

# BLS Distributional Statistics

*with focus on “Distributions of PCE and CE Consumption”*

**Thesia I. Garner**

Chief Researcher, Division of Price and Index Number Research (DPINR)

*FESAC Meeting, June 10, 2022*

**Session 2: Distributional Measures at Census, BEA, and BLS**

**12:00-1:55 p.m.; presentation #3**

*version prepared for release June 2, 2022*



# Topic 1

---

## Distributional Statistics Produced in Regular Series

# Topic 2

---

## Distributional Statistics Research



# Topic 1

---

## Distributional Statistics Produced in Regular Series



# Regular Series

1. Employment and Unemployment (OEUS) statistics
2. Compensation and Working Conditions (OCWC) statistics
3. Productivity (OPT) statistics
4. American Time Use Survey (ATUS) statistics
5. Consumer Price Indexes (CPI) statistics
6. Consumer Expenditure Survey (CE) statistics



# Employment Related Distributional Statistics

## Employment and Unemployment

- **Employment**
  - ▶ Provide statistics such as
    - Average earnings and hours by industry of employment
    - Average wages by occupational employment
  - ▶ <https://stats.bls.gov/bls/employment.htm>
- **Unemployment**
  - ▶ Labor market status by demographic characteristics  
<https://stats.bls.gov/bls/unemployment.htm>
  - ▶ Special Reports
    - Working poor
    - Characteristics of minimum wage workers
    - Women in the labor force: a data book
    - Labor force characteristics by race and ethnicity
    - Highlights of women's earnings

## Occupation and Wages

- **National Compensation Survey**
  - ▶ Compensation percentile estimates – employer costs for wages and benefits by wage percentile
  - ▶ <https://www.bls.gov/ect/compensation-percentile-estimates.htm>
  - ▶ Employee benefits –averages for access and participation by wage category
  - ▶ <https://www.bls.gov/ncs/ebs/>
- **Occupation Injuries and Illnesses**
  - ▶ Nonfatal cases requiring days away from work
  - ▶ Workplace injuries available by age, race, gender
  - ▶ <https://www.bls.gov/iif/>
- **Occupational Requirements Survey**
  - ▶ By occupation and occupation groups
  - ▶ Percentiles of length of workday sitting or standing, maximum weight lifted or carried, time associated with requirements (education, training, experience)
  - ▶ <https://www.bls.gov/ors/>

# Other Distributional Statistics

## Productivity

- Dispersion Statistics on Labor Productivity— joint with Census
  - ▶ Dispersion of labor and total factor productivity for people across establishments by year and 4-digit industry
  - ▶ Standard deviation, interquartile range, 90-10 range
  - ▶ <https://stats.bls.gov/bls/productivity.htm>

## American Time Use

- Produces nationally representative estimates of how, where, and when Americans spend their time
- Provides data on full range of nonmarket activities from childcare to volunteering
- Annual (and some quarterly) time use averages and percentage estimates
  - ▶ Day of week
  - ▶ Presence and age of household children
  - ▶ Respondent age, sex, educational attainment, race and ethnicity, employment status, marital status, occupation and industry, job holding status, class of worker, earnings
  - ▶ <https://stats.bls.gov/tus/>

# Prices and Living Conditions Distributional Statistics

## Consumer Price Index

- Indexes
  - ▶ CPI-U: Consumers living in urban areas
  - ▶ R-CPI-E: Based on CUs with age of reference person or spouse, living in urban areas only
  - ▶ CPI-W: Wage earners living in urban areas only
  - ▶ C-CPI-U: U.S. city average only
- All but C-CPI-U published by
  - ▶ Census region
  - ▶ Census division
  - ▶ Select self-representing cities (metro areas)
  - ▶ <https://stats.bls.gov/cpi/>

## Consumer Expenditure Surveys

- Diary and Interview integrated statistics
- Means published by
  - ▶ Income before taxes, quintiles of income before taxes, deciles of income before taxes
  - ▶ Region of residence, population size of area, type of area of CU, State (selected states), MSA
  - ▶ Composition of CU, household size, number of earners, housing tenure,
  - ▶ Characteristics of reference person: education level, age of reference person, generation of reference person, age range of reference person, Hispanic origin of reference person, occupation of reference person, race of reference person
  - ▶ <https://stats.bls.gov/cex/>

# Topic 2

---

## Distributional Statistics Research





# Distribution Statistics: Research Examples

## 1. Employment/work/time use

- a. Growing wage inequality in the U.S. (2020 & forthcoming *Journal Labor Economics* by Handwerker), wage inequality and growth during the 2000s (forthcoming *MLR* by Dey, Handwerker, Piccone, & Voorheis)
- b. Distribution of overall compensation (update of Pierce 2010)
- c. Dispersion of labor productivity by establishment task/skill intensity
- d. Contract with outside vendor to impute time use to CE Survey data for consumption

## 2. Prices and expenditures/consumption

- a. Demographic subgroup CPIs
- b. Consumption expenditures & consumption
  - 1. Distribution of Personal Consumption Expenditures (PCE)
  - 2. BLS Comprehensive Consumption Initiative and distribution of consumption

# Follow OECD 2013 Framework for Underlying Concepts

- **Consumption expenditure** - value of consumption goods and services used or paid for by a household to directly meet its needs
  - ▶ Purchase of select goods and services in the market
  - ▶ In-kind transfers from employers (e.g., health insurance)
  - ▶ Household's own production of goods and services consumed
    - Owner-occupied housing
    - Owned vehicles
    - Durables
    - Other (e.g., child/elder care, meals)
  - ▶ In-kind transfers from other households and from businesses
- **Actual final consumption** - sum of
  - ▶ Consumption expenditure
  - ▶ Public in-kind transfers

Source: OECD (2013), *OECD Framework for Statistics on the Distribution of Household Income, Consumption and Wealth*, OECD Publishing, Paris, Chapter 5. Household Consumption, p.104.



