A New Measure for Food Insecurity

A Curated Data Enterprise Demonstration Use Case

Cesar Montalvo
Vicki Lancaster
Stephanie Shipp
Joseph Salvo

Social and Decision Analytics Division, Biocomplexity Institute

October 2023

Curated Data Enterprise Framework

Develop Use Cases to identify and define capabilities for building the Curated Data Enterprise

Provides foundation for creating *Statistical Products First* Approach

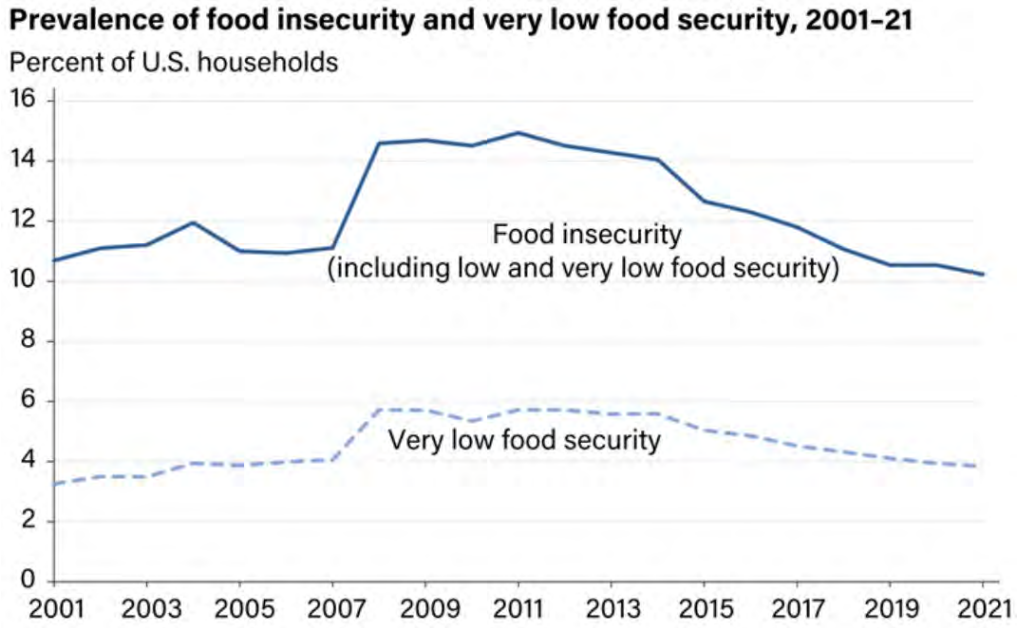
Purposes And Uses

Facts 2021

10.2 % (13.5 million households) were food insecure

3.8 % (approx. 5 million households) were very low food insecure

Source: Coleman-Jensen et. al, 2022

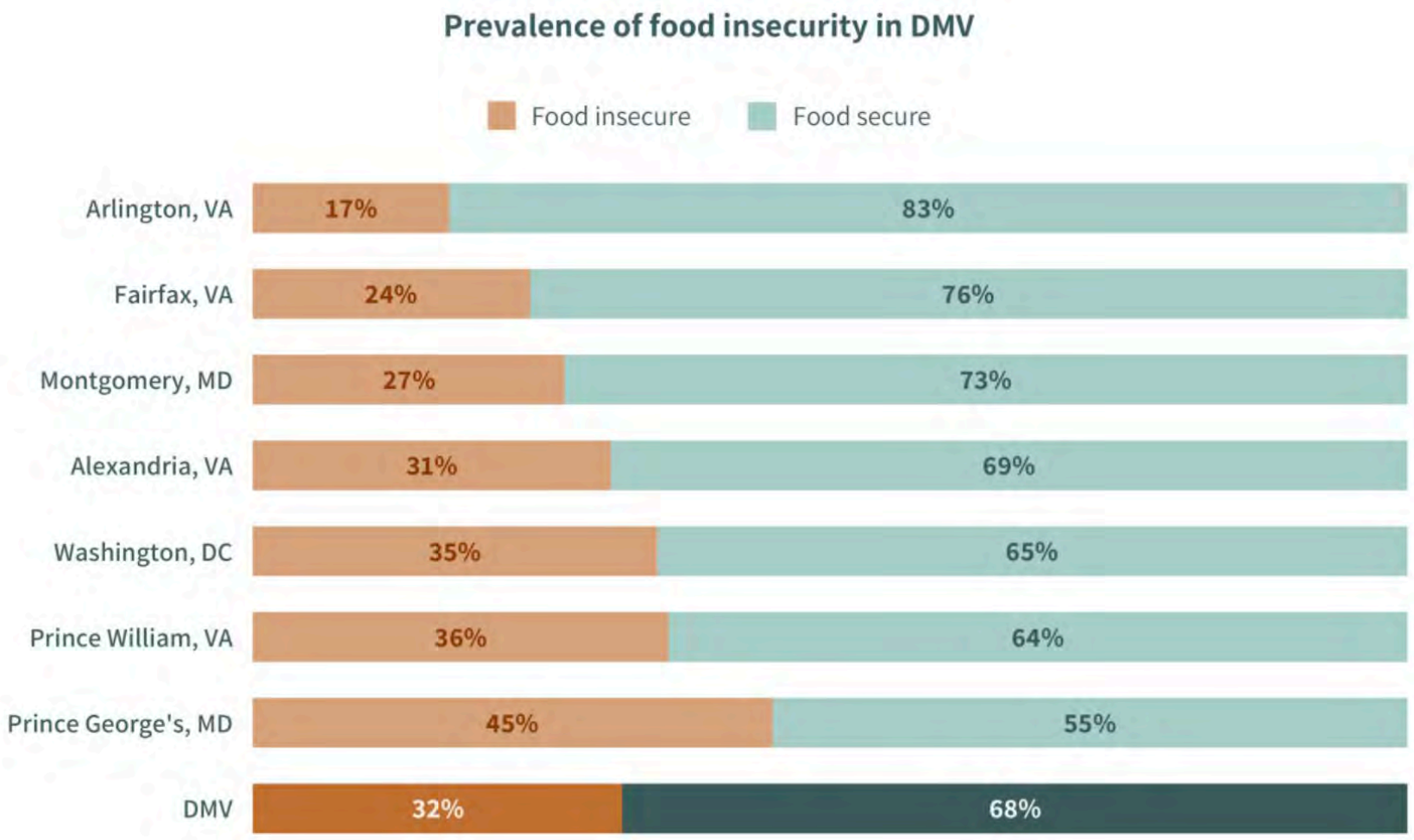


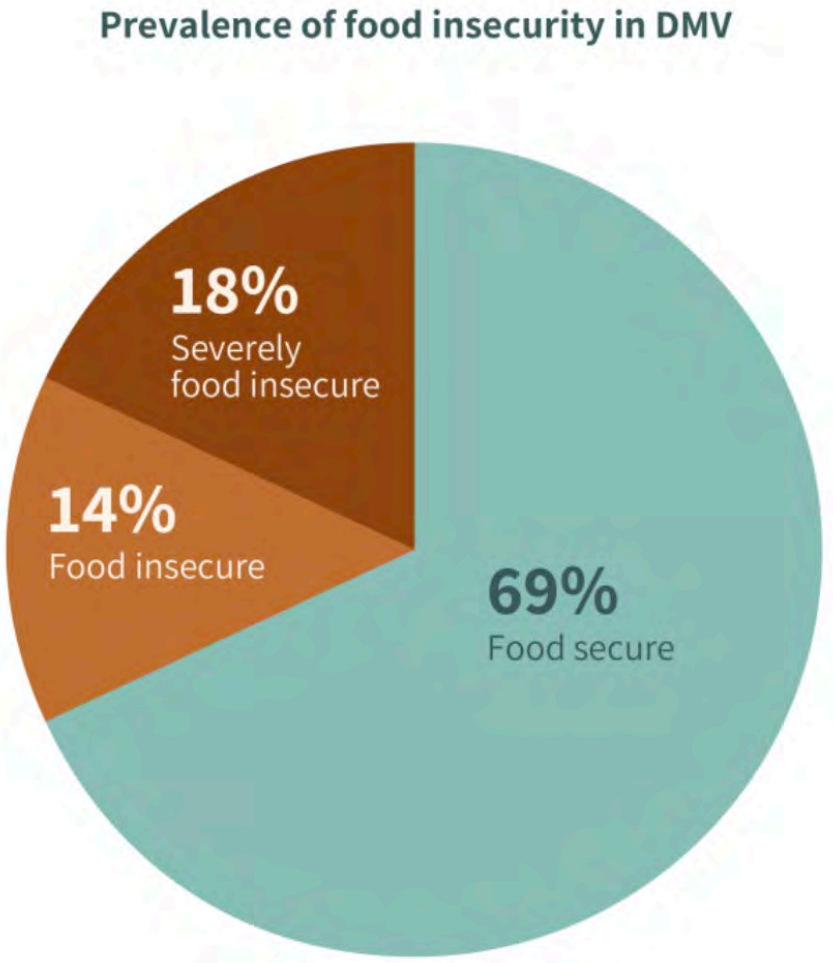
Source: Coleman-Jensen et. al, 2022

Definition

***Food insecurity*:** limited or uncertain availability of nutritionally adequate and safe food or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.

Food Insecurity in the DMV Area – 2023





Source: Capital Area Food Bank Hunger Report 2023.
