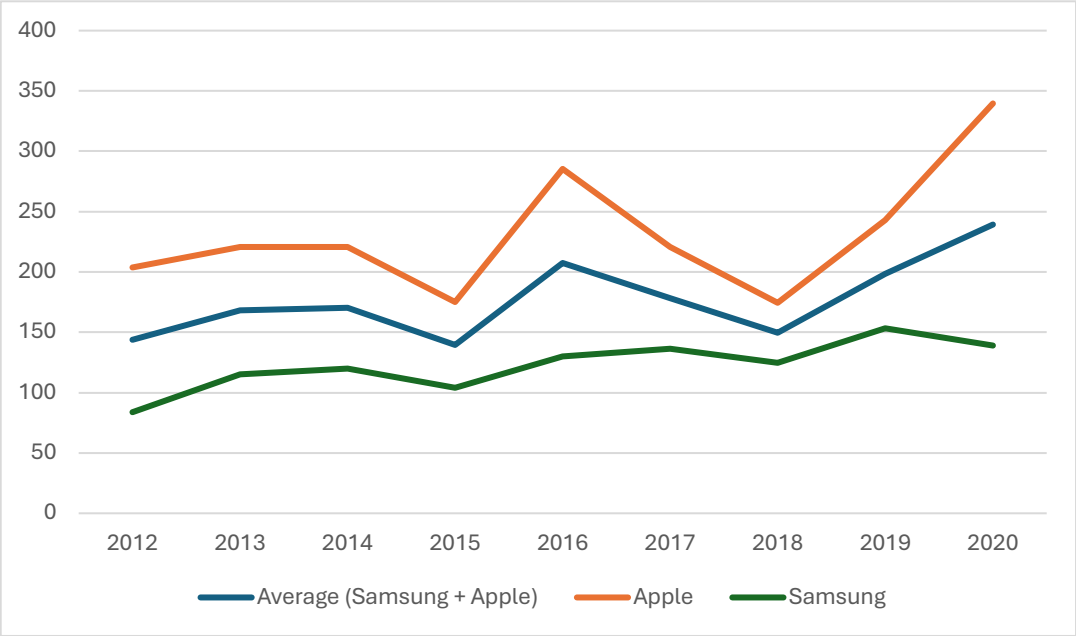
Source: Mobile Vendor Market Share United States Of America Mar 2010 - Sept 2021. (2021). Statcounter Global Stats. Retrieved October 29, 2021, from https://gs.statcounter.com/vendor-market-share/mobile/united-states-of-america/#monthly-201003-20219

A two-year depreciation rate was chosen because waiting two years to purchase a phone significantly reduces its price, usability notwithstanding. However, available software updates become increasingly rare. A 2018 report from the Federal Trade Commission showed that software updates after five years are rare.[122] In addition, there is some evidence from consumer guides recommending replacement of phones when software updates are no longer available.[123] Since LISEP assumes the median-wage worker purchases a mobile phone two years after its release, this results in three years of essential use.

In some cases, a two-year depreciation rate for a specific phone of interest cannot be specified each year because this information is not available. In those cases, the average iPhone or Samsung two-year depreciation rate is used. For example, LISEP could not find the two-year depreciation rate for iPhone 4 (available in 2010), so this phone was depreciated by a rate of 66%, which is the average two-year depreciation of all iPhones released until 2021. Similarly, a two-year depreciation rate for the Samsung Galaxy S2 (available in 2011) wasn't available, so the average Samsung Galaxy S Series two-year depreciation rate of 79% was used.

[122] (Mobile Security Updates: Understanding the Issues)
[123] (Chen B.X. 2021)

Figure 7: U.S. Mobile Phone 2-Year Depreciated Prices (Apple, Samsung, & Average)



Sources: *iPhone prices from the original to iPhone X*. (2017, September 12). Venture Beat. Retrieved October 29, 2021, from https://venturebeat.com/2017/09/12/iphone-prices-from-the-to-iphone-x/

Brown, C. S. (2021, April 10). *How the price of Samsung Galaxy S phones changed over the years*. Android Authority. Retrieved October 29, 2021, from https://www.androidauthority.com/samsung-galaxy-s-prices-1192063/

Cellular Service

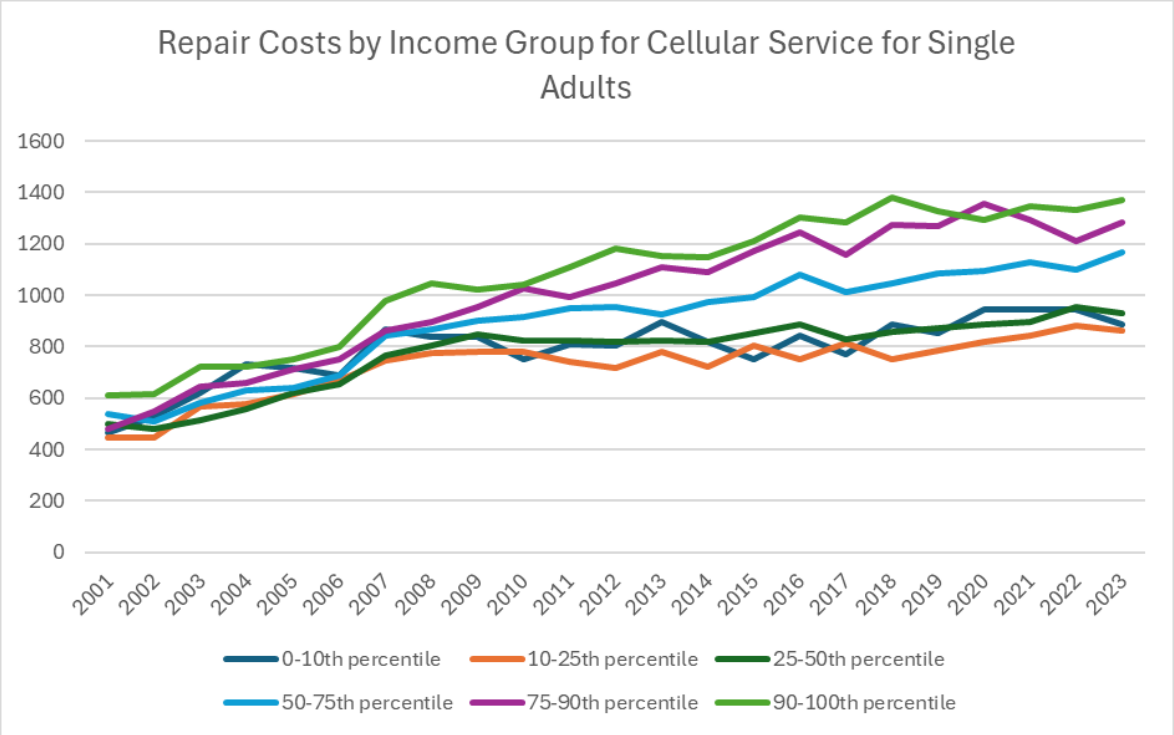
LISEP used CE PUMD data, specifically the UTA detailed data file from the interview survey, to estimate the cost of cellular service from 2001-onward (note that cellular service is the cost of the service, not of the hardware). The procedure for estimating the cost of cell service is analogous to estimating the cost of internet, except that the relevant variables are "Total expense for mobile/cellular service (adjusted for business)": *telcellx* for the first period and *telcel1x*, *telcel2x*, and *telcel3x* for the second, and that the sample for drawing the average was restricted by whether the household's spending included cell service, rather than dial-up costs.

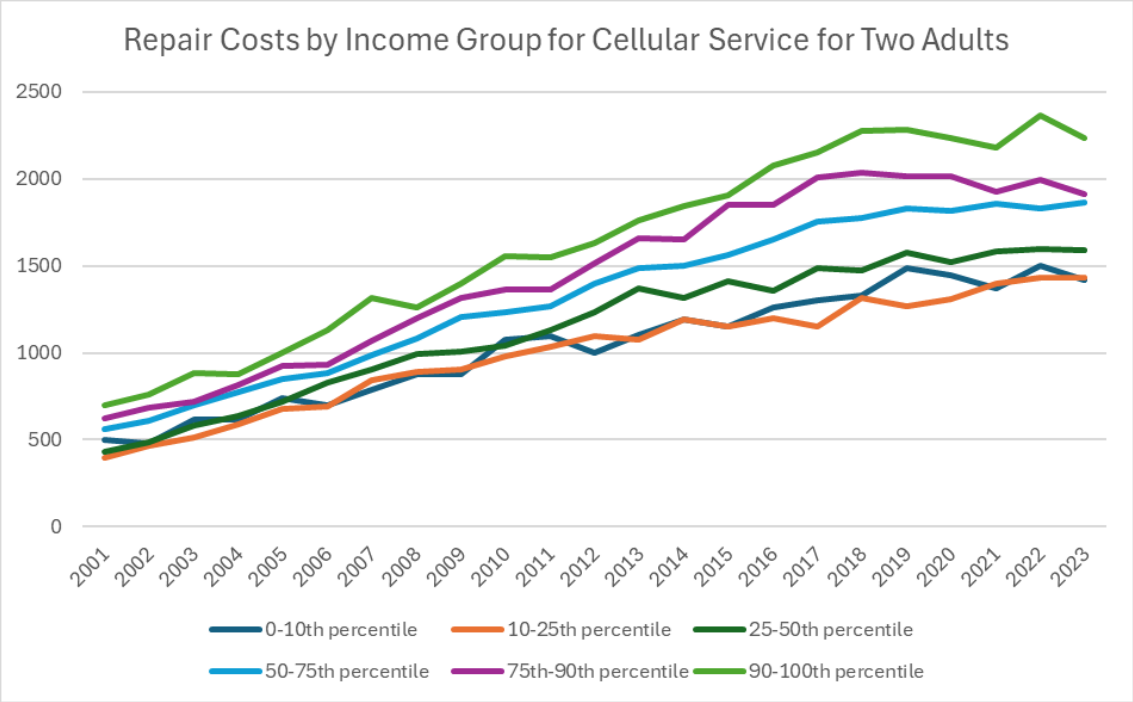
In the years prior to 2012, the cost of the cellular device was bundled with the cell phone service. LISEP generated the average spending within income groups by year among those that purchased cellular service (see Figure 8). Lastly, because it is assumed that just household adults use cell phones, different estimates are created for households without children with one versus two adults, with reasoning justified in the data section.

To calculate cell phone prices, only households that are single persons or couples are used. We allocate the single person's cost to that of the family that has a single adult, and the couple's cost to two-parent families. LISEP does not include any families with children in this analysis because cell phones for children aren't considered to be a minimal adequate need. There is no way

to distinguish spending within the reporting household, and so just the households that don't have children are evaluated to be confident that the cell phone spending was not allocated to the children.

Figure 8: Cellular service spending by income group for single and couple households





Source: Consumer Expenditure Survey. (2024, October). *Consumer Expenditure Surveys Public Use Microdata*

The percentage growth from 2001 to 2023 for households headed by a single adult in the 10th-75th percentile income groups for cell phone service is similar (see Figure 8). The average yearly increase in spending for the 10th to 25th, 25th to 50th, and 50th to 75th percentiles is 3% 2.9% and 3.6% respectively. The same story holds for two adult households without children (see Figure 8) where the average percentage growth from 2001 to 2023 is 6% for the 10th to 25th group, 6.1% for the 25th to 50th group and 5.6% for the 50th to 75th group. These consistent spending patterns suggest that these income groups are facing very similar cost increases. We take the spending increases for the 10th to 25th percentiles to take a "minimal" approach to conservatively allocate costs to the relevant household budgets (single adult families).

Appendices

Appendix 1

Table 1: Desktop features and composite prices

Year	First Desktop Price	Features	Second Desktop Price	Features	Third Desktop Price	Features	Composite Price
2000	$699	Processor 500MHz + 15" monitor + 32 SDRAM	$899	Processor 500MHz + 15" monitor	$899	Processor 667MHz + 15" monitor + 32 SDRAM	**$832**
2001	$699	Processor 933 MHz + 15" monitor + 64 SDRAM	$899	Processor 766MHz + 15" monitor + 64 SDRAM	$799	Gateway essential PC	**$799**
2002	$678	Processor 733 MHz + 15" monitor + 64 SDRAM	$899	Processor 1.7 GHz + 17" monitor + 128 SDRAM	$849	Processor 1.8 GHz + Samsung monitor	**$809**
2003	$759	Processor 2GHZ + 17" monitor + 256 SDRAM	$599	Processor 2.4 GHz + Samsung monitor + 256 SDRAM	$719	Processor 2.4 GHz + Samsung monitor + 128 SDRAM	**$692**
2004	$599	Processor 2.66GHz + 17" monitor + 128 SDRAM	$529	Processor 2.8 GHz + Samsung monitor + 128 SDRAM	$618	Processor 2.6 GHz + 17" monitor + 128MGB SDRAM	**$582**
2005	$400	Processor 2.4GHz + Samsung monitor + 256 SDRAM	$696	Processor 2 GHz, 15" monitor + 256 SDRAM	$768	Processor 2.8 GHz + 15" monitor + 256 SDRAM	**$621**

2006	$684	Processor 2.2GHz + 17" LCD monitor + 512 SDRAM	$729	Processor 2.53 GHz + 17" LCD monitor + 512 SDRAM	$533	Processor 2.8 GHz + 17" LCD monitor from Walmart + 256 SDRAM	**$649**
2007	$510	Processor 3.46GHz + 17" LCD monitor	$528	Processor AMD Sempron 3400+ + 17"LCD Dell monitor + 512 SDRAM	$638	Processor Pentium D + 19" LCD MONITOR + 1024 SDRAM	**$559**
2008	$598	Processor 2.2 GHz + monitor 19" LCD + 2 GB SDRAM	$548	Processor 2 GHz + 19" LCD monito + 1 GB SDRAM	$599	Intel dual core processor 1.8 GHz + 19" LCD monitor + 1 GB SDRAM	**$582**
2009	$598	X2 4850e+ Dual-Core Processor + 20" LCD monitor + 3 GB of SDRAM	$479	Processor dual core E1400 + 20" LCD monitor	$498	Processor 2.2 GHz + 19" LCD monitor + 2GB SDRAM	**$525**
2010	$498	Processor 2.2 GHz + 18.5" LCD monitor + 3GB of SDRAM	$448	Processor 1.6 GHz + 19" LCD monitor + 3GB SDRAM	$503	Processor 1.6GHz + 15.6" LCD monitor + 2GB of SDRAM	**$483**
2011	$498	Processor 3.5GHz + 20" LCD monitor + 4GB SDRAM	$498	Processor 2.2 GHz + 21.5" LCD	$448	Processor 2.2 GHz + 18.8" LCD	**$481**

				monitor + 3GB of SDRAM		monitor +3GB SDRAM	
2012	$479	Processor 1.7 GHz + 20" monitor + 2GB SDRAM	$529	Processor 2.2 GHz + 20" monitor + 4GB SDRAM	$510	Processor 1.8 GHz + 18.5" LCD monitor + 2GB SDRAM	**$506**
2013	$499	Processor 2.5GHz + 20" monitor + 4GB SDRAM	$449	Processor 1.4GHz + 20" monitor + 2GB SDRAM	$449	Processor 2.2ghZ + 20" monitor + 2GB of SDRAM	**$466**
2014	$349	Processor intel Celeron + 19.5" monitor + 4GB of SDRAM	$339	Processor 1.4GHz + 18.5" monitor + 4GB SDRAM	$349	Processor quad core + 20" monitor + 4GB SDRAM	**$346**
2015	$399	Processor 2.41GHz + 19.45" monitor + 4GB SDRAM	$479	Processor 2.58GGHz + 19.5" monitor + 2GB of SDRAM	$429	Processor 2.9GHz + 23" monitor + 8GB SDRAM	**$436**
2016	$449	Processor 2.9GHz + 20" monitor + 4GB SDRAM	$452	Processor 1.4GHz + 21.5" monitor + 4GB SDRAM	$349	Processor 2.8GHz + 19.5" monitor + 4GB of SDRAM	**$417**
2017	$499	Processor 2.4GHz + 21.5" monitor + 4GB SDRAM	$349	Processor 1.6GHz + 19.5" monitor + 8 GB SDRAM	$399	Processor 2.64GHz + 19.5" monitor + 4GB SDRAM	**$416**