# Framework Comparison

Item	Consumption Exp. or Final Consumption (OECD /PCE)	Proposed BLS Consumption	Planned Research
Acquisition cost of services and non-durable goods	Yes	Yes	n/a
Financial services	Yes	Yes	n/a
Service flow from housing	Yes	Yes	n/a
Service flow from vehicles *	Yes/No	Yes	Yes
Service flow from other durable goods *	Yes/No	Yes	No
In-kind receipt of goods and services **	Yes/Partial	Yes	Yes
Other home production *	Yes/No	Yes	Yes
Interhousehold transfers (including gifts received) *	Yes/No	Yes	Yes
Health***	Yes	Partial	Yes
Education	Yes	??	Not yet

\* Yes/no: in OECD, not PCE

\*\* PCE rents reflect what subsidized (e.g., rent-control, section 8, public housing) renter paid, not flow of services

\*\*\* Restricted to health insurance for BLS consumption



# Framework Comparison

Item	Consumption Exp or Final Consump. (OECD /PCE)	Proposed BLS Consumption	Planned Research
Gifts of goods & services given outside household	Yes	No	No
Life insurance/other personal insurance	Yes	No	No
Purchase price of vehicles **	No/Yes	No	No
Purchase price of other durables **	No/Yes	No	No

\*\* No/Yes: Not OECD but in PCE



# Topic 2.b.1

## Distribution of PCE over People Living in “Households”

*Researchers: S. Curtin, T. Garner, B. Martin, and B. Matsumoto*



# Overview of Research

## ■ Why produce distributional PCE accounts?

- ▶ Large demand for household distributional information in line with national accounts totals
- ▶ OECD and Eurostat launched an expert group to develop distributional results on income, consumption and savings in line with national accounts aggregates
- ▶ Developed methodology to compile distributional results in line with national accounts on the basis of available micro data sources

## ■ This project

- ▶ **Problem:** PCE available only at for total population; no household characteristics available
- ▶ **Potential solution:** assign PCE aggregates to consumer units in the CE such that distributional analysis possible
- ▶ **Potential drawback:** assumptions made regarding scaling up unlikely to reflect reality
- ▶ Work being done in coordination with BEA
- ▶ Results by percentiles and for demographic groups (only select results presented today)



# Method to Produce PCE-defined Consumption Expenditures

- Start with CE
  - ▶ Use Interview as base (represents ~ 95% of total expenditures)
  - ▶ Apply statistical matching to impute the remaining 5% from the Diary
  - ▶ To represent 2019 annual estimates, use Interviews with reference period November 2018 – February 2020
- Organize CE to match PCE category definitions
- Add what not included in CE for health care using administrative data
  - ▶ Center for Medicare and Medicaid Services (CMS) National Health Expenditure (NHE)
  - ▶ Medical Expenditure Panel Survey (MEPS-IC) from the Agency for Healthcare Research and Quality
- Scale up CE to PCE major product aggregates, e.g.,
  - ▶ 2019 PCE for Healthcare = \$2,450,839 million
  - ▶ CU “X” had 0.000005% of total PCE-defined CE healthcare spending
  - ▶ CU “X” assigned  $0.000005\% \times \$2,450,839$  million (PCE healthcare total \$) as CU “X’s” expenditure



# Most Health Care Spending Not in CE but Can Be Added at the Consumer Level

Preliminary Estimates 2019

CE to PCE Ratios			
PCE Category	Diary imputed to Interview before adjustments	+ Adjustment to split CE OOP health insurance premium into PCE categories	+ With imputations for benefits before scaling up
Pharmaceuticals and other medical goods	0.16	0.27	0.68
Health care services	0.05	0.20	0.80
Health insurance premium (net for split)	1.85	0.19	0.79

NOTE: ranking of eq. PCE expenditures after scaling up





# CE/PCE Ratios After All Adjustments to CU Expenditures but before “Scaling up” to PCE Totals

Preliminary Estimates 2019

	CE/PCE before scaling up	CE/PCE published	CE/PCE published “comparables”
<b>PCE less final Cons. Exp. of NPISHs</b>	0.70	0.60	0.73
Durable goods	0.56	0.59	0.65
Nondurable goods	0.63	0.52	0.53
Services	0.75	0.63	0.87

Source for published CE/PCE: [https://stats.bls.gov/cex/cecomparison/pce\\_profile.htm](https://stats.bls.gov/cex/cecomparison/pce_profile.htm)



# Method to Produce Distributions

- Apply square root of consumer unit size equivalence scale
- Assign equivalized CE-PCE expenditures to each person within CU
- Rank people by equivalized values (population weighted)
- Shares and rank percentiles based on equivalized values (population weighed)