Survey, May 2022 - Apr 2023, 5261 adults, DC Metro Area.
Questions: eighteen-item screener for food insecurity.

Why a new measure of Food insecurity is important?

"Indicators inform action"

- Understand smaller and specific geographies (census tract level).
- Account for household composition.
- Acknowledge income and cost of living differences.
- Predictive tool of food insecurity (e.g., housing cost or inflation).
- Identify "at-risk" populations and severity of food insecurity.
- Improve food assistance programs.

Household Living Budget (Data Discovery)

Amount of income necessary to meet a household's needs to function at a modest yet adequate standard of living and to pay federal and state income taxes.

Household Living Budget HLB

= **Food** + **Housing** + **Healthcare** + **Childcare** + **Transport** + **Internet** + **Taxes** + **Other**

Food	Housing	Healthcare	Childcare	Transport	Internet	Taxes	Other
USDA and Feeding America	Dept. Housing Urban Developm.	Health Insurance Marketplace	Women's Bureau US Dept. of Labor	Center for Neighborhood Technology	BroadbandNow	IPUMS and NBER	National Academy SEM

Novel extension: Small geographies + Household composition

Household Combination: Adult/Teenager/Schooler/Preschooler/Toddler/Infant (6-digits)

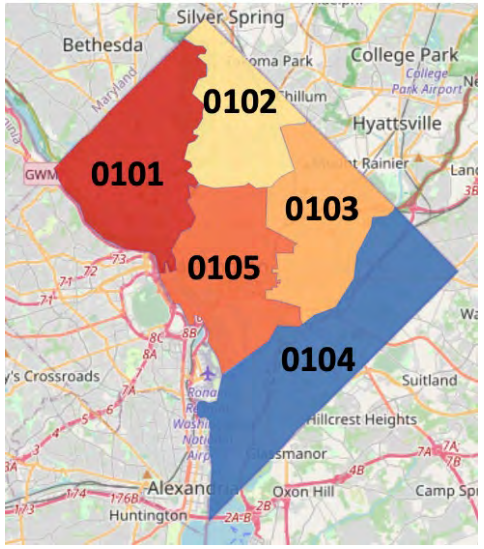
Example: 210010 → 4-person household with 2 Adults/ 1 Teenager/1 Toddler

Households based on Income and Size (Stat Development)

To obtain the income-household size table per census tract, we use Iterative Proportional Fitting

1

Seed distribution using IPUMS microdata



District of Columbia
5 PUMAs
-Public Use Microdata Areas-
at least 100,000 people

Source: US Census Bureau

2

Marginal information

Income bracket	Number Households	Margin of Error
Less than $15,000	18	±14
$15,000 to $29,999	66	±14
$30,000 to $39,999	17	±22
$40,000 to $49,999	10	±19
$50,000 to $74,999	116	±48
$75,000 to $99,999	93	±19
$100,000 to $149,999	244	±68
$150,000 to $199,999	87	±86
$200,000 and more	445	±76
Total	1,096	±76

Household size	Number Households	Margin of Error
1	146	±55
2	398	±82
3	197	±63
4	229	±81
5	82	±44
6	10	±19
7	34	±45