2018	$379	Processor 1.8 GHz +19.5" monitor +4GB SDRAM	$439	Processor 1.4GHz + 21.5" monitor + 4GB SDRAM	$399	Processor 2GHz + 21.5" monitor + 4GB SDRAM	**$406**
2019	$379	Processor 2.7GHz + 19.5" monitor + 4GB SDRAM	$379	Processor 2.3 GHz + 19.5" monitor + 4GB SDRAM	$438	Processor 2GHz + 22" monitor + 4GB SDRAM	**$399**
2020	$541	Processor 3.7GHz + 21.5" monitor + 4GB SDRAM	$399	Processor 2.3 GHz + 19.5" monitor + 4GB SDRAM	$400	Processor 3GHz + 19.5" monitor + 4GB SDRAM	**$447**

Appendix 2

Table 2: Evidence for availability of free cellphones with a plan

Year	Website visited	URL
2001	Nokia	https://web.archive.org/web/20010615132849/http://www.nokiausa.com/firsttimebuyers/1,2506,;;index,FF.html#howmuch
2002		
2003	All business	https://www.allbusiness.com/cell-phone-basics-1124-1.html
2004	Nokia	https://web.archive.org/web/20040614184050/http://www.nokiausa.com/phones/

2005	Nokia	https://web.archive.org/web/20050624013656/http://www.nokiausa.com/phones/compareandbuy/1,1816,hm:link,00.html
2006	Nokia	https://web.archive.org/web/20060703040716/http://www.nokiausa.com/phones/comparephones
2007	Nokia	https://web.archive.org/web/20070202130024/http://www.nokiausa.com/phones/comparephones
2008	AT&T and T-Mobile	• https://web.archive.org/web/20080615011510/http://www.wireless.att.com/cell-phone-service/cell-phone-sales/promotion/free-phones.jsp?source=IC4425L3100u9000 https://web.archive.org/web/20081012072217mp_/http://www.t-mobile.com/shop/phones/default.aspx?all=true
2009	AT&T and T-Mobile	• https://web.archive.org/web/20090706234012/http://www.wireless.att.com/cell-phone-service/cell-phones/free-phones.jsp • https://web.archive.org/web/20090228121303mp_/http://www.t-mobile.com/shop/phones/default.aspx?all=true
2010	AT&T and T-Mobile	• https://web.archive.org/web/20100519230557/http://www.wireless.att.com/cell-phone-service/cell-phone-sales/promotion/free-phones.jsp • https://web.archive.org/web/20100722094207/http://www.t-mobile.com/shop/phones/?priceRange=0-0&WT.z_unav=mst_shop_phones_free
2011	AT&T, T-Mobile, and Verizon	• https://web.archive.org/web/20110620074417/http://www.wireless.att.com/cell-phone-service/cell-phones/free-phones.jsp?wtSlotClick=1-0060AM-0-2 • https://web.archive.org/web/20110626005501/http://www.t-mobile.com/shop/phones/?pricerange=0-0

		• https://web.archive.org/web/20110603223730/http://www.verizonwireless.com/b2c/promo/splash/ewp?v=16
2012	T-Mobile, AT&T, and Verizon	• https://web.archive.org/web/20120613231729/http://www.t-mobile.com/shop/phones/?pricerange=0-0 • https://web.archive.org/web/20120601172548/http://www.wireless.att.com/cell-phone-service/cell-phones/free-phones.jsp?wtSlotClick=1-006PV2-0-2 • https://web.archive.org/web/20121018010506/http://www.verizonwireless.com/b2c/store/controller?&item=phoneFirst&action=viewPhoneOverviewByDevice&linkId=15

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Miscellaneous Items

Aim

The aim for the miscellaneous items section is to fill in the gaps of necessities that are not covered by the other categories. These include apparel, personal care, necessary services, and household items not included in rent. The minimal adequate need of personal care and apparel items is defined to be such that they do not impede the ability for people to interact in society and live a healthy life.

To justify the inclusion of these goods into the budgetary needs of the household, personal care and apparel are addressed together, and necessary household items separately. For hygiene and apparel, studies show that there is a strong correlation between personal hygiene and social.[124,125] These can be in day-to-day social interactions, but also in the labor force and in hiring. Mack and Rainey (1990) show that it is practically impossible for employers to ignore deficient

[124] Zaka Ullah, P., Batool, Z., & Shabbir, M. (2020)
[125] Mack, D., & Rainey, D. (1990).

grooming in candidates seeking employment. Thus, expenditures on personal care and apparel are a necessity.

The other large group of miscellaneous items are those spent on household items. For health reasons, it is imperative to buy cleaning supplies and other household items that help to maintain the living space clean.126 Further, the UN defines that adequate housing must provide habitability, stating that "housing is not adequate if it does not guarantee physical safety or provide adequate space, as well as protection against the cold, damp, heat, rain, wind, other threats to health and structural hazards."127 Because of this, furniture, window and floor coverings, and other household items are a necessity for habitability in order to meet the need of minimal adequate housing established in section A.

Susserman and Alter (2012) argue that consumers fail to accurately predict the cost of these non-recurring expenses (overestimating the cost of some and underestimating the cost of others). This suggests that it is more accurate to consider actual spending habits of individuals rather than hypothesizing about potential costs and replacement rates. Thus, LISEP's best metric of what is minimally adequate is most likely the actual spending habits of the middle part of the income distribution. Including only the middle part of the distribution is LISEP's best attempt at excluding those who do not have access to the necessary miscellaneous goods and those who superfluously spend on these goods. Under this assumption, two groups are thus excluded from consideration. One group is characterized by the inability to meet this standard for any reason. This group may not have access to the necessary apparel, personal care, or household cleaning products because of monetary restrictions, or individuals may not maintain social standards because of personal preferences. Second, we exclude those who spend superfluously on these miscellaneous items. This might include spending on expensive brands, purchasing too many items too frequently, or frivolous use of goods.

High Level Methodology

Each of the LISEP households is allocated a necessary miscellaneous budget equal to the average annual expenditures made by households of the same size between the 10th and 75th household income percentiles on apparel, personal care and necessary services, and household items.

Data on spending behavior on goods, disaggregated by household income and size, is obtained from the Public Use Microdata (PUMD) on the Consumer Expenditure (CE) survey from the Bureau of Labor Statistics.[128] Estimations from the PUMD data from the CE survey satisfy the minimal adequate need requirement of not impeding a person's ability to interact and be hygienic in society.

There is an important distinction that LISEP makes in this section. Instead of using the family types to sort the households, the number of people in the household is relied upon. We reason that the expenditures in personal care, apparel, and housekeeping supplies are largely similar for both children and adults. Further, the sample size of the CE PUMD data used does not

[126] (University of Michigan Health, 2020)

[127] (Office of the United Nations High Commissioner for Human Rights & UN Habitat, 2009)

[128] (Bureau of Labor Statistics)

allow for precise estimates for less common family types such as single parents with three children. For example, the same shampoo that can be used for a 4-year-old in a single parent household can also be used by an adult in a married couple household. Although children's clothes are generally cheaper, this is potentially evened out by the fact that children's clothes may be bought more often. LISEP takes the general lower and middle class of each household size (defined by household income between the 10th and the 75th percentile) and measures their actual expenditures on these goods throughout time, adjusting for regional differences.

Data

LISEP uses data from the Public Use Microdata on the Consumer Expenditure surveys portion of the Bureau of Labor Statistics site[129] (the BLS uses this data to construct overall consumer expenditures and the CPI bundle). Four types of files were selected: MTBI and FMLI from the Interview survey and EXPD and FMLD from the Diary survey. Due to the large scope of the miscellaneous budget, spending estimates from both were required.

A CE household is assigned a different identifier variable NEWID each quarter it is in the survey (the CE uses the term "consumer unit" but to maintain continuity with other government data sources, LISEP will use the term "CE household".) The good or service purchased during the expenditure in question can be identified by the universal classification code (UCC). In many cases, the same good or service can be tracked in both surveys; when this happens, we follow the CE's guidance on which survey to use as our data source (the sample is different for each survey, which means that matching the two surveys by the consumer unit is impossible).

Specific Methodology

Selection & Time-Harmonization of Universal Classification Codes (UCCs)

The relevant basket of goods and services is determined by selecting relevant UCCs from the 2022 UCC-ELI concordance for spending in apparel, household items, and personal care and necessary services (see Table 1). Then, those codes are linked to their respective codes in past releases. Finally, LISEP determines whether the UCC in question should be sourced from the Interview or the Diary Survey in that year – LISEP follows the CE convention in making this choice. LISEP constructed a UCC directory for this purpose. Although most UCCs remain consistent over time, some codes change, or are added or removed, when the CE adds new items or groups similar ones under one UCC, so LISEP assigns UCCs to each relevant cost category for each quarterly expenditure file.

The basis of the directory is all the UCC codes that appear in the MTBI and EXPD quarterly files, identified uniquely by the year and quarter in which the survey recording the UCC in question was conducted, the reference year when the expense took place, and by whether they appeared in the Interview (MTBI) or the Diary (EXPD) data. The relevant UCCs are classified as part of the apparel, personal care, or household items baskets. Then, the directory is ready to be merged with the MTBI or EXPD files to compute average spending on these expenses.

Table 1: Universal Classification Codes (UCC) for miscellaneous expenses in 2022

[129] (Bureau of Labor Statistics)

UCC	Description	Category	ELI
360110	Mens Suits	Apparel	AA011
360120	Mens Sportcoats/Tailored Jackets	Apparel	AA012
360210	Mens Coats And Jackets	Apparel	AA013
360311	Mens Underwear	Apparel	AA021
360312	Mens Hosiery	Apparel	AA021
360320	Mens Nightwear/Loungewear	Apparel	AA021
360330	Mens Accessories	Apparel	AA022
360360	Mens Swimwear	Apparel	AA021
360420	Mens Sweaters/Shirts/Vests	Apparel	AA033
360513	Mens Pants And Shorts	Apparel	AA041
360901	Mens Uniforms	Apparel	AA090
360902	Mens Costumes	Apparel	AA090
370110	Boys Coats And Jackets	Apparel	AB011
370125	Boys Sweaters/Shirts/Vests	Apparel	AB012
370211	Boys Underwear	Apparel	AB013
370212	Boys Nightwear	Apparel	AB013
370213	Boys Hosiery	Apparel	AB013
370220	Boys Accessories	Apparel	AB013
370311	Boys Suits, Sportcoats,Vests	Apparel	AB014
370314	Boys Pants And Shorts	Apparel	AB014
370360	Boys Swimwear	Apparel	AB013
370902	Boys Costumes	Apparel	AB090
370903	Boys Uniforms	Apparel	AB090
380110	Womens Coats And Jackets	Apparel	AC011
380210	Womens Dresses	Apparel	AC021
380311	Womens Sportcoats, Tail. Jkts	Apparel	AC031
380315	Womens Sweaters/Shirts/Tops	Apparel	AC031
380320	Womens Skirts	Apparel	AC032
380333	Womens Pants And Shorts	Apparel	AC032
380360	Womens Swimwear	Apparel	AC041
380410	Womens Sleepwear	Apparel	AC041
380420	Womens Undergarments	Apparel	AC041
380430	Womens Hosiery	Apparel	AC042
380510	Womens Suits	Apparel	AC033
380901	Womens Accessories	Apparel	AC042
380902	Womens Uniforms	Apparel	AC090
380903	Womens Costumes	Apparel	AC090
390110	Girls Coats And Jackets	Apparel	AD011
390120	Girls Dresses, Suits	Apparel	AD012

390210	**Girls Shirts/Blouses/Sweaters**	**Apparel**	**AD013**
390223	**Girls Skirts, Pants, And Shorts**	**Apparel**	**AD014**
390310	**Girls Underwear And Sleepwear**	**Apparel**	**AD016**
390321	**Girls Hosiery**	**Apparel**	**AD016**
390322	**Girls Accessories**	**Apparel**	**AD016**
390360	**Girls Swimwear**	**Apparel**	**AD016**
390901	**Girls Uniforms**	**Apparel**	**AD090**
390902	**Girls Costumes**	**Apparel**	**AD090**
400110	**Mens Footwear**	**Apparel**	**AE011**
400210	**Boys Footwear**	**Apparel**	**AE021**
400220	**Girls Footwear**	**Apparel**	**AE022**
400310	**Womens Footwear**	**Apparel**	**AE031**
410110	**Infant Coat/Jacket/Snowsuit**	**Apparel**	**AF011**
410120	**Infant Dresses/Outerwear**	**Apparel**	**AF011**
410130	**Infant Undergarments**	**Apparel**	**AF012**
410140	**Infant Nightwear, Loungewear**	**Apparel**	**AF011**
410901	**Infants Accessories**	**Apparel**	**AF011**
430110	**Watches**	**Apparel**	**AG011**
430120	**Jewelry**	**Apparel**	**AG021**
230112	**Painting/Papering Labor/Mat Ownd**	**Household Items**	**HP043**
230117	**Repl Dishwash/Disp/Hood Rntr**	**Household Items**	**HP043**
230118	**Repl Dishwash/Disp/Hood Ownd**	**Household Items**	**HP043**
230141	**Repair-Displ/Dwshr/Rang Hd Rntr**	**Household Items**	**HP041**
230142	**Repair-Displ/Dwshr/Rang Hd Ownd**	**Household Items**	**HP041**
230150	**Rep/Maint Labor/Mat Rntr**	**Household Items**	**HP043**
240111	**Paint/Wallpaper And Supp Rntr**	**Household Items**	**HM011**
240112	**Paint/Wallpaper And Supp Ownd**	**Household Items**	**HM011**
240121	**Equip For Paint/Wpaper Rntr**	**Household Items**	**HM011**
240122	**Equip For Paint/Wpaper Ownd**	**Household Items**	**HM011**
240211	**Mat For Panl/Roof/Siding,Etc Rntr**	**Household Items**	**HM090**
240212	**Mat For Panel/Siding, Etc Ownd**	**Household Items**	**HM090**
240221	**Mat For Patio,Masonry,Etc Rntr**	**Household Items**	**HM090**
240222	**Mat For Patio,Masonry,Etc Ownd**	**Household Items**	**HM090**
240311	**Plumbing Supp/Equip Rntr**	**Household Items**	**HM090**

240312	**Plumbing Supp/Equip Ownd**	**Household Items**	**HM090**
240321	**Elec Supp, Heat/Cool Equip Rntr**	**Household Items**	**HM090**
240322	**Elec Supp,Heat/Cool Equip Ownd**	**Household Items**	**HM090**
270901	**Septic Tank Cleaning Rntr**	**Household Items**	**HP090**
270902	**Septic Tank Cleaning Ownd**	**Household Items**	**HP090**
280110	**Bathroom Linens**	**Household Items**	**HH031**
280120	**Bedroom Linens**	**Household Items**	**HH032**
280140	**Kitchen/Dining Room/Othr Linens**	**Household Items**	**HH033**
280210	**Curtains And Drapes**	**Household Items**	**HH021**
280220	**Slipcovers/Decorative Pillows**	**Household Items**	**HJ021**
290110	**Mattress And Springs**	**Household Items**	**HJ011**
290120	**Other Bedroom Furniture**	**Household Items**	**HJ012**
290210	**Sofas**	**Household Items**	**HJ021**
290310	**Living Room Chairs**	**Household Items**	**HJ022**
290320	**Living Room Tables**	**Household Items**	**HJ023**
290410	**Kitchen/Dining Room Furniture**	**Household Items**	**HJ024**
290420	**Infants Furniture**	**Household Items**	**HJ031**
290430	**Outdoor Furniture**	**Household Items**	**HJ032**
290440	**Wall Units, Cabinets, Occas Furn**	**Household Items**	**HJ033**
300111	**Purch/Inst Refrig/Freezer Rntr**	**Household Items**	**HK011**
300112	**Purch/Inst Refrig/Freezer Ownd**	**Household Items**	**HK011**
300216	**Purch/Inst Clths Washr/Dryr Rntr**	**Household Items**	**HK012**
300217	**Purch/Inst Clths Washr/Dryr Ownd**	**Household Items**	**HK012**
300311	**Stoves, Ovens Rntr**	**Household Items**	**HK013**
300312	**Stoves, Ovens Ownd**	**Household Items**	**HK013**
300321	**Microwave Ovens Rntr**	**Household Items**	**HK014**
300322	**Microwave Ovens Ownd**	**Household Items**	**HK014**
300331	**Purch/Inst Port Dishwasher Rntr**	**Household Items**	**HK090**
300332	**Purch/Inst Port Dishwasher Ownd**	**Household Items**	**HK090**
300411	**Purch/Inst Window A/C Rntr**	**Household Items**	**HK023**
300412	**Purch/Inst Window A/C Ownd**	**Household Items**	**HK023**
320111	**Floor Coverings (Non-Perm.)**	**Household Items**	**HH011**
320120	**Window Coverings**	**Household Items**	**HH022**
320140	**Laundry And Cleaning Equip.**	**Household Items**	**HN012**