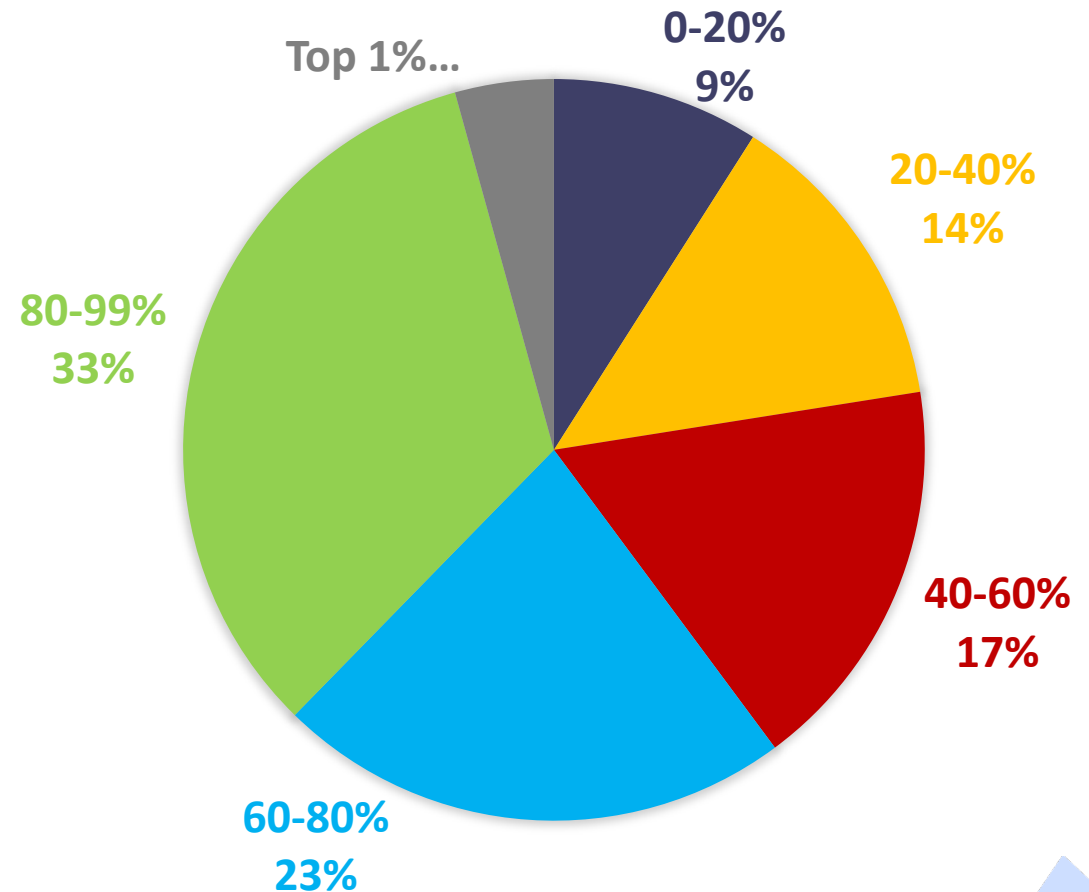


# Shares of “Equivalized PCE” by Distribution of Population

Preliminary Estimates 2019

## For example...

*33% of Equivalized PCE accounted for by the population within 80-99<sup>th</sup> equivalized CE-PCE expenditure percentile range*

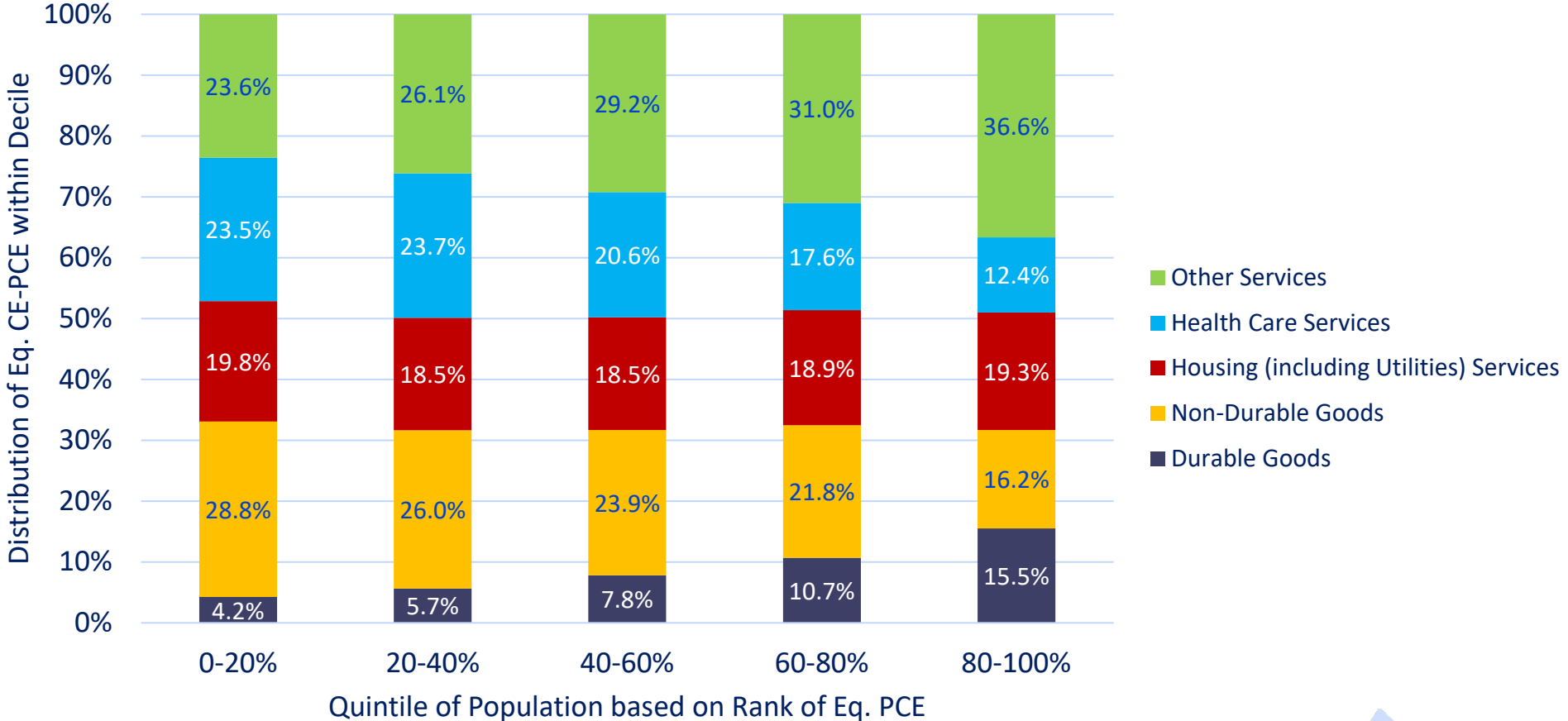


**NOTE:** Shares and rank percentiles based on CExp scaled up to PCE, referred to a “Equivalized PCE”

# Composition of “Equivalized PCE” by Quintile

Preliminary Estimates 2019

**For example...**  
*23.5% of PCE*  
*accounted for by*  
*households in the*  
*bottom quintile, is*  
*for Health Care*