Source: American Community Survey

3

Number of households using **Iterative Proportional Fitting** by census tract

Household size

Income bracket	1	2	3	4	5	6	7	Number Households
Less than $15,000								18
$15,000 to $29,999								66
$30,000 to $39,999								17
$40,000 to $49,999								10
$50,000 to $74,999								116
$75,000 to $99,999								93
$100,000 to $149,999								244
$150,000 to $199,999								87
$200,000 and more								445
Total:	146	398	197	229	82	10	34	1,096

R Package: “mipfp”

Estimate(seed, target.data, method = "ipfp")

4

Synthetic population

Sampling Exercise
+
From IPUMS data
+
For all census tracts with household composition

Approx. 310000 households with 263 unique household combinations

Food Insecurity Determination using HLB (Stat Development)

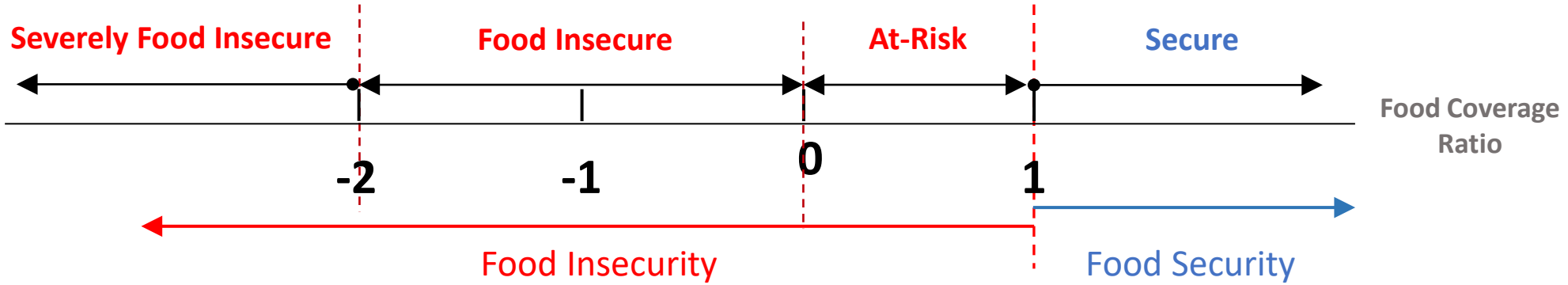
1 **HLB** = Food + Housing + Healthcare + Childcare + Transport + Internet + Taxes + Other

HLB-Nonfood Cost

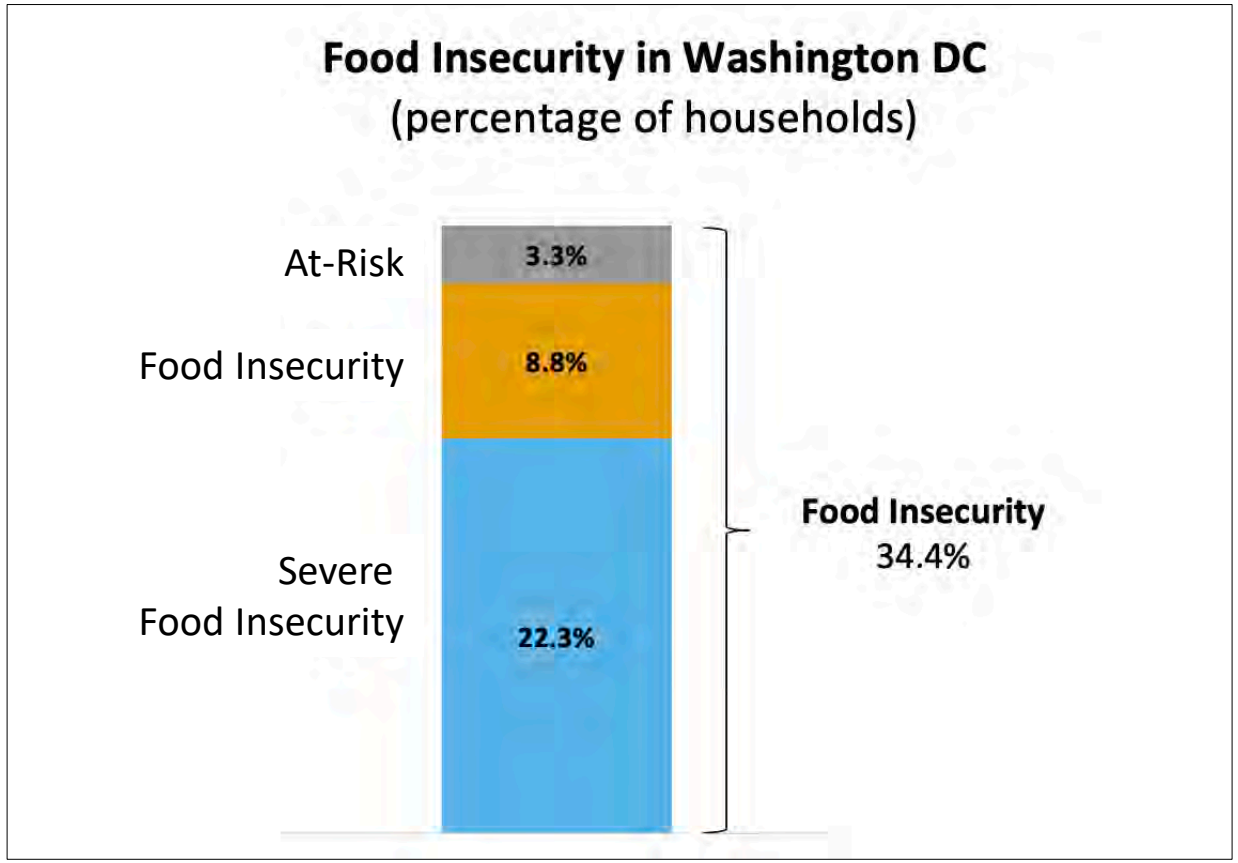
2 **Residual Food Income** = **Household Income** - **HLB-Nonfood Cost**