320150	**Barbeque Grills And Outdoor Equip**	**Household Items**	**HM021**
320221	**Lamps/Light Fixtures/Ceiling Fans**	**Household Items**	**HL011**
320233	**Clocks And Other Hh Decor Items**	**Household Items**	**HL012**
320330	**Flatware**	**Household Items**	**HL032**
320345	**Dishes/Cups/Glasses/Serving Piecs**	**Household Items**	**HL031**
320370	**Nonelectric Cookware**	**Household Items**	**HL041**
320380	**Tableware/Non-Elec. Kitware**	**Household Items**	**HL042**
320410	**Lawn And Garden Equipment**	**Household Items**	**HM021**
320420	**Power Tools**	**Household Items**	**HM012**
320430	**Other Hardware**	**Household Items**	**HM013**
320511	**Electric Floor Cleaning Equip**	**Household Items**	**HK021**
320521	**Small Electric Kitchen Appliances**	**Household Items**	**HK022**
320522	**Portable Heating/Cooling Equip**	**Household Items**	**HK023**
320611	**Constrct Mat-Rntr/Udr Cn/Sec Hm**	**Household Items**	**HM013**
320612	**Construction Mat Ownd**	**Household Items**	**HM013**
320624	**Flooring Inst/Rep/Repl Rntr**	**Household Items**	**HH011**
320625	**Flooring Inst/Rep/Repl Ownd**	**Household Items**	**HH011**
320631	**Lndscping Mat-Rntr/Udr Cn/Sc Hm**	**Household Items**	**HM090**
320901	**Office Furniture Home Use**	**Household Items**	**HM090**
320902	**Hand Tools**	**Household Items**	**HM014**
320903	**Indoor Plants, Fresh Flowers**	**Household Items**	**HL021**
320904	**Closet And Storage Items**	**Household Items**	**HM090**
320905	**Misc. Household Equip/Parts**	**Household Items**	**HM090**
330110	**Soaps And Detergents**	**Household Items**	**HN011**
330210	**Other Laundry /Cleaning Prods.**	**Household Items**	**HN011**
330310	**Paper Towels/Napkins/Toilet Ti**	**Household Items**	**HN021**
330510	**Misc Household Products**	**Household Items**	**HN031**
330511	**Mat For Termte/Pst Cntrl Maintce**	**Household Items**	**HM022**
330610	**Lawn And Garden Supplies**	**Household Items**	**HM022**
340420	**Water Softening Service**	**Household Items**	**HP090**
340620	**Repair Of Household Appliances**	**Household Items**	**HP041**
340630	**Reupholstery Of Furniture**	**Household Items**	**HP042**

340901	**Rental/Repair-Tools,Lawn/Garden**	**Household Items**	**HM090**
340903	**Misc. Home Services**	**Household Items**	**HP090**
340904	**Rental Of Furniture**	**Household Items**	**HJ090**
340907	**Rental Of Household Equipment**	**Household Items**	**HK090**
340911	**Mngmt/Spec Ser/Security Ownd**	**Household Items**	**HP090**
340914	**Serv For Termt/Pst Cntrl**	**Household Items**	**HP090**
690244	**Oth Hh Appl Rntr**	**Household Items**	**HK023**
690245	**Oth Hh Appl Ownd**	**Household Items**	**HK023**
320130	**Infants Equipment**	**Personal Care and Services**	**GE013**
340520	**Hshld Lndry,Drycln Not Coin-Op**	**Personal Care and Services**	**GD031**
340530	**Coin-Op Hshld Lndry, Dry Cln**	**Personal Care and Services**	**GD031**
430130	**Luggage**	**Personal Care and Services**	**GE012**
440110	**Shoe Repair, Oth Shoe Service**	**Personal Care and Services**	**GD041**
440120	**Coin-Op Apparel Ldry/Dry Clng**	**Personal Care and Services**	**GD031**
440130	**Alter/Repair Of Apparel, Access**	**Personal Care and Services**	**GD042**
440140	**Clothing Rental**	**Personal Care and Services**	**GD042**
440150	**Watch And Jewelry Repair**	**Personal Care and Services**	**GD043**
440210	**Apparel Lndry/Dry Clng N/Coin-Op**	**Personal Care and Services**	**GD031**
440900	**Clothing Storage Outside The Home**	**Personal Care and Services**	**GD031**
620112	**Credit Card Memberships**	**Personal Care and Services**	**GD051**
640110	**Hair Care Products**	**Personal Care and Services**	**GB011**
640120	**Non-Elec Articles For The Hair**	**Personal Care and Services**	**GB011**
640130	**Wigs And Hairpieces**	**Personal Care and Services**	**GB090**
640210	**Oral Hygiene Products,Articles**	**Personal Care and Services**	**GB012**

640220	**Shaving Needs**	**Personal Care and Services**	**GB012**
640310	**Cosmetics, Perfume, Bath Prep**	**Personal Care and Services**	**GB021**
640410	**Deod,Fem Hyg, Misc. Pers. Care**	**Personal Care and Services**	**GB013**
640420	**Electric Personal Care Appliances**	**Personal Care and Services**	**GB014**
640430	**Adult Diapers**	**Personal Care and Services**	**GB013**
650310	**Pers. Care Serv.**	**Personal Care and Services**	**GC011**
680110	**Legal Fees**	**Personal Care and Services**	**GD011**
680140	**Funeral Expense**	**Personal Care and Services**	**GD021**
680210	**Safe Deposit Box Rental**	**Personal Care and Services**	**GD051**
680220	**Check Accts / Oth Bank Serv Chgs**	**Personal Care and Services**	**GD051**
680901	**Cemetery Lots,Vaults,Maint Fees**	**Personal Care and Services**	**GD021**
680902	**Accounting Fees**	**Personal Care and Services**	**GD052**
680903	**Misc. Pers. Services**	**Personal Care and Services**	**GD090**

Linking Households to Relevant Expenditures

For the interview, we used the FMLI and the MTBI files. Both types of files are published as quarterly downloads, all relevant quarters were appended to create an entire year's sample.

After excluding purchases which occurred outside the calendar year in question, each yearly MTBI sample was merged with the UCC directory, and, for UCCs whose designated source was Interview in the relevant year and quarter, total quarterly expenditure for apparel, personal care, and household goods were recorded for each CE household[130]. CE households who did not spend on any apparel items were assigned zero spending and retained in the sample, likewise for personal care and household goods.

FMLI files were cleaned by generating appropriate population weights POPWEIGHT using FINLWT21 and QINTRVMO, QINTRVYR, to accurately weight the different consumer units for the year,

[130] Technically, because the same household can appear in two different quarters of Interview under a different NEWID, this is each combination of CE household and interview quarter. However, as these households are treated as statistically independent, we express the procedure this way for clarity.

accounting for the overlapping nature of the interviews[131]. Before-tax income was then time-harmonized using variables FINCBTAX, FINCBTXM, and RESPSTAT, dropping households that are not complete income reporters from 2001-2003, and including households regardless of income reporting from 2004 onward.

EXPD and FMLD were cleaned analogously, combining the quarterly samples into annual samples. In the EXPD files, NEWIDs who did not record at least one purchase for any good or service in the reference year were dropped. Because each NEWID's expenditures only sum to a weekly expenditure, each COST was inflated to the quarterly level by scaling by 13 before being allocated to apparel, personal care, or a household item when applicable. Households who did not report any spending on the miscellaneous goods were retained in the sample with a spending of zero. FMLD required a simpler population weight adjustment of POPWEIGHT using FINLWT21. Before-tax income was time-harmonized using variables FINCBEFX, FINCBEFM, and RESPSTAT.

For both Interview and Diary, the resulting cleaned expenditure and household characteristics samples were merged using NEWID, so LISEP had created a file that contained the total quarterly costs for apparel, personal care, and household goods by consumer unit, and the household income of that specific consumer unit.

Averaging by Income and Size Strata, Calculating Regional Weights

Interview and Diary merged files were processed separately, then their yearly estimates were added together to obtain coverage of all goods in the apparel, personal care, and household goods baskets.

The national average annual cost paid by each household for apparel, personal care, and household items was computed by household size, regardless of the household's geographic location. Specifically, all the households were grouped by household size of one to five people, then stratified by income within each group. Households with income below the 10th percentile and above the 75th percentile of income were dropped. The average annual spending was calculated for each group in accordance with the CE's guidelines for computing mean annual expenditures.[132]

To address geographic differences in spending, LISEP adjusted national spending by household size for each miscellaneous expense for the four Census regions Households were grouped by Census region and household size, then stratified by income within each grouping, keeping households between the 10th and 75th percentiles of income. Using analogous logic, average annual spending was then calculated for each region, treating households of all sizes as a single group. Finally, LISEP computed national average spending on each miscellaneous category for households between the 10th and 75th percentile of income for their respective household sizes using the same procedure.

The regional weights were defined as the ratios of the regional spending averages to the national averages, as clarified in the example below.

[131] https://www.bls.gov/cex/pumd-getting-started-guide.htm#section6
[132] https://www.bls.gov/cex/pumd-getting-started-guide.htm#section6

Household Budget Estimation and Assignment

LISEP adjusted the average spending estimated for each household size group by each of the regional weights. The resulting estimate of average spending by household size at a regional level was assigned to an appropriate LISEP family type.

For ease of understanding, LISEP will illustrate the process with apparel as an example.

Apparel expenditures for each household size are calculated for the total population.[133] LISEP does this for each year and then takes the regional average of spending on apparel, not sorting by household size. LISEP then takes the ratio of the regional average to the national average and adjusts the household sizes by their respective regional-to-national ratio.

For example, assume the average spending on apparel is $100 a year in 2001 for a one-person household nationally. Also assume that the average total apparel spending for all household sizes nationally is $500. In the South, the average total apparel spending for all households in 2001 is $400. LISEP then adjusted the one-person household's expenditure by 0.8 (400/500) to get that a one-person household in the South in 2001 would spend an average of $80. LISEP then completes this process for each region, year, and household size. Although the above example is for apparel, the same process is used for personal care and services, and household miscellaneous items.

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[133] 10th to 75th percentile but including all regions.

III. Robustness Checks

MIT Living Wage Calculation Comparison

Overview of Robustness Check[134]

A robustness check is conducted for overall trends of cost of living using different definitions for each one of the expenditures. The Living Wage Calculator, developed by Dr. Amy K. Glasmeier and Tracey Farrigan, has been published since 2004. We wanted to affirm that our findings on the change in the cost of living were aligned well with other cost of living estimates. Although the Living Wage Calculator is published every year for each county throughout the United States, it is not published as a time series to track the cost of living on average throughout time. Thus, we used the definitions for each different type of expenditure in the methodology from 2019-2020. Given the resources made publicly available, LISEP reconstructed a cost-of-living index using these definitions for each type of good. This was done to show robustness in LISEP findings by using different definitions of what is necessary to meet basic needs. The "living wage model is an alternative measure of basic needs"[135] to the federal poverty metric, which moves in line with CPI.[136] Thus, any attempt to measure the change of cost of living for those near the poverty level is futile and will just yield the CPI-U, which is the cost-of-living metric LISEP is trying to improve. First LISEP shows the differences between MIT cost-of-living budget allocations and the LISEP TLC budget allocations. The method of calculating the cost-of-living changes using the MIT allocations.

Differences in Budget Allocations

Family Types

MIT Living Wage calculator uses 12 different family types whereas LISEP TLC uses only 8. The first 8 family types are identical: working single parent with zero, one, two, and three children; two working parents with zero, one, two, and three children. MIT then adds four more family types of "two adult families where one adult is not in the labor force with 0, 1, 2, or 3 dependent children."[137] The percentage of family types averaged throughout the 20-year sample are shown in table 1.

Table 1: Family Type Proportions from 2001-2020 MIT vs LISEP

MIT Description	MIT Proportion of total population	LISEP description	LISEP proportion of total population

[134] Note from 2024 edition. These robustness checks were conducted in advance of the release of the TLC in 2022. As a result, the data reflected in these checks has not been updated to reflect the updates to the methodology and data sources that LISEP has made since the time of original publishing.
[135] (Massachusetts Institute of Technology, 2021)
[136] "The January 2021 poverty guidelines are calculated by taking the 2019 Census Bureau's poverty thresholds and adjusting them for price changes between 2019 and 2020 using the Consumer Price Index (CPI-U)": (Office of the Assistant Secretary for Planning and Evaluation, 2021)
[137] (Massachusetts Institute of Technology, 2021)

Single person	20.4%	Single person	20.4%
Single parent one child	3.7%	Single parent one child	3.7%
Single parent two children	3.0%	Single parent two children	3.0%
Single parent three children	2.3%	Single parent three children	2.3%
Dual income couple	12.4%	Couple	28.3%
Dual income couple one child	9.3%	Couple one child	12.5%
Dual income couple two children	12.4%	Couple two children	17.1%
Dual income couple three children	8.2%	Couple three children	12.7%
Single earner couple	15.8%		
Single earner couple one child	3.2%		
Single earner couple two children	4.7%		
Single earner couple three children	4.5%		

Housing

MIT and LISEP used the same method for allocating housing to each family. For county population estimates, the MIT uses the American Community Survey population data whereas LISEP uses the Intercensal county population estimates from the Census Bureau. This does not make a meaningful difference, though. The Census Bureau's Population Estimation Program (PEP) publishes a methodology where it explains its estimates. The PEP explains that it bases its initial estimate from the decennial census, and then adjusts the county flows using predominantly ACS data sources.[138] Thus, the population estimates align.

Food

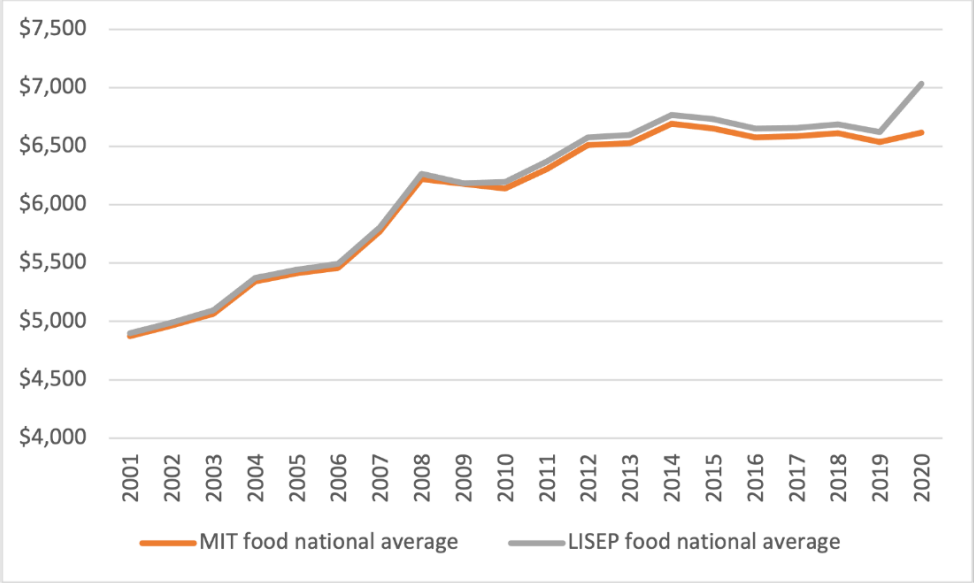
MIT and LISEP both use the low-cost food plan from the United States Department of Agriculture. MIT adjusts their data regionally using a regional food price proportion developed by the USDA in 2007.[139] "The regional adjustment factors by region are as follows: East (1.08), Midwest

[138] (U.S. Census Bureau, 2021)

[139] (Liebtag, E. S., 2007)

(0.95), South (0.93), and West (1.11)."[140] LISEP instead uses the Map the Meal Gap database to adjust food costs by state. Figure 1 shows the food costs using these different regional adjustments. They are extremely similar until 2020. This is because MIT did not recalculate their numbers for 2020 year, instead just used the average CPI to inflate the 2019 numbers to 2020.