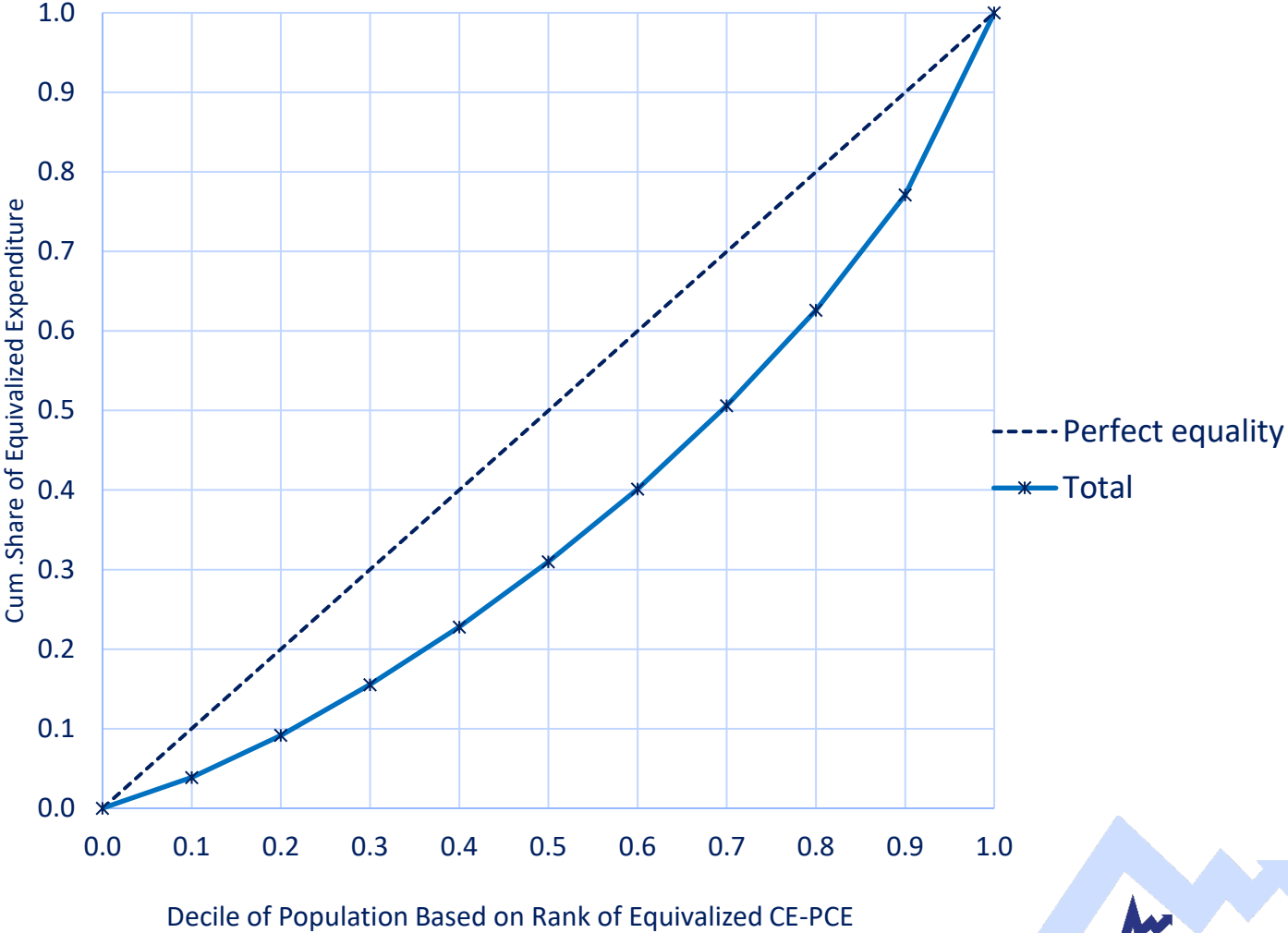
NOTE: ranking of eq. PCE expenditures after scaling up