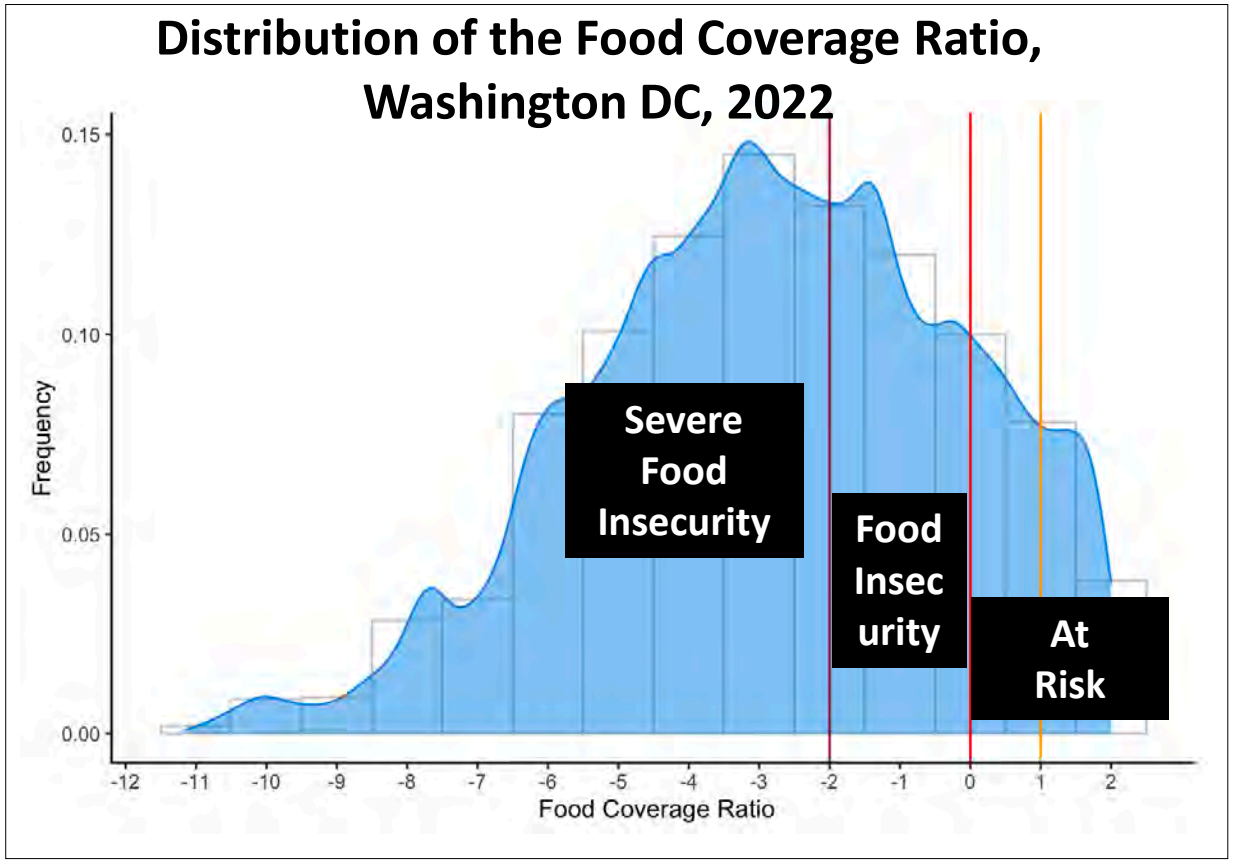
3 **Food Coverage Ratio** = $\frac{\text{Residual Food Income}}{\text{HLB Food Cost}}$