Figure 1: MIT versus LISEP Food Costs



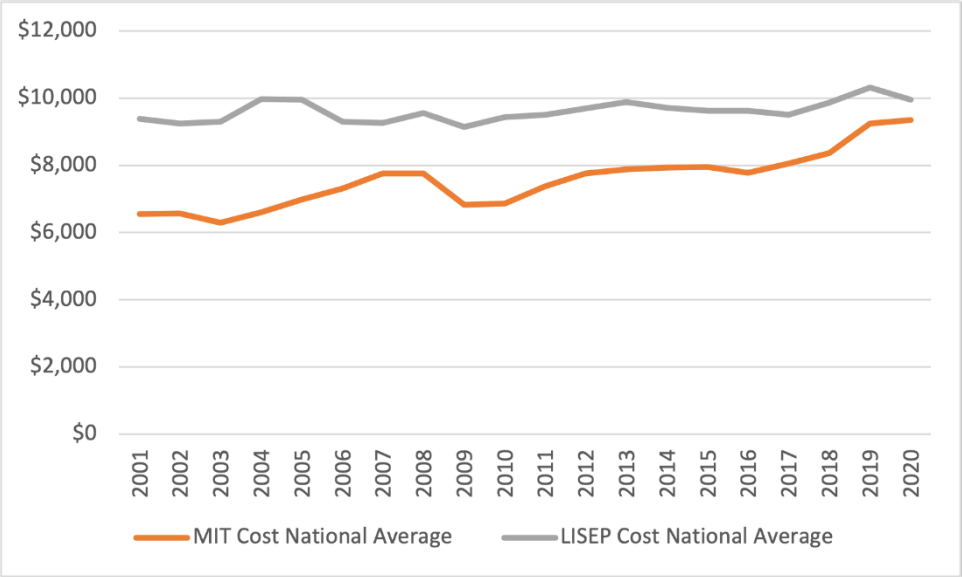
Source: Author's calculations based on MIT assumptions and LISEP data

Transportation

MIT uses the average spending on "(1) Cars and trucks (used), (2) gasoline and motor oil, (3) other vehicle expenses, and (4) public transportation"[141] by household size. They use the data from table 1400 from the Consumer Expenditure Survey. LISEP's transportation cost calculation is vastly different and is detailed earlier in the methodology.

[140] (Massachusetts Institute of Technology, 2021)
[141] (Massachusetts Institute of Technology, 2021)

Figure 2: MIT versus LISEP Transportation Costs



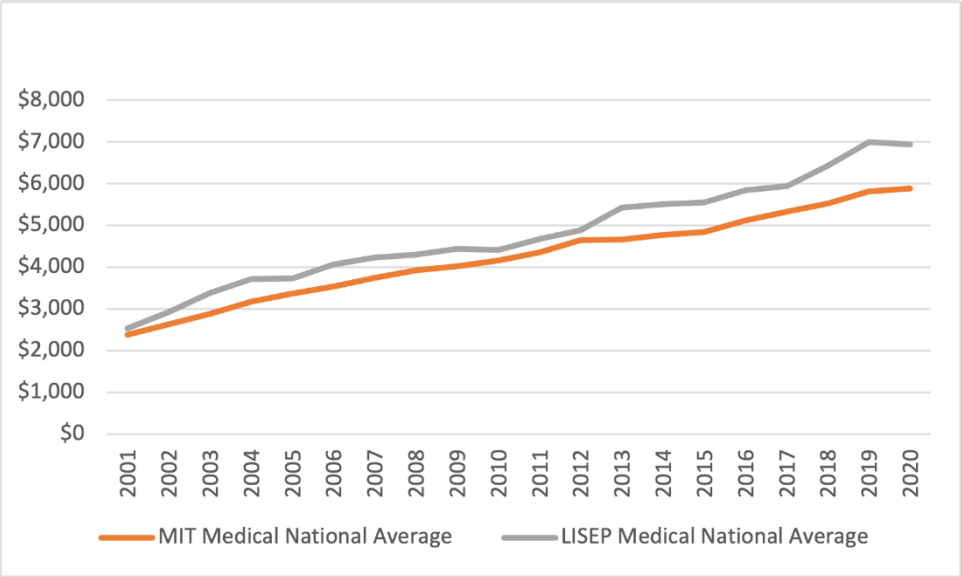
Source: Author's calculations based on MIT assumptions, CE table 1400, and LISEP data

Health

For health insurance, MIT uses the MEPS data for Private Sector Establishments: State Specific Data for Private-Sector Establishments. This is the same data source that LISEP uses, and both assume that the household is privy to employer provided insurance. In contrast to LISEP using the median spending, MIT uses the average spending.

For health expenditures, MIT uses the Consumer Expenditure Survey, table 1400 to allocate average costs for medical services, drugs, and medical supplies by household size. LISEP uses the MEPS data tool to allocate out of pocket costs as detailed in the methodology.

Figure 3: MIT versus LISEP Medical Costs



Source: Author's calculations based on MIT assumptions, CE table 1400, and LISEP data

The reason that LISEP's medical cost allotment is higher than MIT's even though the average of the middle 50% of OOP costs is lower than the average of the entire distribution, is because of dental costs. LISEP determines dental care to be a minimal adequate need, thus these dental costs drive it slightly higher than MIT's although the change throughout time is similar.

Technology

For the first time in 2019, MIT allocated broadband and cellular phone costs to each household's budget. Prior to this it allocated technological expenses from the CE survey. Unfortunately, past versions of the methodology are no longer available, and so tracking these trends throughout the period is not possible. But in 2020, after extensive research using many different data sources, it was concluded that $60 was the average cost of broadband, and that this cost was not regionally idiosyncratic.

They also allocated the cost of cellular service to the living wage calculator. They allocated $42.96 a month for cell phone service ($40 plan with 7.39% U.S. average sales tax). Further, they allocated $204.50 for a low-cost smart phone, assuming a new phone would be purchased every three years.

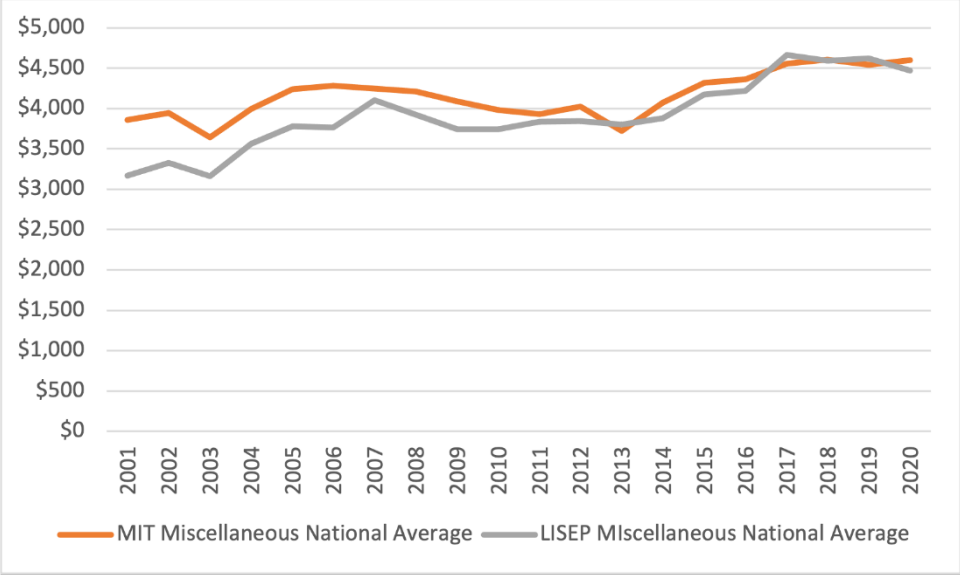
In contrast to this particular year, LISEP allocates a single person about $61.23 for a cell phone service if he or she is single, whereas if they are on a couple's plan, they allocated them $50.77. Internet of $198 is a little less than MIT, with also the assumption of the replacement rate every three years. The reason LISEP has a more expensive cell phone plan here is because we use the actual spending of lower-income households. These spending costs may be skewed upwards by people in rural regions that have to pay more for connection and Wi-Fi. It also could be skewed upwards by the real-life, steep data overages costs.

Miscellaneous and Civic

The MIT Living Wage Calculator uses the average cost by household size for "(1) Apparel and services, (2) Housekeeping supplies, (3) Personal care products and services, (4) Miscellaneous" from the CE survey. LISEP uses the CE microdata to find the costs of similar items in the spending of the 25th to 75th percentile households.

But MIT includes a civic engagement budget in their family costs. "The civic engagement component is constructed using 2019 national expenditure data by household size from the 2019 Bureau of Labor Statistics Consumer Expenditure Survey including: (1) Fees and admissions, (2) audio and visual equipment and services, (3) pets, and (4) toys, (5) hobbies, and playground equipment, (6) other entertainment supplies, (7) equipment, and services, (8) reading, and (9) education."[142] MIT uses the same table 1400 from the Consumer Expenditure Survey that gives the average expenditures by family size. The LISEP TLC takes a more conservative approach and does not budget for any of these items. Figure 5 shows the comparison of miscellaneous costs without the MIT civic costs.

Figure 5: MIT versus LISEP Miscellaneous Costs

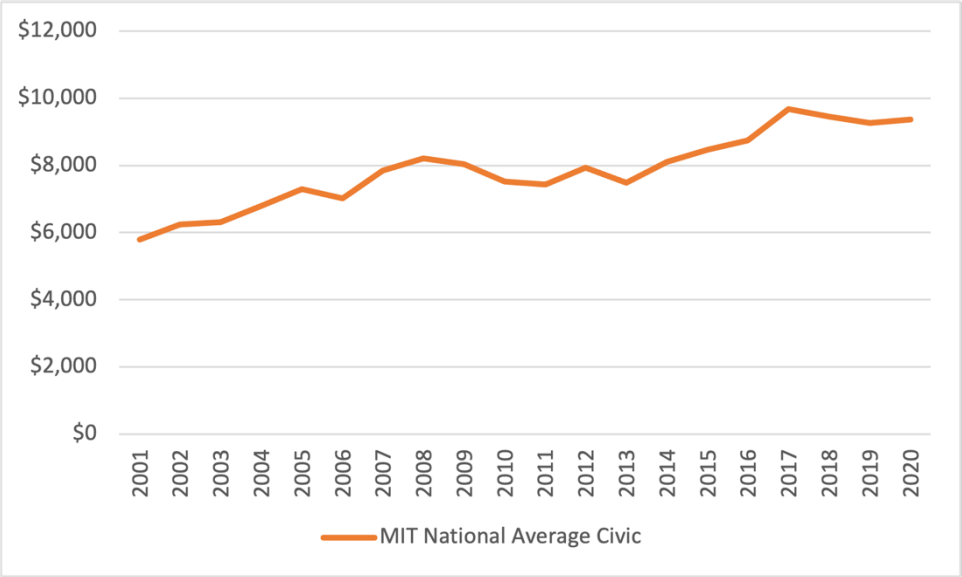


Source: Author's calculations based on MIT assumptions, CE table 1400, and LISEP data

MIT civic costs are also graphed. LISEP does not have these costs in its budget.

[142] (Massachusetts Institute of Technology, 2021)

Figure 6: MIT National Average Civic Spending



Source: Author's calculations based on MIT assumptions, CE table 1400

Tax

The MIT living wage calculator incorporates taxes into the family budget. This aligns with the aim of the living wage calculator- to establish a monetary income level which families need to attain to survive. In LISEP's main number, taxes are left out. But in LISEP's analysis to investigate the change in available spending on recreation/savings for real world families, the TAXSIM32 model detailed in Appendix B is used. MIT on the other hand uses the Urban-Brookings Tax Policy Center Microsimulation Model (version 0217-1). This model outputs distribution samples for average tax rates faced by families in each quintile of income.[143] This is less precise than the model that LISEP uses, but yields an averaged result similar to the TAXSIM32, which reports each individual's tax burden rather than the average for the quantile.

Citations

Nadeau, C. A. (2021). *LIVING WAGE CALCULATOR User's Guide / Technical Notes*. Massachusetts Institute of Technology: Department of Urban Studies and Planning. https://livingwage.mit.edu/resources/Living-Wage-Users-Guide-Technical-Documentation-2021-05-21.pdf

HHS Poverty Guidelines for 2021. (2021, January). Office of the Assistant Secretary for Planning and Evaluation. https://aspe.hhs.gov/topics/poverty-economic-mobility/poverty-guidelines

[143] (Urban Institute)

Methodology for the United States Population Estimates: Vintage 2020. (2021, May). U.S. Census Bureau. https://www2.census.gov/programs-surveys/popest/technical-documentation/methodology/2010-2020/methods-statement-v2020-final.pdf

Leibtag, E. S. (2007, September). *Stretching the food stamp dollar: regional price differences affect affordability of food* (Economic information bulletin; nos. 29–2). U.S. Department of Agriculture, Economic Research Service. https://handle.nal.usda.gov/10113/35106

Urban Institute. (n.d.). *The Tax Policy Center Microsimulation Model*. Urban Institute. Retrieved December 20, 2021, from https://www.urban.org/research/data-methods/data-analysis/quantitative-data-analysis/microsimulation/tax-policy-center-microsimulation-model

Consumer Expenditure Survey Data

The second large robustness check LISEP conducted was to compare the results of the Consumer Expenditure Survey with the allocated costs for our index. We compared these for housing, transportation, food, and healthcare. The costs of childcare were not investigated because there is not a CE question specifically for childcare. The consumer expenditure survey is largely used to estimate technology costs and miscellaneous costs, so LISEP also doesn't use this same source to check these costs.

The FMLI files from the interview survey were used. The files are accessed via the Public Use Microdata (PUMD) from the Consumer Expenditure Survey portion of the Bureau of Labor Statistics site.[144] The survey respondents are sorted into the six different income groups used in the technology section using the household income variable. The income groups are: 1) 0-10th percentile, 2) 10th to 25th, 3) 25th to 50th, 4) 50th to 75th, 5) 75th to 90th, and 6) 90th to 100th. These different income groups are sorted based on the family size, so a 90th percentile single person family is not in the same group as a 90th percentile five-person family. LISEP compares its costs to the spending habits of the lower- and middle-income class, arguing why they are similar or different. In the conclusion, LISEP explains what this comparison tells us about the validity of the data we use.

Housing Comparison

LISEP uses the PUMD interview survey file variables *houspq* and *housecq,* which give the total expenditure for housing in the previous quarter and the current quarter respectively. LISEP calculates the average spending for housing for the year for households in each income range. Below, the graph show the spending of households in the 25th to 50th percentile against the allocated costs from the TLC index. In figure 1A, the spending for single person households in the 25th to 50th percentile household income range (among single person households) is shown compared to our allocated costs for single people. Figure 1B shows the comparison of spending for five-person households compared to our costs for five-person households (family type of 2 adults and 3 children).