# Equivalized PCE: Aggregate Inequality Indices & Lorenz Curve

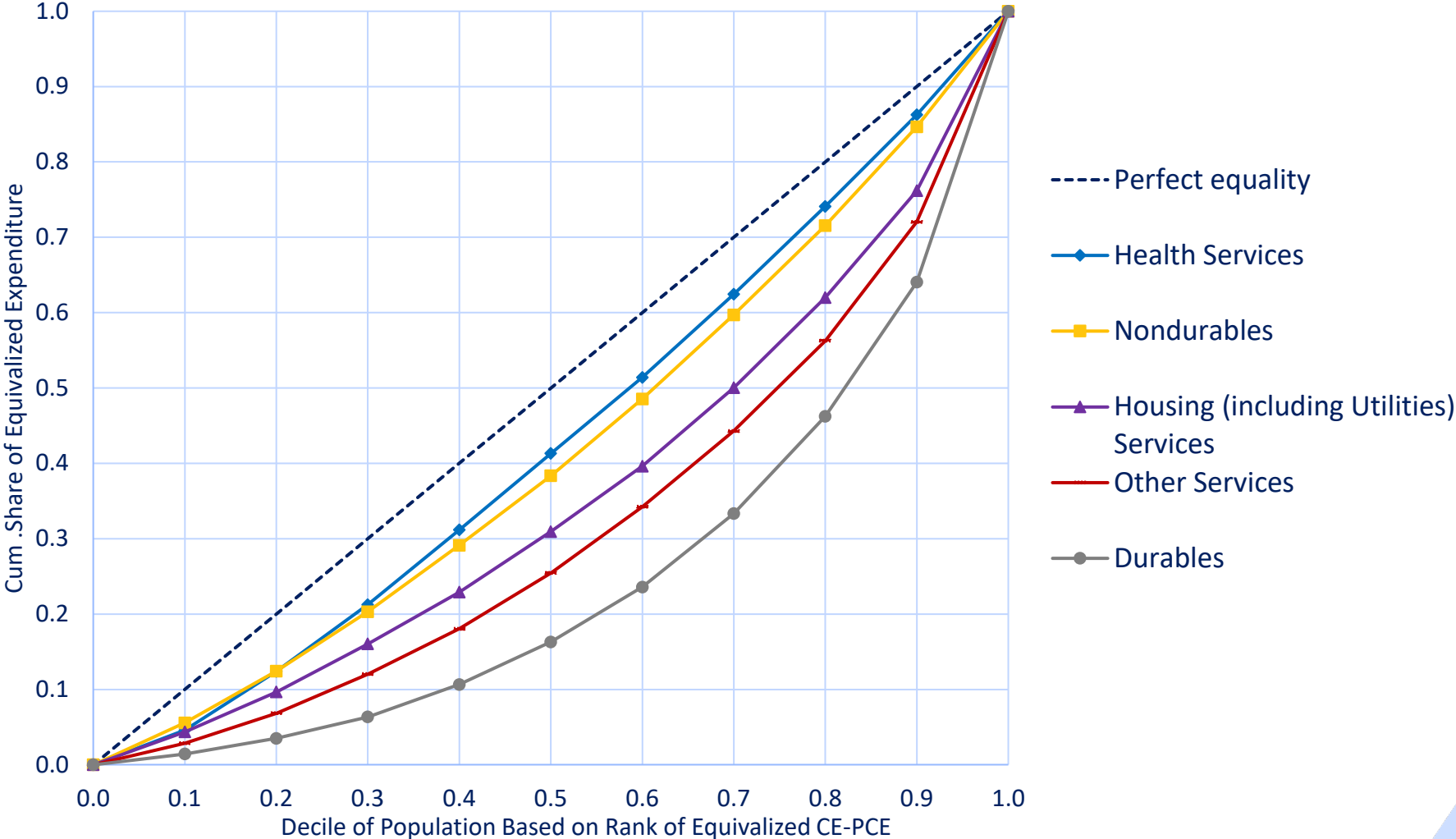
Preliminary Estimates 2019

Aggregate Inequality Indices	
Gini	0.28
Thiel	0.14
Mean log dev.	0.13
90/10 ratio	3.40



# Equivalized PCE: Concentration Curves by PCE Product

Preliminary Estimates 2019



## Topic 2.b.2

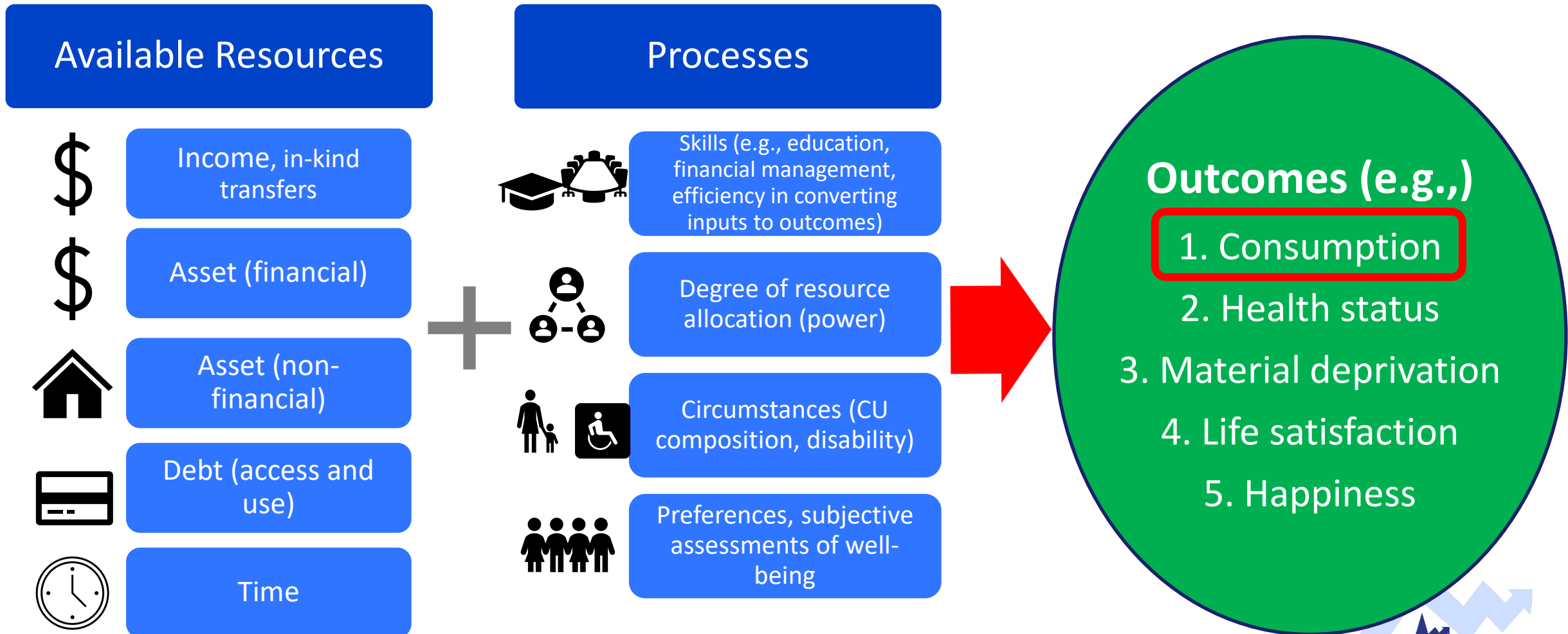
---

# BLS Initiative to Produce a Comprehensive Consumption Measure and Distributional Statistics

*Researchers: S. Curtin, T. Garner, B. Matsumoto, and J. Schild*



# BLS Initiative Focuses on Consumption as a Well-being Outcome as A Function of Resources and Processes





# Overview of Research

## ■ Why produce a comprehensive measure of consumption?

- ▶ Large demand for measure that reflects how people live, not just how they could live
- ▶ Period of COVID-19 showed us that more goods and services are produced by household members consumption of these missing in current measures of economic well-being at the household level
- ▶ Supports work and recommendations
  - OECD Framework of Final Consumption (2013)
  - Interagency Technical Working Group (ITWG) on Evaluating Alternative Measures of Poverty (2021)
  - CNSTAT Panel An Integrated System of U.S. Household Income, Wealth, and Consumption Data and Statistics to Inform Policy and Research (present)

## ■ This project

- ▶ **Problem:** Consumer Expenditure Survey is not designed to measure consumption
- ▶ **Potential solution:** identify goods and services for which consumption values missing; impute values
- ▶ **Potential drawback:** assumptions regarding imputations influenced by use (e.g., treatment of health)
- ▶ With support of academics (e.g., Consumption Symposium 2021), and others in federal agencies
- ▶ Results by percentiles and for demographic groups (only select results presented today)

# Method to Produce CE Consumption Measure

- Start with CE
  - ▶ Use Interview as base (represents ~ 95% of total expenditures)
  - ▶ To represent 2019 quarterly estimates, use Interviews with reference period January 2019 – February 2020
- Identify categories of consumer expenditures to exclude
- Add what not included in consumer expenditures