4 **Categories**



Food Insecurity Assessment Based on the HLB For Washington DC, 2022 (Fitness-for-Purpose)

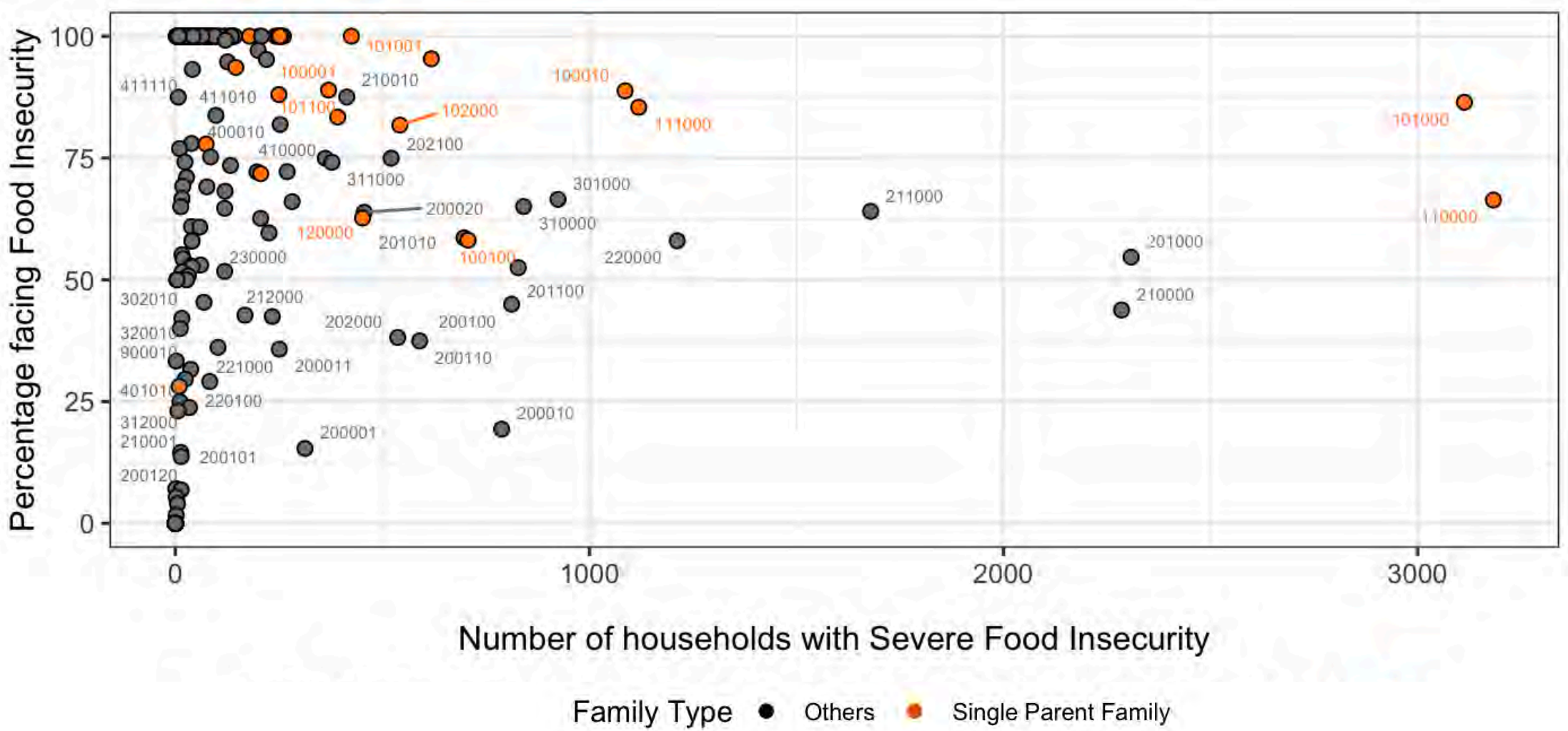




PRELIMINARY RESULTS

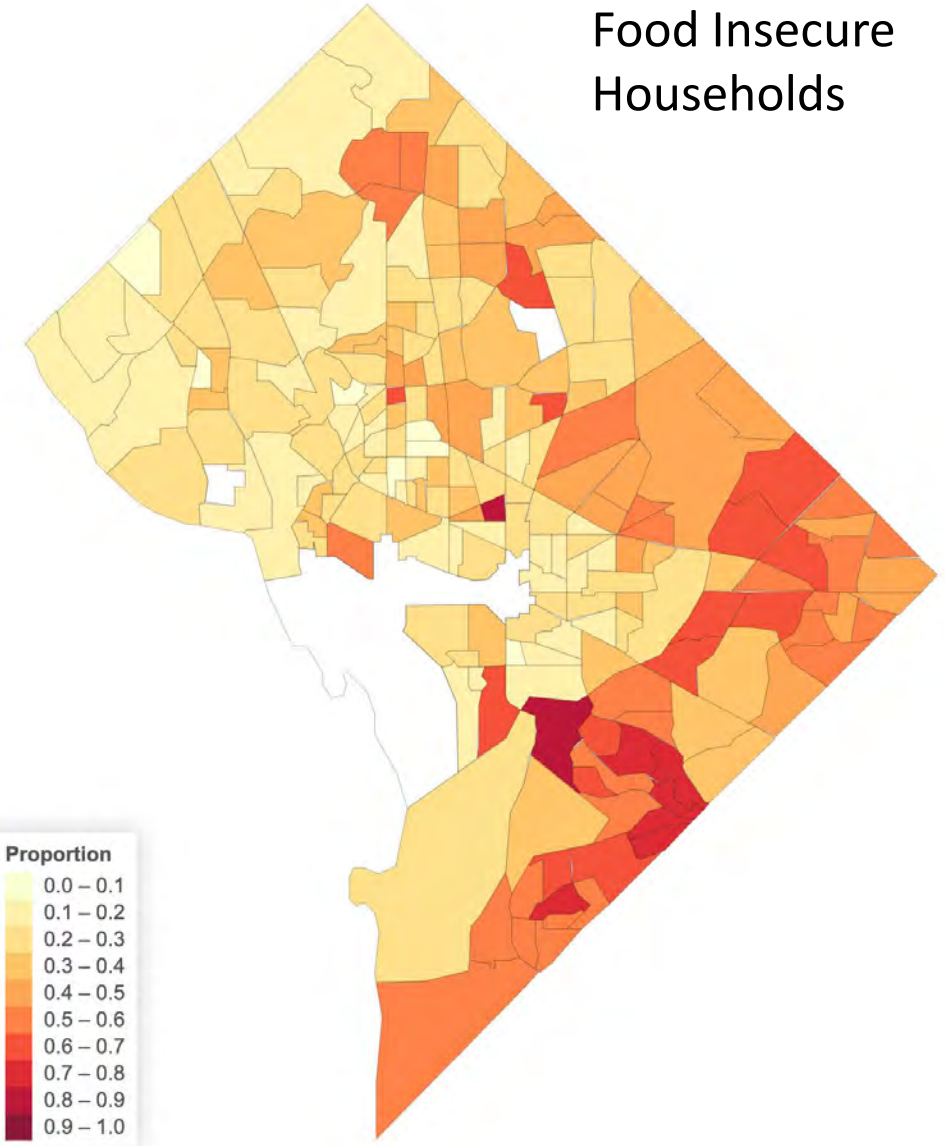
Food Insecurity For Households with Children in DC, 2022

Filled circles represent a household combination.
Household Combination: Adult/Teenager/Schooler/Preschooler/Toddler/Infant.