[144] (Consumer Expenditure Survey 2021)

Figure 1A: Housing Expenditures compared to Housing Cost Index for Single person households

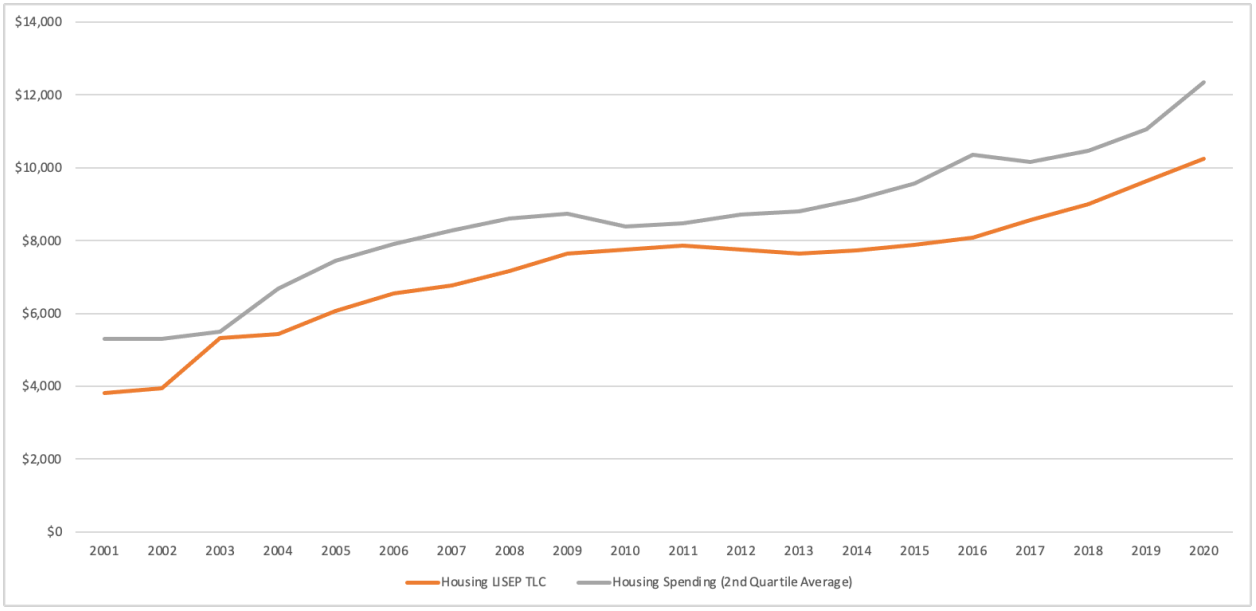
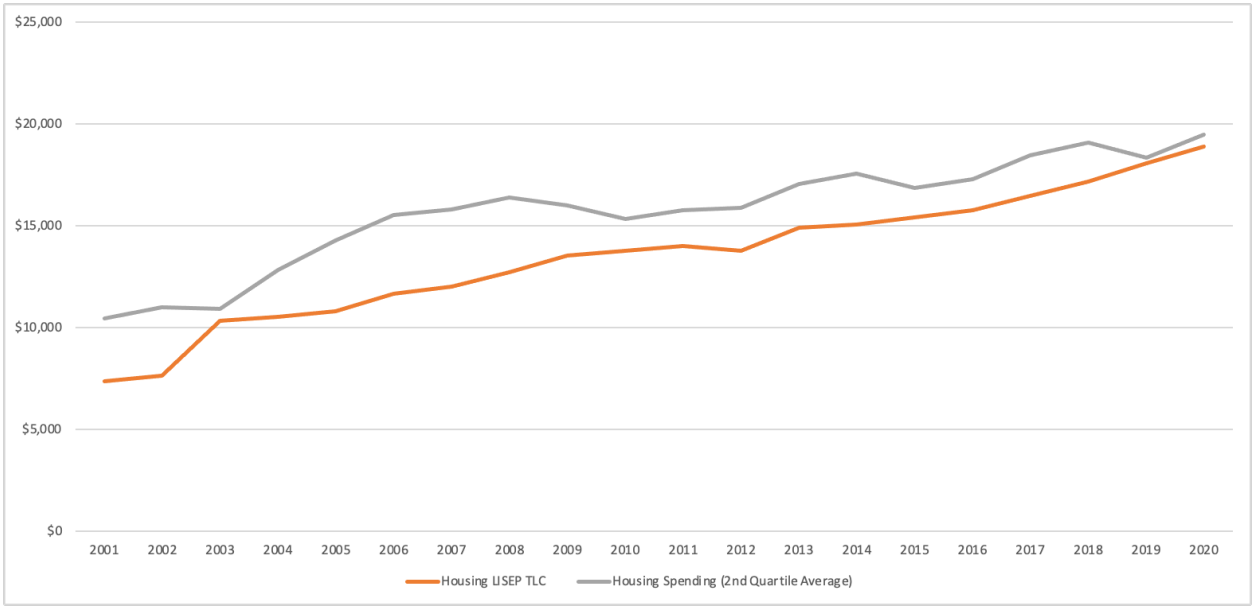


Figure 1B: Housing Expenditures compared to Housing Cost Index for five person Households



The above graphs show that LISEP's estimates of the costs of one person households align almost perfectly with actual spending. They differ slightly for five-person households but show a very similar trend. This is validating to LISEP's cost estimates because housing is an expense that is

usually high up on a family's spending hierarchy. Thus, it is unsurprising that even those who are not well-off purchase housing. But because we match the second-quartile average, these costs are not overestimated.

Figure 1C and 1D show the costs of LISEP versus the spending of the 75th to 90th percentile. These graphs show that the LISEP estimates are consistently below the actual spending for upper middle-class households, thus proving the conservative nature of our estimates.

Figure 1C: Housing Expenditures (75th to 90th percentile) compared to Housing Cost Index for single person Households

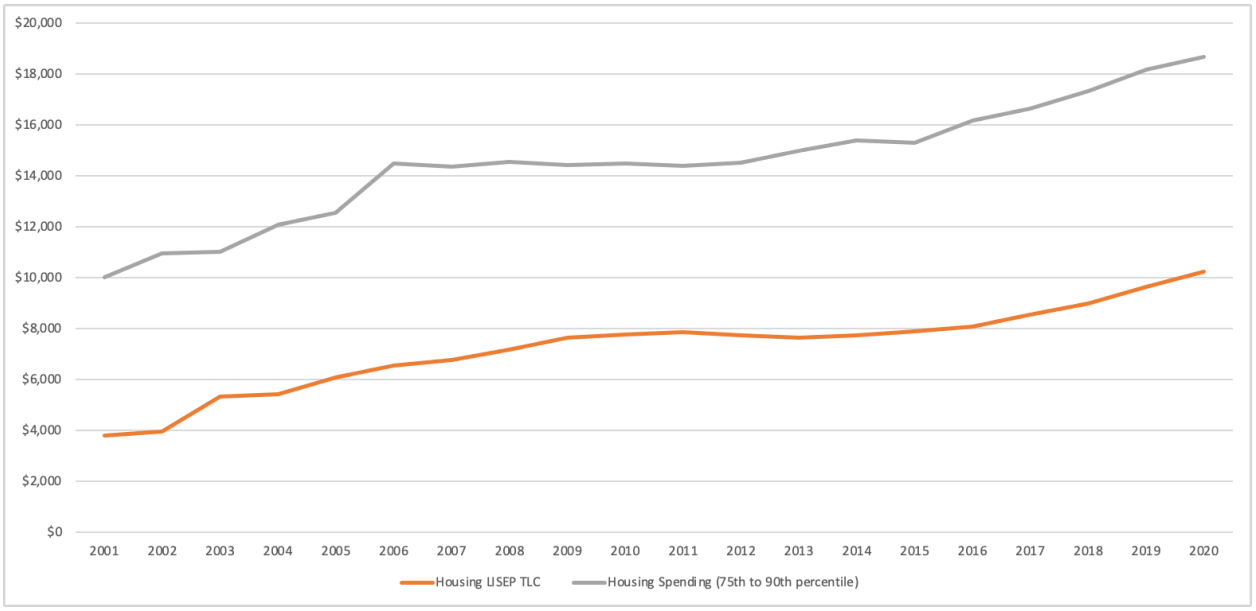
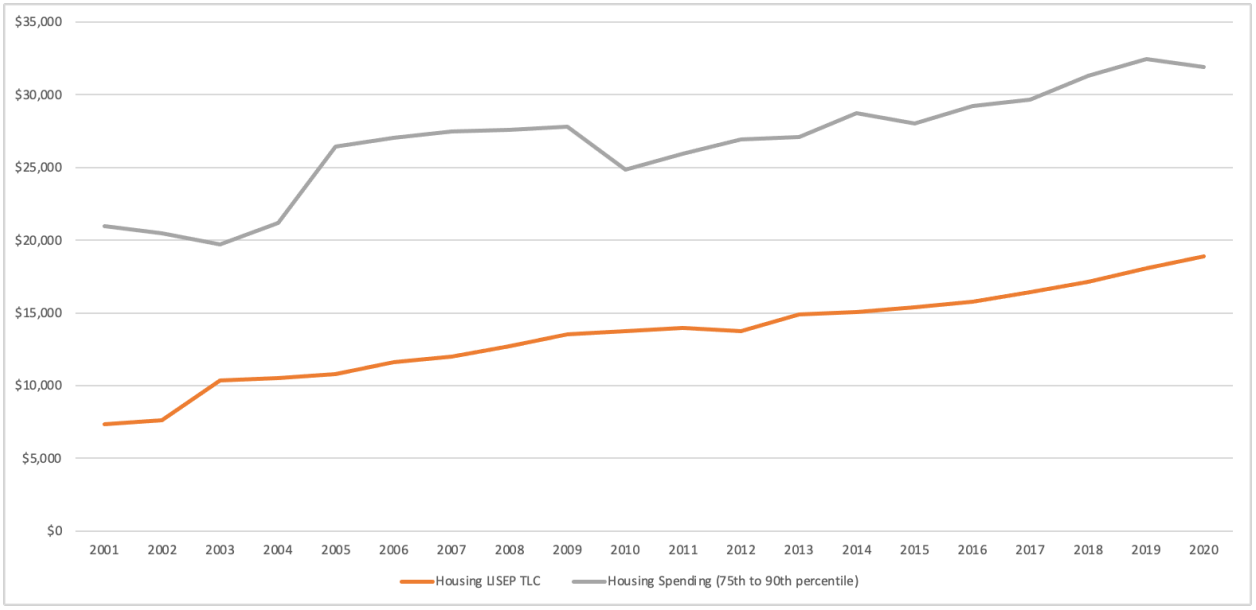


Figure 1D: Housing Expenditures (75th to 90th percentile) compared to Housing Cost Index for five person Households



Source for 1A-1D: Consumer Expenditure Survey. (2021, September). *Consumer Expenditure Surveys Public Use Microdata*

Food Comparison

LISEP uses the PUMD interview survey file variables *fdhomepq* and *fdhomecq,* which give the total expenditure for food purchased for in-home use in the previous and current quarters. LISEP calculates the average spending for food at home for the year for households in each income range. Below the graph shows the spending of households in the 25th to 50th percentile against the allocated costs from the TLC index. In figure 2A, the food spending for single person households in the 25th to 50th percentile household income range (among single person households) is shown compared to allocated costs for single people. Figure 2B shows the comparison of spending for two-person households compared to our costs for households with an adult couple. Figure 2C shows spending for five-person households compared to our allocated costs for the five-person household family (family type of 2 adults and 3 children).

Figure 2A: Food Expenditures compared to Food Cost Index for Single Person Households

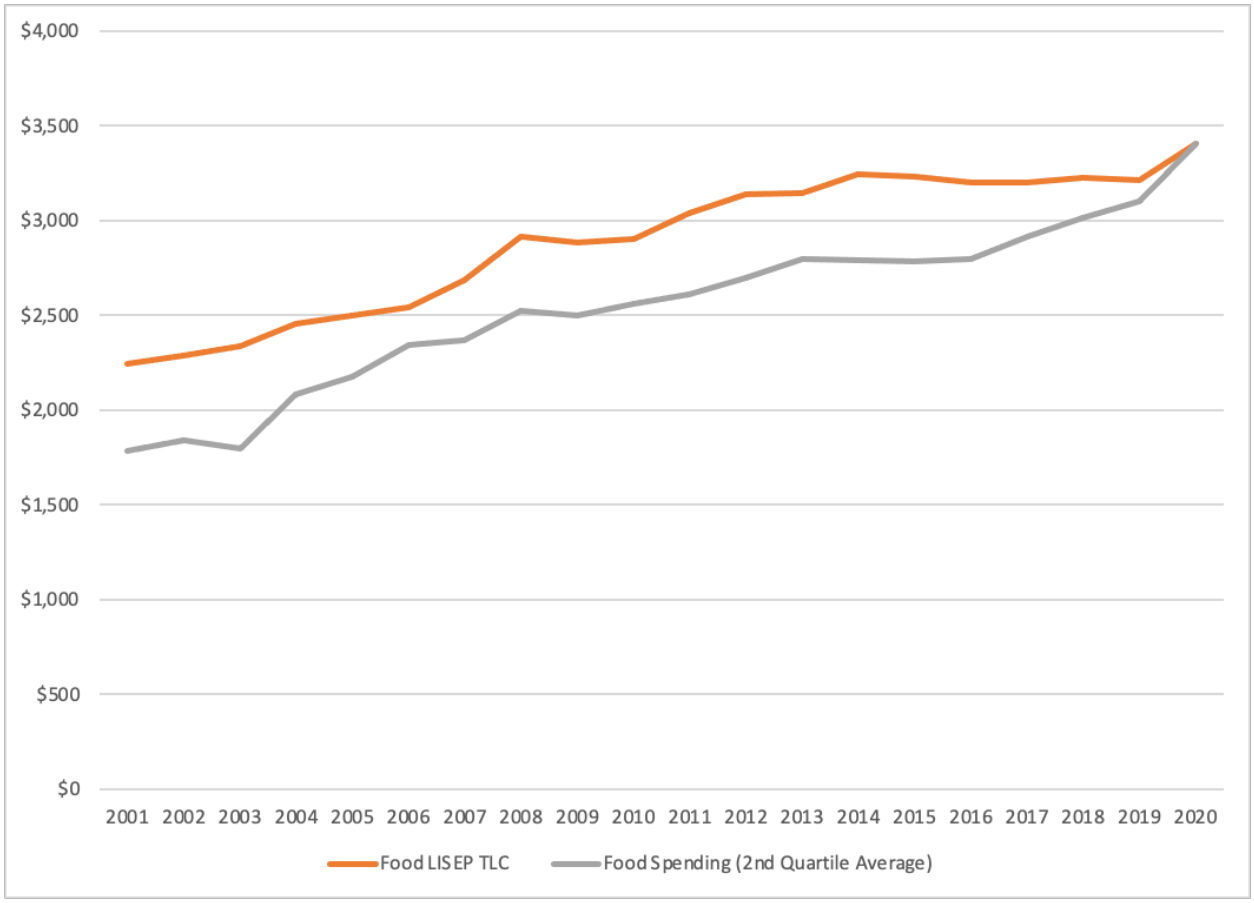
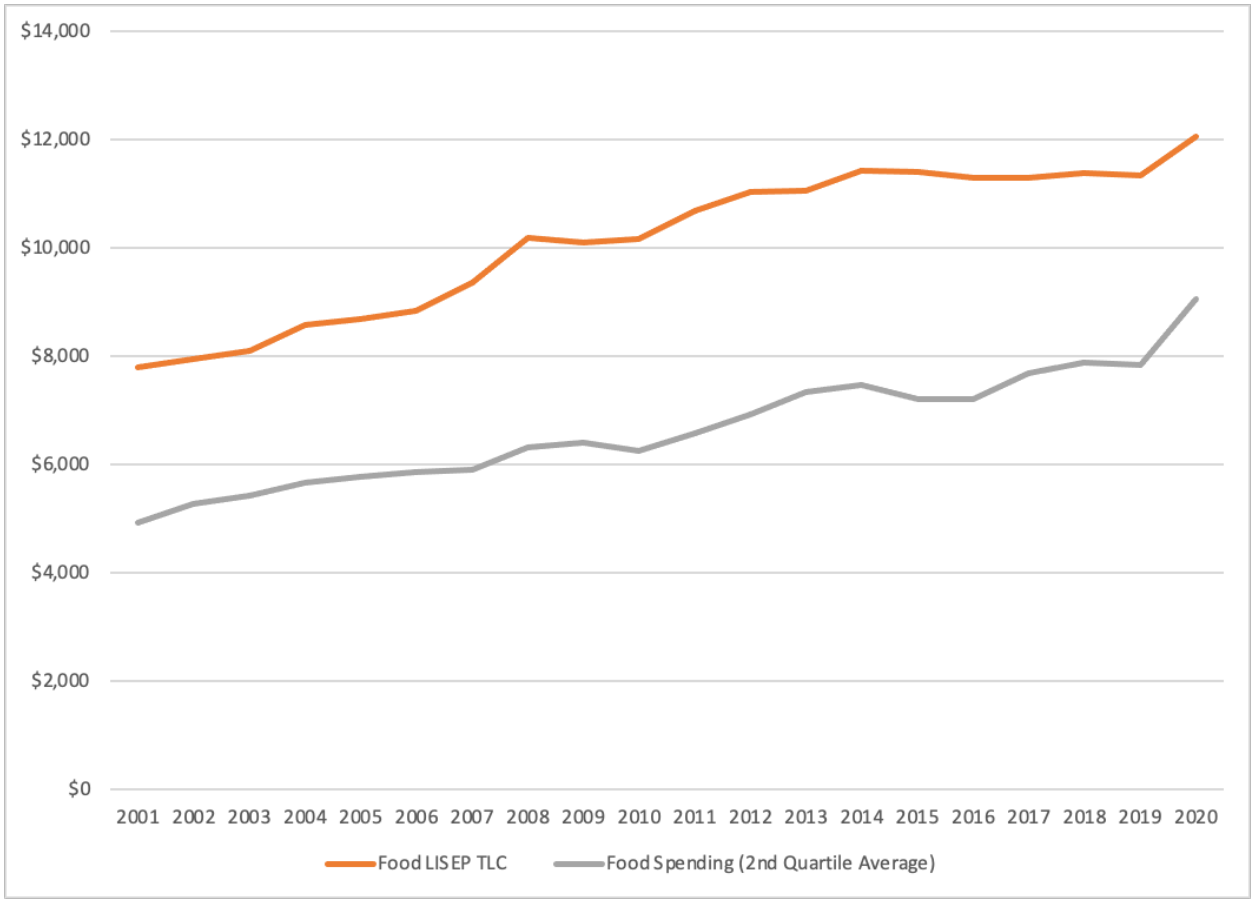