# Comprehensive Measure of Consumption

Item	Current	Planned Research
Acquisition cost of services and non-durable goods	Yes	n/a
Service flow from housing	Yes	n/a
Service flow from cars and trucks	Yes	Yes
In-kind receipt of goods and services (currently only: NSLP, LIHEAP, WIC, rental assistance)	Yes	Yes
Gifts of goods & services given outside household*	Yes	Yes
Other home production **	No	Yes
Interhousehold transfers (including gifts received)	No	Yes
Health***	No	Yes
Education	No	Not yet

\* Future: subtract for within household consumption

\*\* Contract with outside vendor to estimate

\*\*\*Restricted to health insurance



# Construction of Comparison Measures

Measure	Base	Not Included	Addition
<b>Consumption Expenditures</b>	CE Publication Definition of Total Expenditures (e.g., mortgage interest payments, net purchase price of vehicles)	Cash contributions; allocations to and purchases of life insurance, endowments, annuities, and other personal insurance; retirement, pensions, and Social Security	
<b>After Tax and Transfer Income</b>	CE Defined After Tax Income		LIHEAP, NSLP, WIC, rental assistance in-kind transfers



# Method to Produce Distributions

## ■ Measures

- ▶ Consumption quarterly
- ▶ Consumption expenditures quarterly
- ▶ After tax and transfer (TT) income divided by 4

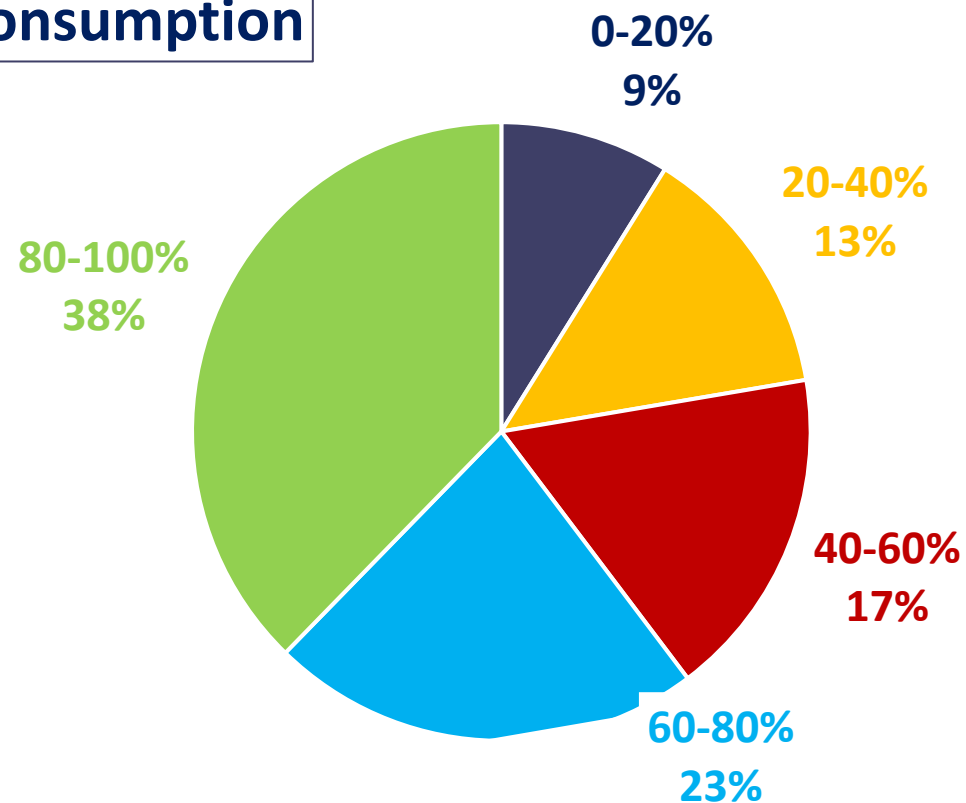
## ■ For each measure

- ▶ Apply square root of consumer unit size equivalence scale
- ▶ Assign equivalized value to each person within CU
- ▶ Rank people by equivalized values (population weighted)
- ▶ Shares and rank percentiles based on equivalized values (population weighed)

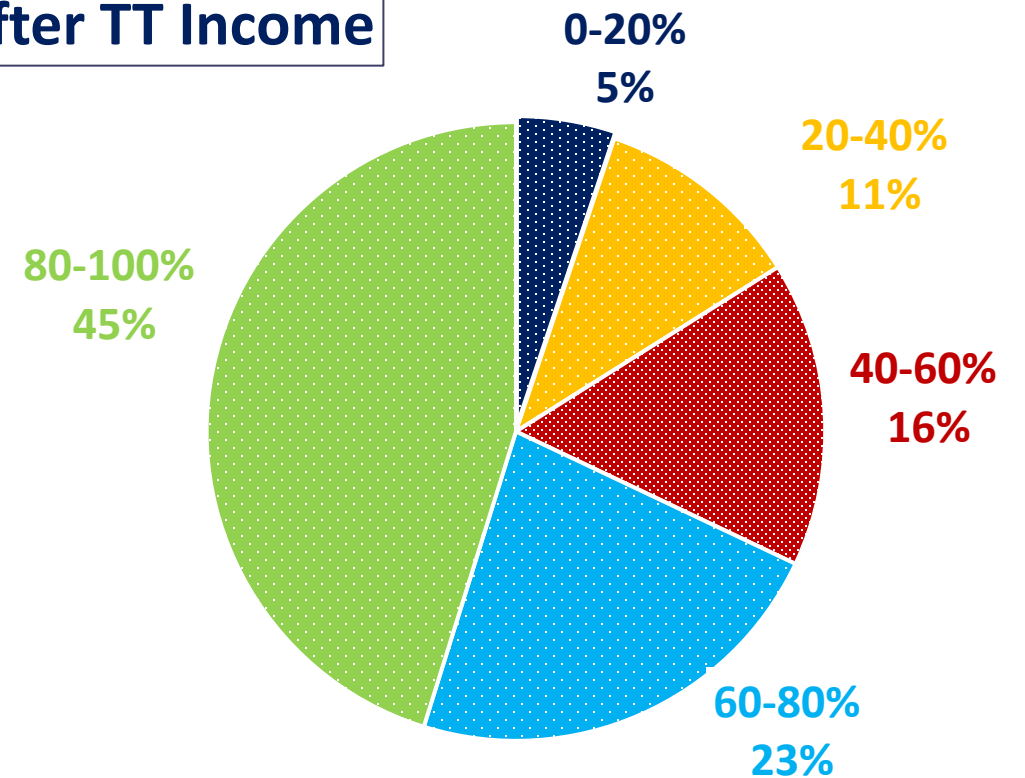
# Shares of Equivalized Consumption & Equivalized After TT Income by Quintile

Preliminary Estimates 2019

### Consumption



### After TT Income



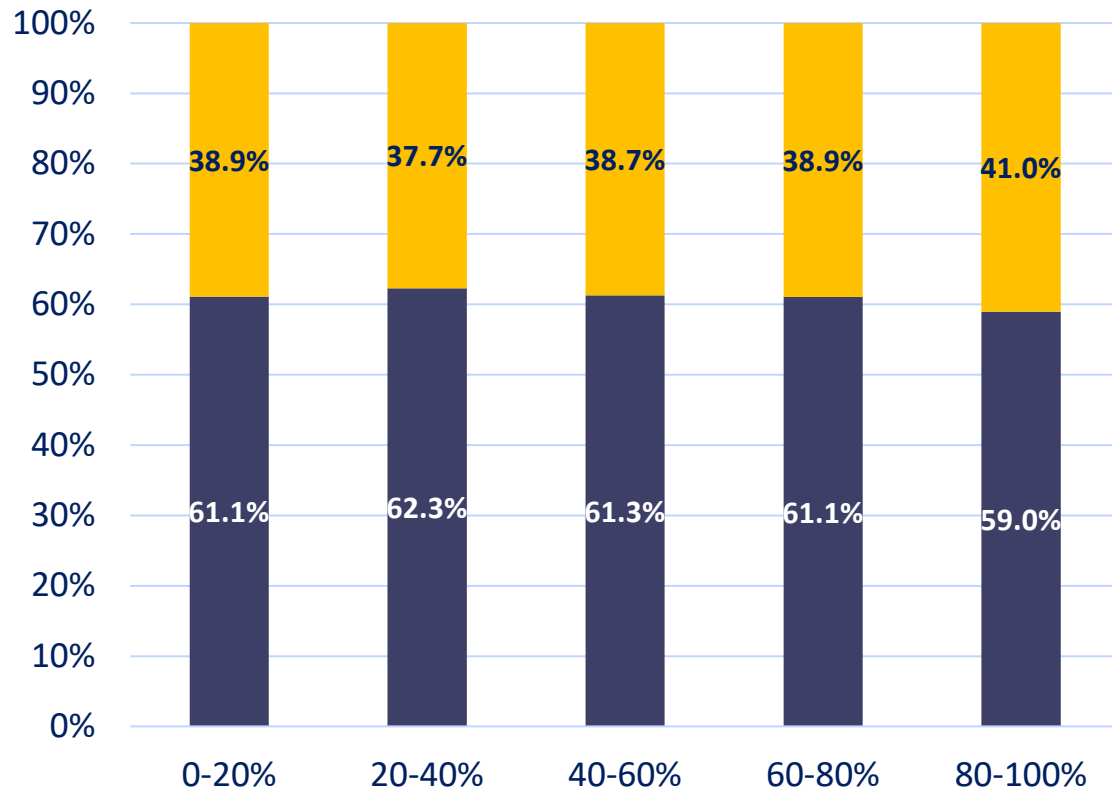
**NOTE:** Quintiles based on rank of population by equivalized consumption or after tax and transfer income



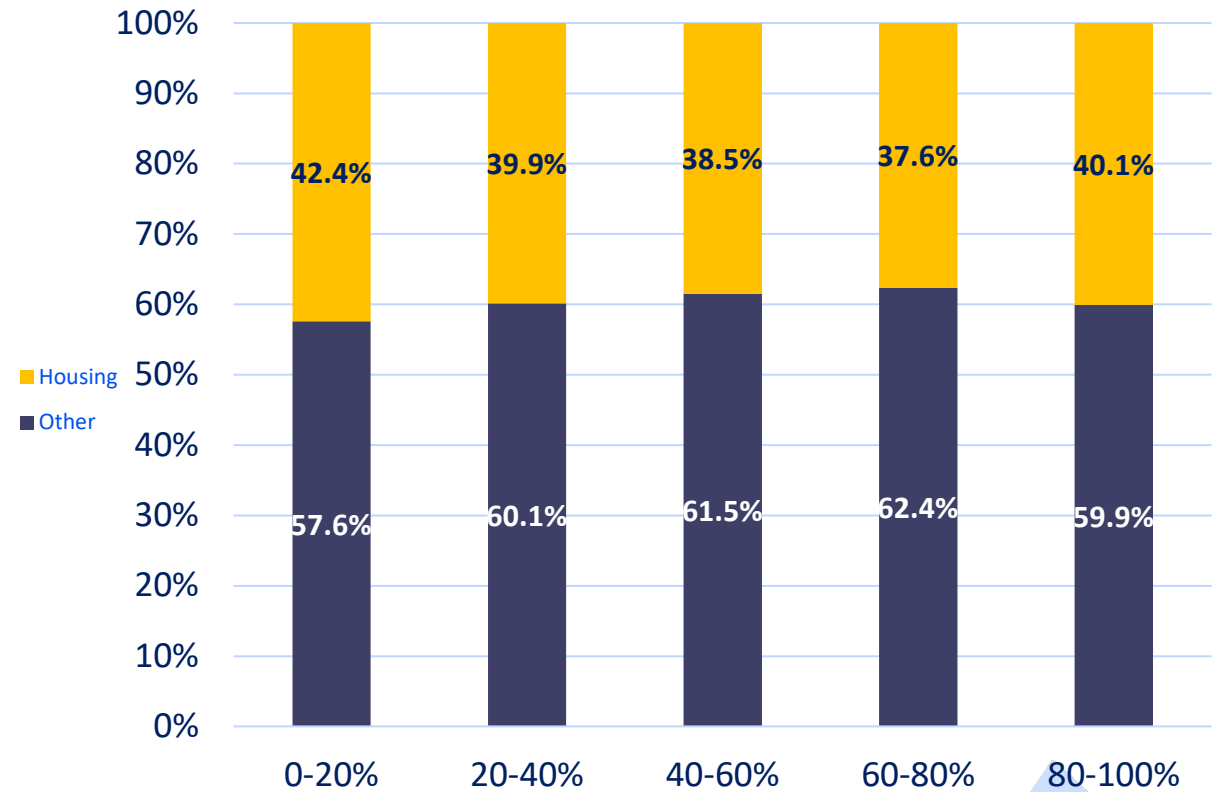
# Housing (including Utilities) as Share of Total Consumption by Quintile