Figure 2B: Food Expenditures compared to Food Cost Index for five person households

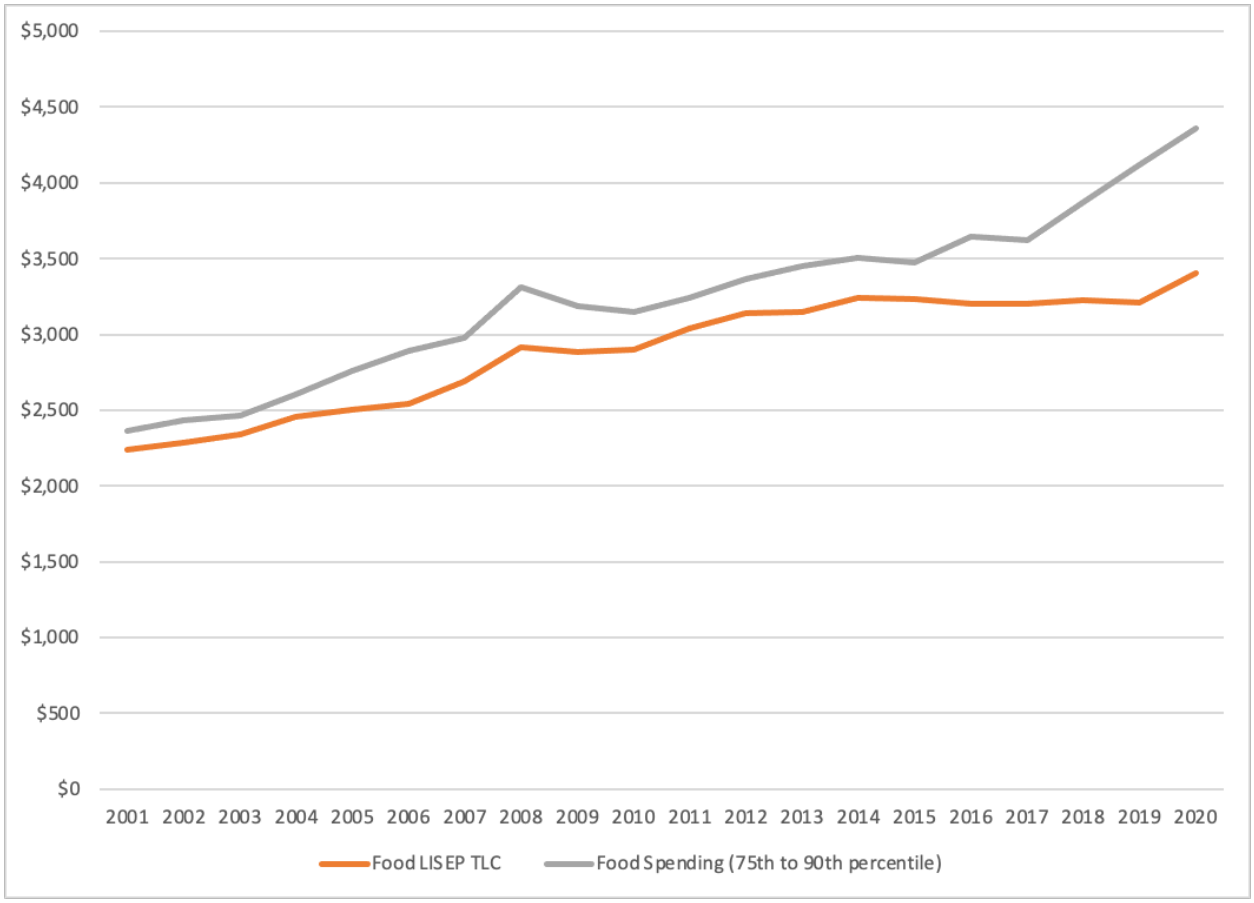


This suggests that the food spending in total is relatively similar for those in households with fewer people than those of households with more people. Further, in almost all the households, our cost allocation is higher than the spending of households in the second quartile. French et. al. finds that in their study, "overall nutritional quality of foods and beverages purchased was significantly lower among lower income households compared with higher income households."[145] Thus, it makes sense that lower income households have lower food budgets than the nutritious budget that is estimated by the USDA.

Figure 2C shows the food at home spending for the upper middle class (75th to 90th percentile) compared to the food cost allocated in the TLC. This level of spending matches almost perfectly, thus showing that higher incomes allow households to purchase the nutritional quality suggested by the USDA. LISEP deems that nutritional food is a minimal adequate need, even though spending data suggests that the lower middle class is not meeting this standard.

[145] (French, S.A., Tangney, C.C., Crane, M.M. *et al*. 2019)

Figure 2C: Food Expenditures compared to Food Cost Index for single person households in the 75th to 90th percentile

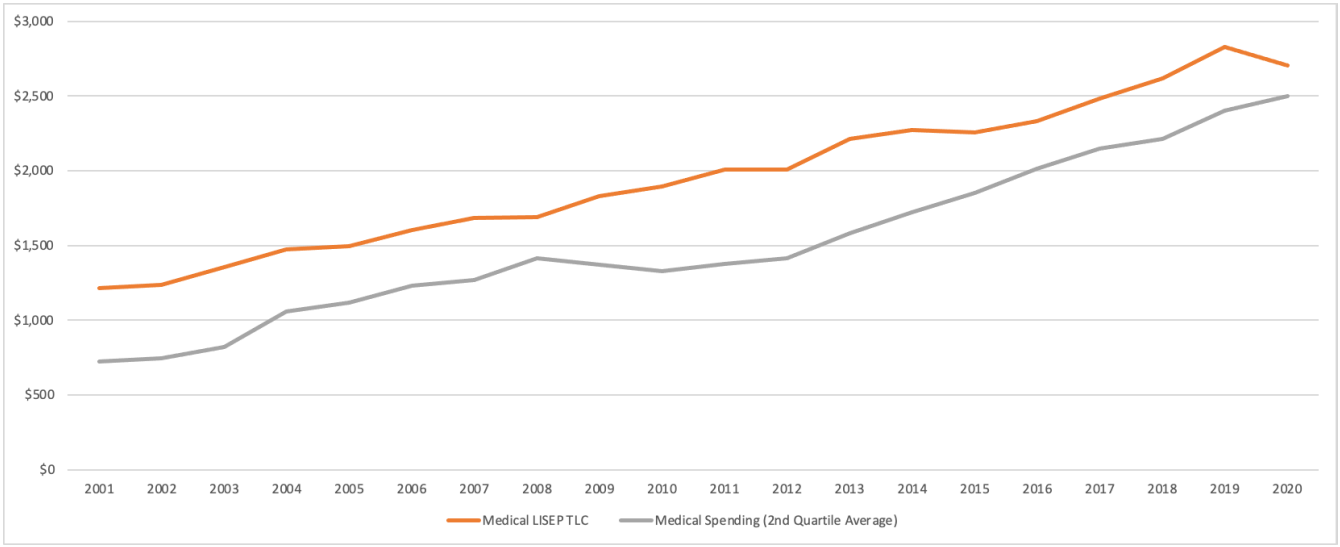


Source for 2A-2D: Consumer Expenditure Survey. (2021, September). *Consumer Expenditure Surveys Public Use Microdata*

Medical Care Comparison

The PUMD interview survey file variables *healthcq* and *healthpq,* which give the total expenditure for healthcare in the previous and current quarters, are used to calculate the average spending for medical care for the year for households in each income range. Below we graph the spending of households in the 25th to 50th percentile against the allocated costs from the TLC index. In figure 3A, medical care spending for single-person households in the 25th to 50th percentile household income range (among single person households) are compared to LISEP's allocated costs for single people.

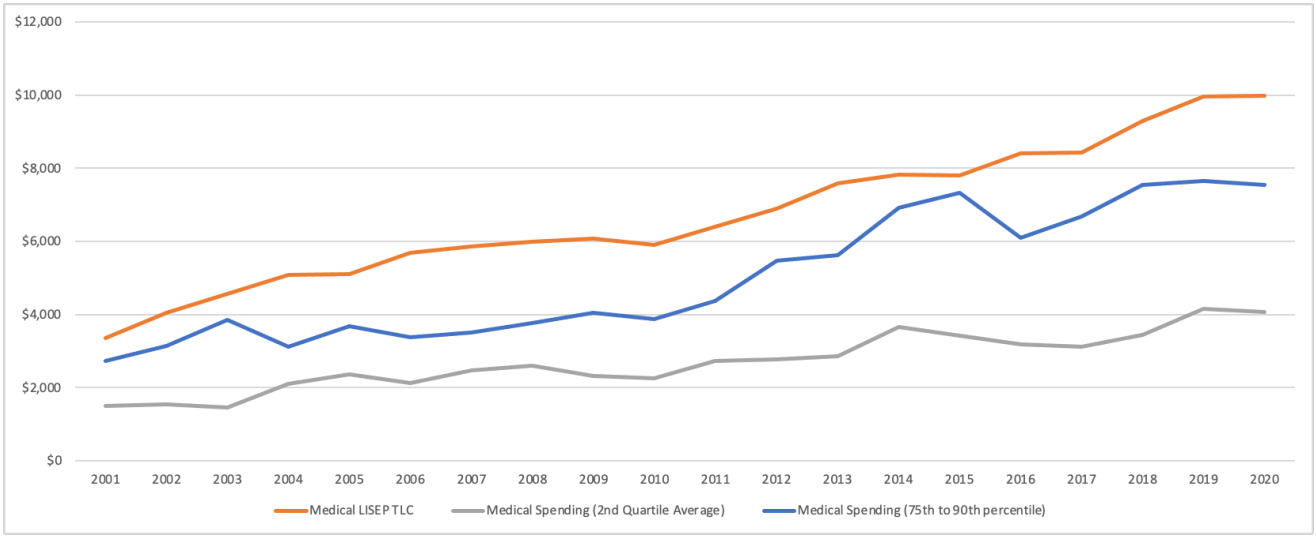
Figure 3A: Total Medical Expenditures compared to Medical Cost Index for Single Person Households



This above figure is unsurprising as a large part of the population is uninsured.[146] This would then lead to less spending on healthcare through healthcare avoidance, or larger out of pocket expenses. Similar trends emerge when household size is expanded. Figure 3B shows the comparison of spending for five-person households compared to our costs for five person households (family type of two adults and three children). It also includes the spending for the upper-middle-class on healthcare. This again is below the cost LISEP has allocated in the budget but is much closer than the lower-middle class. Again, we argue that the difference in cost versus real life spending does not suggest that we have overestimated the cost of adequate healthcare. Rather it indicates that a large portion of the American population is underinsured or inadequately covered.

[146] (Sommers et al 2021)

Figure 3B: Total Medical Expenditures compared to Medical Cost Index for five person households



Transportation

LISEP uses the PUMD interview survey file variables *transcq* and *transpq,* which give the total expenditure for transportation costs in the previous and current quarters. LISEP calculates the average spending for transportation for the year for households in each income range. Below LISEP graphs the spending of households in the 25th to 50th percentile against the allocated costs from the TLC index. In figure 4A, LISEP shows the medical care spending for single-person households in the 25th to 50th percentile household income range (among single-person households) compared to the costs that we allocate for single people.

Figure 4A: Total Transportation Expenditures compared to Transportation Cost Index for Single Person Households

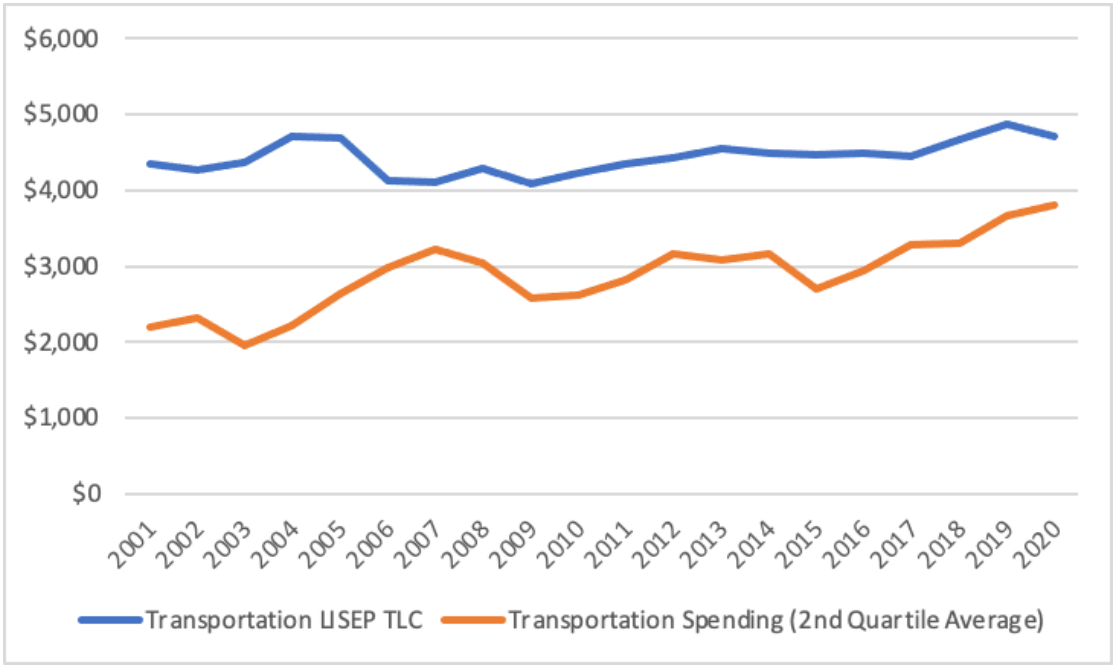
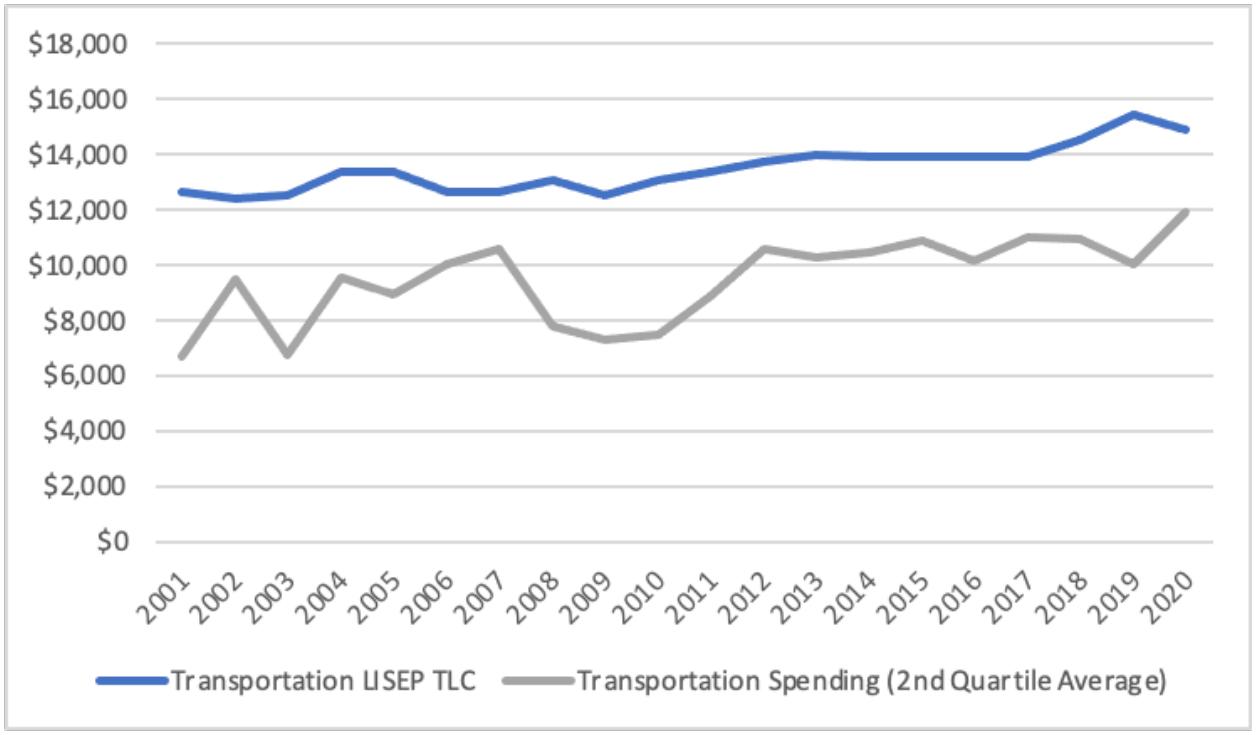


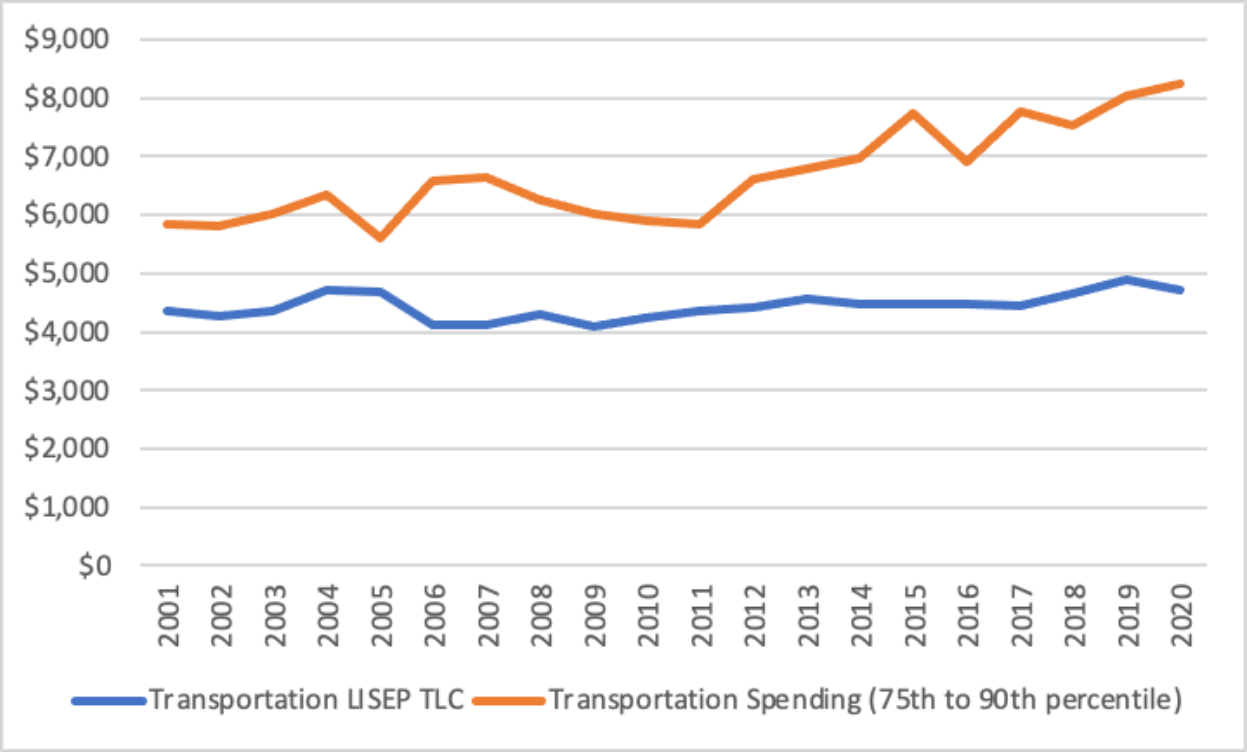
Figure 4B: Total Transportation Expenditures compared to Transportation Cost Index for five person households



These two figures suggest that the cost of transportation allocated in the LISEP TLC index for transportation was more than the 2nd quartile spent in both five-person families and single-person families. But the change in transportation spending was actually less than the change in the budget for transportation LISEP allocated.

In figure 4C, the upper middle-class average spending on transportation is shown throughout the period revealing that by the time that the household income moves into this level, it can spend more on transportation, and exceeds the transportation budget allocated by TLC.

Figure 4C: Total Transportation Expenditures compared to Transportation Cost Index for single person households at the 75th to 90th percentile



Conclusion

LISEP's estimates of what families should buy are largely consistent with the second quartile's average spending on housing. In food costs, the second quartile spends slightly less on food at home. This makes sense because LISEP allocates a conservative food allotment of only eating meals cooked at home. Even in the lower middle-class, people in real life eat sometimes at restaurants, and so some of their spending is allocated to this. Further LISEP suspects that, to meet the nutritional needs ascribed by the USDA, one must eat a more diverse diet of fresh food than lower middle-income families consume. Looking at the upper middle-class, though, food spending exceeds the allotment of the TLC index. Thus, we are assured that this is a minimal, and not extravagant, allotment.

Regarding medical care, the fact that the 2nd quartile spends less than allotted is unfortunately of no surprise. With higher income, the spending approaches LISEP's adequate

allotment. In 2018, national polls found that over 40% of Americans skip medical treatment due to costs.[147] Thus, it is of no surprise that Americans actually are spending less than what LISEP determined to be an "adequate" need.

Finally, the same trend observed for food persists in transportation. The second quartile spends less than we allot (although their spending increases faster than our budget), but the upper middle-class spending exceeds our budget.

Citations

French, S.A., Tangney, C.C., Crane, M.M. *et al.* Nutrition quality of food purchases varies by household income: the SHoPPER study. *BMC Public Health* **19,** 231 (2019). https://doi.org/10.1186/s12889-019-6546-2

Sommers, B. D., Finegold, K., Conmy, A., Chu, R. C., & Bosworth, A. (2021, February 11). *Trends in the US uninsured population, 2010-2020*. ASPE Office of Health Policy.

NORC at the University of Chicago. (2018, March 26). *New Survey Finds Large Number of People Skipping Necessary Medical Care Because of Cost* [Press release]. https://www.norc.org/NewsEventsPublications/PressReleases/Pages/survey-finds-large-number-of-people-skipping-necessary-medical-care-because-cost.

Healthcare Affordable Care Act Premiums Comparison

This robustness check reverses the assumption that each family is covered by employer provided healthcare. Instead, the employer does not provide healthcare. Above details the reasons LISEP assumes that employer-provided healthcare is a given, but we take the opposite assumption to measure the impact of this on a family's health spending. One of the major problems with assuming that the families are not provided with employer healthcare is that it is impossible to track the "silver level" coverage (used in the ACA benchmark) before 2014 because this benchmark did not exist prior to the law. Instead, LISEP uses a level of healthcare (defined by actuarial value) that is provided to the lowest-wage workers. The actuarial value of a healthcare policy is the percentage of total medical costs that the healthcare company expects to cover. For example, for an 80% actuarial value, the healthcare company would expect to pay for 80% of the costs and the policyholder would then pay for the other 20% of the costs out of pocket. To attempt to hold this constant throughout the sample, the total premium cost of the lowest 25% of workers offered healthcare is used, assuming that the family is paying for that level of coverage but in the private marketplace. This is done for two reasons. First, this level of insurance can be tracked throughout the whole sample, so there is available and accurate data. Second, this provides a good proxy for an adequate level of insurance to meet minimal needs. Because LISEP is using the average premium cost for the lowest quartile, an exorbitantly high premium cost isn't being used. Furthermore, we also are assured that it is adequate coverage because the MEPS data shows that

[147] (NORC at the University of Chicago 2018)

the actuarial percentage for the average plan for the lowest-quartile wage worker on employer health insurance is about 80%.[148]

Data

Kaiser Foundation Health Insurance Marketplace Calculator[149] is used for the years 2014 through 2019. Because the rules and poverty limits of the ACA changed each year, a different calculator was necessary, but all were from the Kaiser Family Foundation. A second data source is also from the Kaiser family foundation[150] to establish the benchmarks. Data from the BLS's earner study,[151] which reports the median earnings for full-time workers by quarter, is also used. This was necessary to obtain the subsidy level provided to each family (each subsidy is dependent on annual household income).

To determine the maximum premium amount that could be paid by that family, IRS data for the premium caps was used. These were all based on the original ACA law and then updated each year with different percentages based on the family's relationship to the poverty level.[152][153]

The next source of data was from the Medical Expenditure Panel Survey (MEPS), which is published under the Agency for Healthcare Research and Quality, which is a part of the Department of Health and Human Services.[154] The data used to get the premium calculation is taken from the Insurance/Employer Component of the survey, which asks establishments and governments the amount that they pay for their employees'[155] insurance. LISEP used the summary level tables by state and quartile of earners (the microdata was not available) found in tables VIII.A.1, VIII.D.1, and VIII.E.1 which are the total premium for single coverage, family coverage, and employee plus one coverage respectively.

Specific Methodology

The ACA establishes the maximum amount that each family type is legally allowed to pay depending on that family's relationship to the poverty level. The tax credit assistance given by the ACA is determined by the "benchmark" plan, which is a plan with an actuarial value of 70%. With this benchmark then, the calculation of the subsidy is the benchmark minus the maximum that you can pay by law. Note that this does not actually mean that this silver plan must be purchased, and one can use this tax credit to purchase a higher or lower-level metal (Bronze, Silver, Gold, Platinum) plan[156].

Each year though, the cost of the benchmark plan changes. The benchmark plan is determined by the private marketplace's cost of a 70% actuarial value plan and is thus set by health

[148] This is similar to the "gold level" tier of insurance offered by the ACA.
[149] (Kaiser Family Foundation, 2018)
[150] (Kaiser Family Foundation, 2021)
[151] (Bureau of Labor Statistics)
[152] (Legal Information Institute)
[153] (Internal Revenue Service)
[154] (Agency for Healthcare Research and Quality)
[155] (Agency for Healthcare Research and Quality)
[156] (Legal Information Institute)

insurance companies. For example, the cost of a silver plan (the benchmark) for a single payer from 2014 to 2019 moved from $3,276 to $5,736 on average. Furthermore, each year the premium cap (the maximum amount that you can pay) changes. In 2014, the maximum amount that someone who lives in a household that is 300% of the poverty limit can spend on their healthcare is 9.50%, whereas by 2019 this was 9.86%. To further complicate things, each state was encouraged by the ACA to set up their own healthcare marketplace. For example, the cost of a premium in Vermont in 2014 was 188% higher of the average plan in the United States, but in 2018 the average silver plan in Vermont was only 88% of the average plan in the entire U.S.

Thus, the specific calculation for each year and plan depends on the state in which the family resides, the premium cap (maximum premium), the poverty status of the family, and the cost of the benchmark plan for that year. To generate the specific subsidy that each family type would get, LISEP continued the assumption that each adult in the family worked at the median wage level for that year as a full-time employee. To determine the maximum premium amount that could be paid by that family, LISEP used the household income and multiplied it by the maximum amount of the premium that could be paid that year. This number then is the maximum amount that the family could pay for a benchmark plan.

The subsidy was calculated by taking the benchmark plan and subtracting it by the maximum amount that each family type was allowed to pay for their health insurance under the ACA given their relationship to the poverty line. If the maximum amount that they were allowed to pay was greater than the benchmark plan, they received no subsidy. LISEP then applied this subsidy to a different level of healthcare rather than the silver plan: the plan provided by employees of the lowest 25% of wage earners that were on their employer's healthcare.

The benchmark plan was not used. As mentioned above, the ACA did not come into practice until 2014, and so the ranking of tiered plans also did not exist until then, so "silver plans" couldn't be tracked throughout time because this title was invented with the ACA.

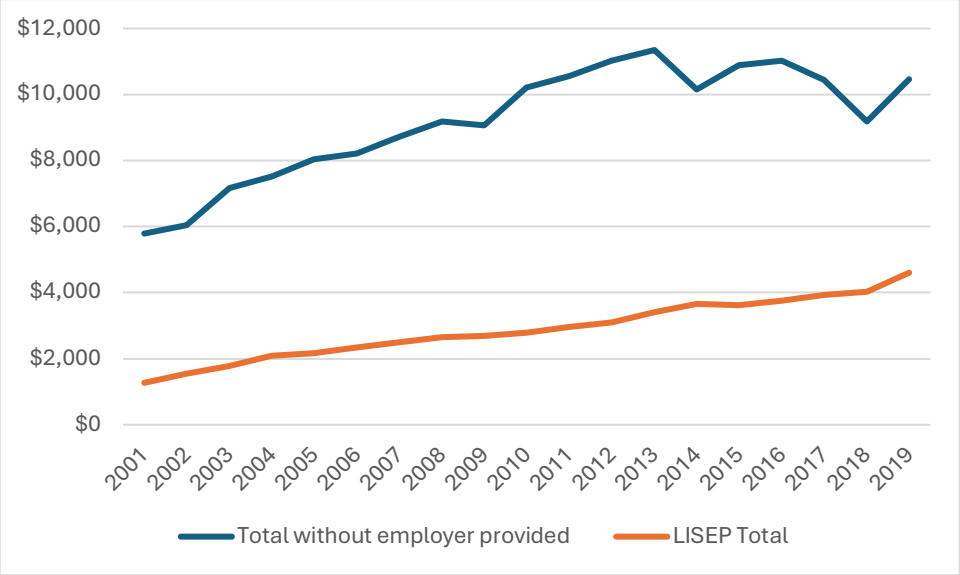
To address this problem, LISEP used employer-based health insurance for the lowest 25% of wage earners as the minimal adequate health insurance. Luckily this data is quite robust, and costs of premiums could be tracked by state, which is important when states have their own respective health insurance marketplaces. Also, because of the granularity of the microdata for the MEPS, LISEP was able to calculate the actuarial value for the employer-based health insurance by region and year.][157] During the sample it ranges from 80 to 90% which further lends credence to the decision not to accept the 70% actuarial value of the silver plan; even the lowest-paid workers on employer-provided healthcare had plans with actuarial values significantly higher.

To calculate the total cost of health premiums by family, LISEP took the total amount of a premium paid for each insurance type (single, employee plus one, and family insurance) applied this premium to the representative family within our framework. LISEP then subtracted this premium value by the amount of subsidy that they would receive. Essentially, LISEP is taking the subsidy provided by the ACA and applying it to what the labor market has deemed to be the minimally acceptable level of health insurance.

[157] We report this calculation in the Appendix.