Preliminary Estimates 2019

### Ranked by Consumption



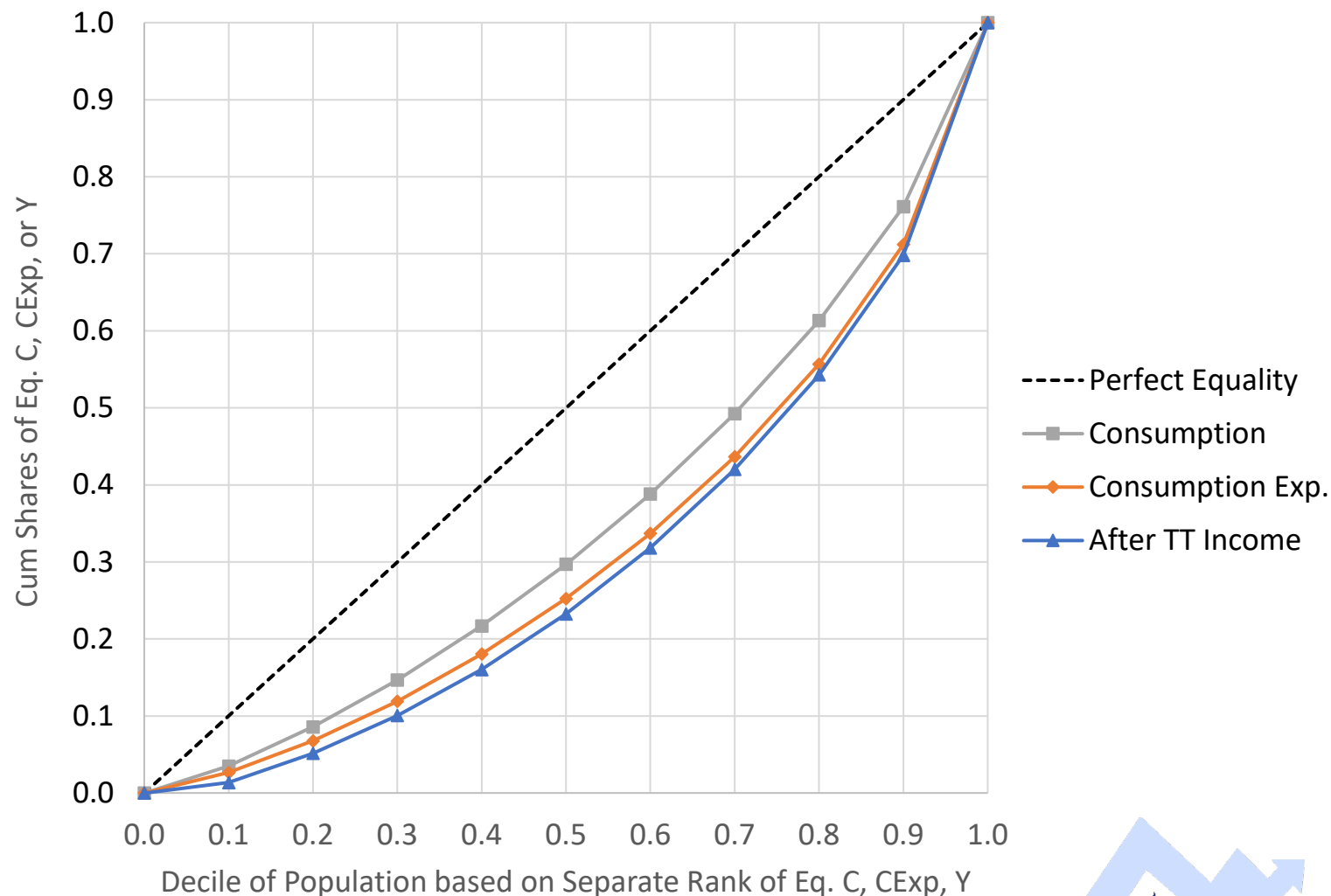
### Ranked by After TT Income



# Aggregate Inequality Indices & Lorenz Curves of Consumption, Consumption Spending, and After TT Income

Preliminary Estimates 2019

Aggregate Inequality Statistics	
<b>Consumption</b>	
Gini	0.29
Thiel	0.14
Mean log deviation	0.14
90/10 ratio	3.57
<b>Consumption Spending</b>	
Gini	0.37
Thiel	0.25
Mean log deviation	0.23
90/10 ratio	5.22
<b>After Tax and Transfer Income</b>	
Gini	0.39
Thiel	0.33
Mean log deviation	0.31
90/10 ratio	5.82





# Summary of Research Activities

- Distributional analyses regarding employment, unemployment, wages, compensation, productivity, and time use
- Distributional PCE accounts and inequality
  - ▶ Refinements to CE allocations and adjustments
  - ▶ Update to more recent time periods
- Comprehensive measure of consumption focused on inequality and poverty
  - ▶ Move closer to OECD definitions of “consumption expenditures” and “final consumption”
  - ▶ Add health insurance
  - ▶ Add home production
  - ▶ More consideration for including education (consumption for some, investment for others)
- Joint distribution of consumption, income, and wealth
- Progress posted on <https://www.bls.gov/cex/consumption-home.htm>



# Contact

**Thesia I. Garner**

Chief Researcher, Division of Price and Index Number Research (DPINR)

Bureau of Labor Statistics

Washington, DC 20212

[Garner.Thesia@BLS.gov](mailto:Garner.Thesia@BLS.gov)