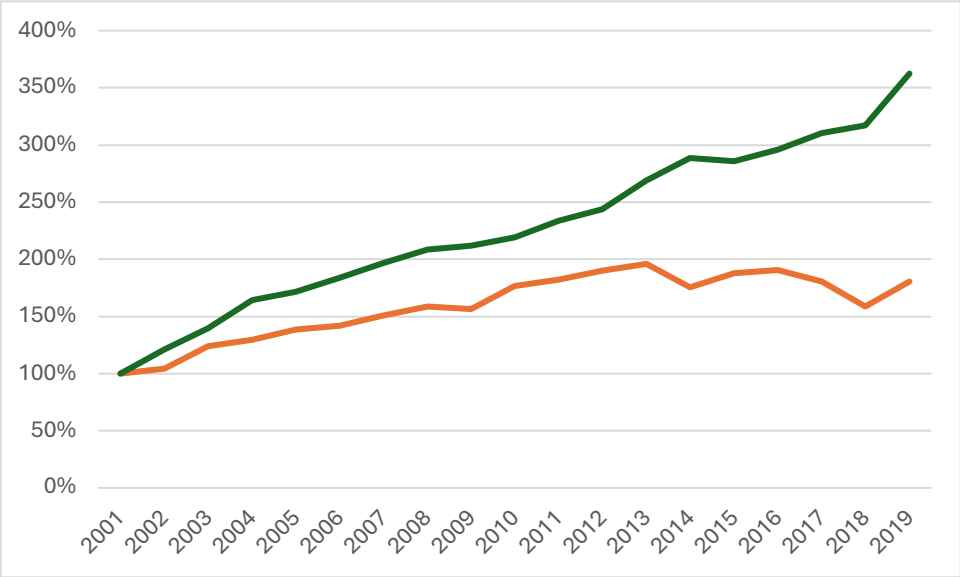
In figure 1, the comparison for the total costs for the premiums is shown for both assumptions: the original assumption of employer-provided healthcare versus the assumption of no employer-provided healthcare. Without employer subsidies, the cost of healthcare is about four times as much, but there is a leveling out and even a decline in the average with the introduction of the ACA in 2014.

Figure 1: Total Costs for Health Premiums Comparison



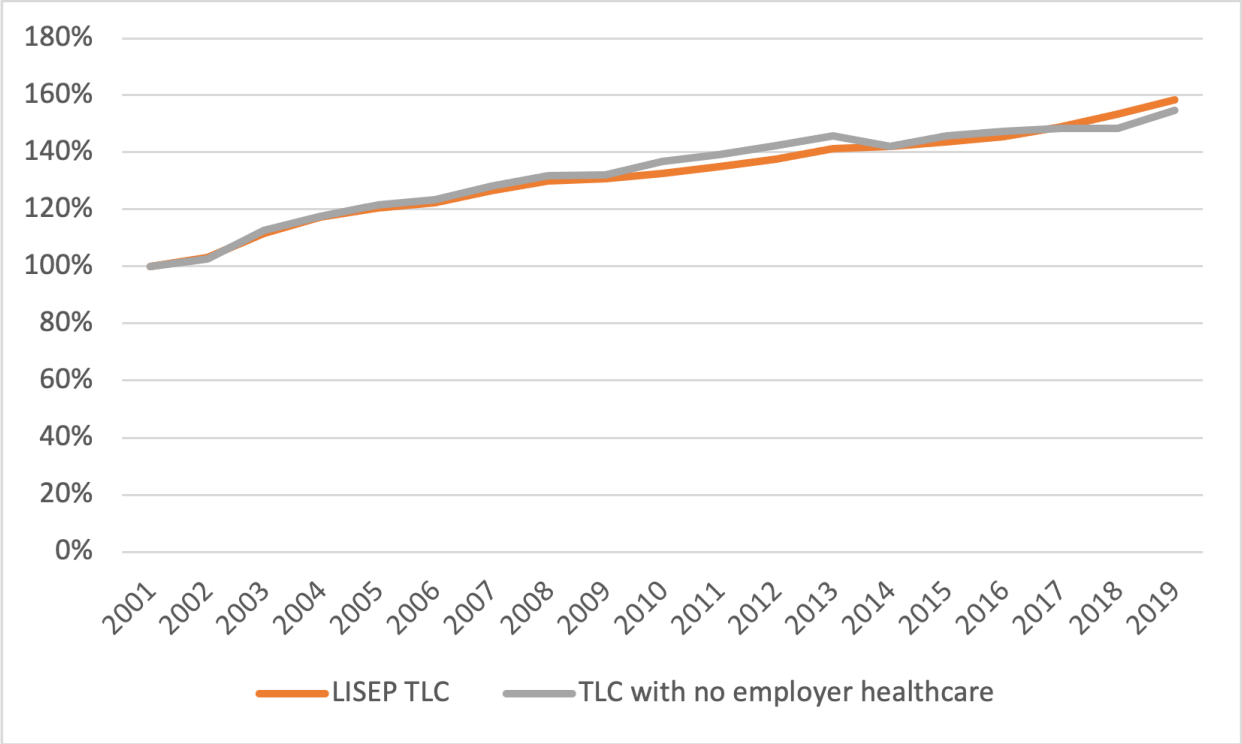
In figure 2, we show the percentage increase for costs with the two different assumptions.

Figure 2: Percentage Change Comparison in Premiums Costs



This suggests that the percentage change in employee contributions to employer-provided premiums is steeper than the percentage change in overall premiums. This is a result of the dual effect of rising premium costs and employers reducing their contributions. Notably, in 2014 the percentage change levels off with the introduction of the ACA. This effect is driven by single parents and couples with at least two children. That is because a dual-earning couple with both earners earning the median wage exceeds the 400% of poverty threshold needed to qualify for the ACA. In all though, if you compare the LISEP TLC and the TLC without the assumption of employer provided healthcare, this changes the total number only marginally. In figure 3, we graph the entire index with both assumptions to compare. The graph suggests a negligible difference.

Figure 3: TLC versus TLC without employer healthcare percentage change



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Appendix: Revisions

2024 Data Update (February 2026)

For the 2024 TLC update, LISEP revised previously published cost estimates to reflect updated data sources, methodological refinements, and corrections to the housing, food, transportation, healthcare, childcare and technology components. Under the updated methodology, the cumulative increase in cost of living between 2001 and 2023 remains 97.4%. However, the year-over-year increase for 2023 was revised from 9.4% to 9.9% as a result of these refinements. Under the 2024 update, total costs for LISEP family types in 2023 are between 1.6% and 3.9% lower than previously reported—representing reductions of $809 to $4,036, depending on household.

YEAR	LISEP FAMILY TYPE	TOTAL COSTS 2023 UPDATE	TOTAL COSTS 2024 UPDATE
2023	Single with No Child	38685	37876
2023	Single with 1 Child	64074	63037
2023	Single with 2 Children	81261	78403
2023	Single with 3 Children	90753	87797
2023	Couple with No Child	62456	60598
2023	Couple with 1 Child	84127	81955
2023	Couple with 2 Children	99706	95770
2023	Couple with 3 Children	107311	103275

Housing: Revisions reflect updates to the Intercensal Population Estimates data published by the U.S. Census Bureau for 2020-2024 and the Fair Market Rents history files published by the U.S. Department of Housing and Urban Development.

- The percentage increase of housing under the 2024 update between 2001-2023 is 131.2% compared to 131.3% under the previously published version. This largely reflects rounding differences, with the aggregate percentage increase under the 2024 update is 131.248% compared to 131.251% previously.
- Under the 2024 update, annual housing costs in 2023 were at most 29 cents lower for a family type with two adults and three children than under the previously published version.

Food: Revisions reflect updates to the Intercensal Population Estimates data for 2020-2024; the inclusion of Map the Meal Gap data for 2023 published by Feeding America to adjust national food costs to the state level and the correction of a data input error that mismatched the Map the Meal Gap meal cost series for some states in 2009 and 2011-2021. This correction also affected the adjustment of regional costs before 2009 when Map the Meal Gap data is unavailable.

- The percentage increase of food under the 2024 update between 2001-2023 is 79% compared to 78.9% under the previously published version.
- Under the 2024 update, annual food costs in 2001 were between 0.09% lower and 0.18% higher at the national level than under the previously published version. Annual food costs in 2023 were between -0.12% lower and 0.11% higher and between $14 lower and $12 higher under the 2024 update.

Transportation: Revisions reflect the following changes:

- Used car costs based on Car Gurus data and extended through CPI are no longer tracked. The average cost of car ownership is already included under the fixed costs estimates by the American Automobile Association that the Bureau of Transportation Statistics publishes. Previously, the TLC included 10% of the average purchase price of an 8-year-old popular mid-sized sedan to the fixed and variable costs of car ownership, which already account for the purchase and depreciation of a new vehicle over five years.
- The 1.75 multiplier to adjust for the higher maintenance cost of older vehicles is no longer applied as a result. This adjustment was implemented incorrectly and resulted in a downward rather than upward adjustment in maintenance costs. As a result, the removal of this part of the code results in higher maintenance costs in the 2024 update than in the previously published version, partially offsetting the decrease in costs due to the double counting of car ownership costs.
- The percentage increase of transportation under the 2024 TLC update between 2001-2023 is 56.4% compared to 52.6% under the previously published version, or 2.05% per year compared to 1.94% per year. In 2023, the percentage increase in transportation costs under the 2024 TLC update is 16.2% compared to 14.7% under the previous version.
- National transportation costs for a single adult in 2023 were $10,078 under the 2024 TLC update compared to $10,445 under the previously published version, or 3.51% smaller.
- These revisions also apply to the Minimal Quality of Life (MQL) Index 2024 update, which allocates 15,000 miles of driving per year for car owners instead of 10,000 miles under the TLC. As a result, the percentage increase between 2001-2023 was 59.4% under the MQL 2024 update compared to 55.1% under the previously published version. National transportation costs for a single adult in 2023 were $11,262 under the MQL 2024 update compared to $11,182, or 0.72% higher given the larger revision to variable costs.

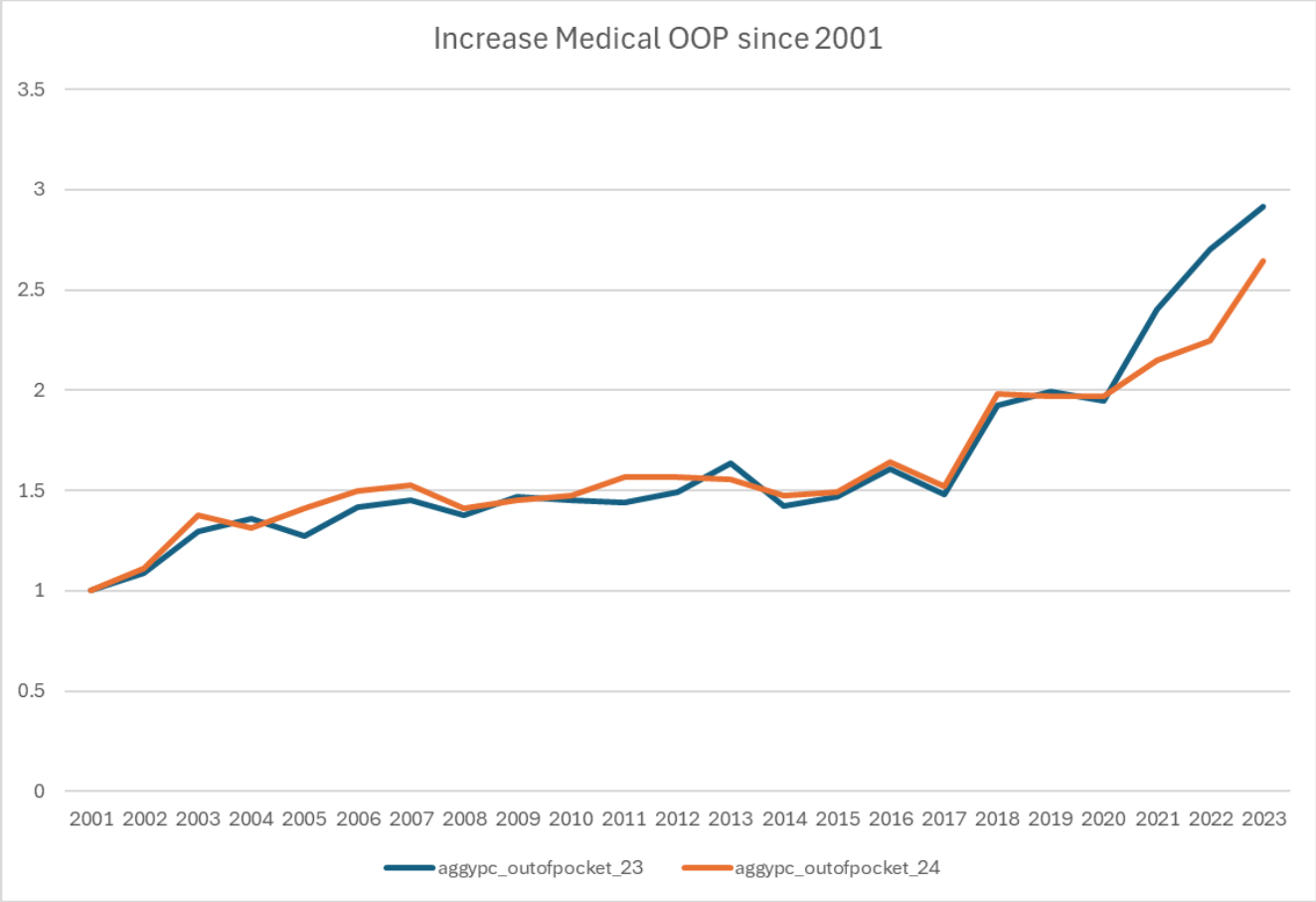
Healthcare: Revisions to medical premiums and medical and dental out-of-pocket expenses resulted in a percentage increase in healthcare costs between 2001-2023 of 199.6% under the 2024 TLC update compared to 214% under the previously published version, or 5.11% compared to 5.34% per year. In 2023, healthcare costs were between 8.3% and 13.2% lower and between $447 and $1,826 lower depending on the family type under the 2024 TLC update than under the previously published version.

Revisions reflect the following changes for medical premiums:

- Revised data input inconsistencies to ensure the average premium contributions by employees in establishments paying wages in the second wage quartile is tracked through the entire period for each state. This primarily affected the year 2001, resulting in a downward revision to the average premium paid for single-person plans and an upward revision to the average premium paid for employee-plus-one and family plans for that year. Data for the years 2002, 2005, 2006, 2009-2010 and 2015 were also revised, but fewer state-level series were affected.
- The percentage increase of medical premiums under the 2024 update between 2001-2023 was 266.8% under the 2024 TLC update compared to 300.9% under the previously published version, or 6.09% per year compared to 6.51% per year. Between 2002 and 2023, the percentage increase of medical premiums under the 2024 update was 128.3% compared to 128.8% under the previously published version.

Revisions reflect the following changes for medical- and dental out-of-pocket (OOP) expenses:

- Families with outsized OOP costs (defined as spending more than 10% of income on OOP expenses) were excluded from the regional-level average expense computation . Including this spending skewed the regional average cost per adult and per children higher, which became more common in later years
- Subtracted dental OOP spending from the medical OOP spending computation to prevent double-counting dental expenses
- Harmonized average OOP spending computation methods for adults and children.
- Update of 2023 costs with new Medical Expenditure Panel Survey (MEPS) data release.
- The percentage increase of medical out-of-pocket costs update between 2001-2023 was 164.4% under the 2024 TLC update compared to 191.3% under the previously published version, or 4.52 % per year compared to 4.98% per year. The percentage increase of dental out-of-pocket costs between 2001-2023 was 95.2% under the 2024 update compared to 84.3% under the previously published version, or 3.09% compared to 2.82% per year.
- Before 2021, medical out-of-pocket expenses under the 2024 update increased similarly to those under the previously published version: 97.0% compared to 94.4%. Under the 2024 update, the annual percentage increase in medical out-of-pocket expenses was 9.0% in 2021 and 4.6% in 2022 compared to 23.4% and 12.5% respectively:



- In total, medical and dental OOP expenses in 2022 were between 35.8% and 41.9% lower and between $595 and $1,813 lower depending on the family type under the 2024 update than in the previously published version.

Childcare: Revisions reflect the switch to tracking the average median cost of care for school-aged children at the state level rather than the 75th percentile as well as the incorporation of new data through 2022 from the National Database of Childcare Prices (NDCP), new data for 2024 from Child Care Aware of America, and new data from some states' childcare market rate survey reports.

- The percentage increase of childcare costs between 2001-2023 was 104.6% under the 2024 TLC update compared to 106.4% under the previously published version.
- The switch to tracking the 50th percentile rather than the 75th percentile resulted in childcare costs in 2023 between 6.6% and 6.9% lower and between $1,440 and $1,553 lower than under the previously published version for family types with at least two children for whom the TLC allocates school-aged childcare.

Technology: Revisions reflect the harmonization of the method to compute the cost of an iPhone and of a Samsung two years after release (in September and February of a given year respectively).

The percentage increase in technology costs between 2001-2023 was 132.6% under the 2024 update compared to 132.5% under the previously published version. This reflects that technology costs were 33.35 cents higher per adult in 2023 than under the previous version.