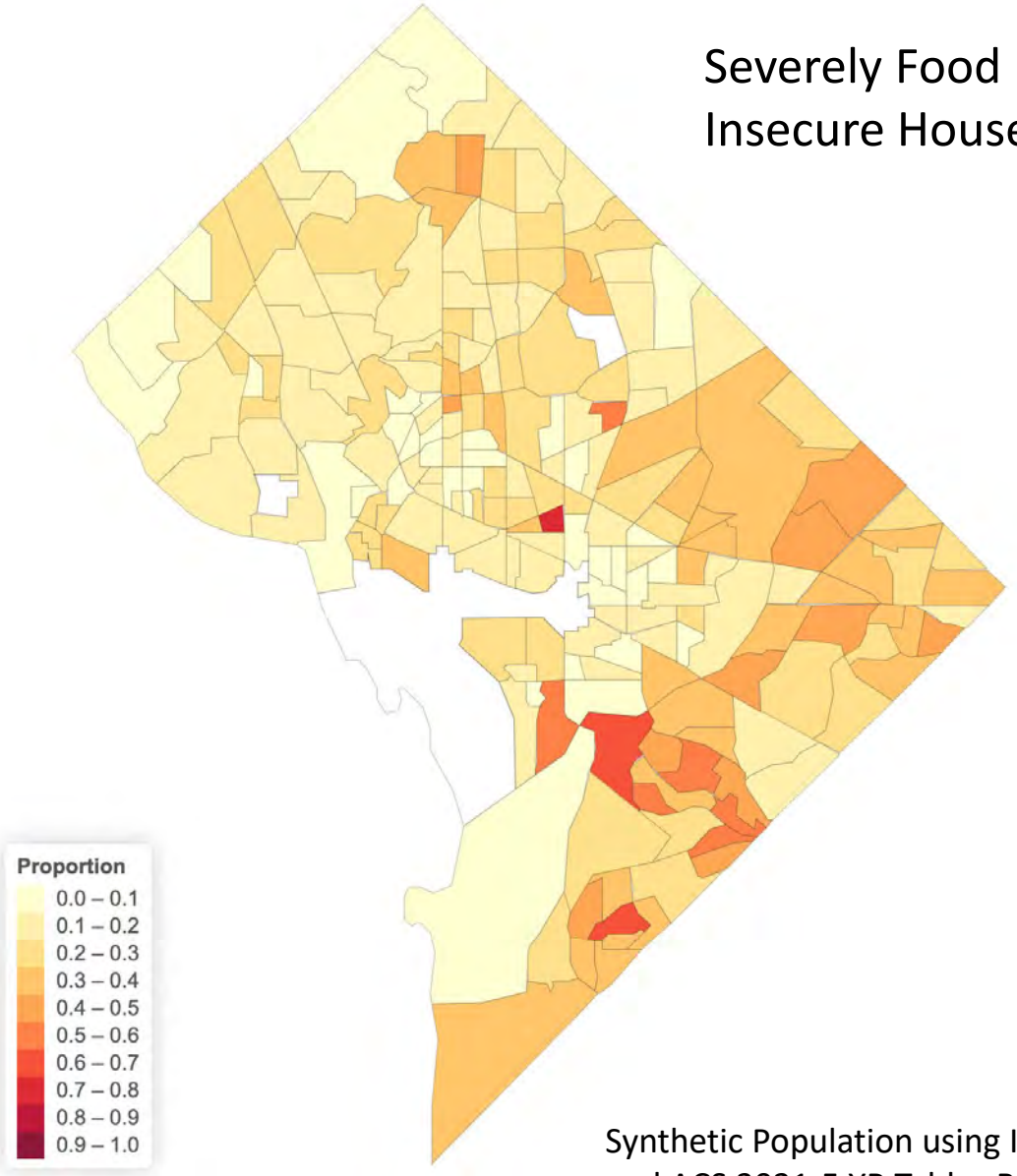


Food Insecurity in Washington DC, 2022

Food Insecure Households



Severely Food Insecure Households



Synthetic Population using IPUMS and ACS 2021-5 YR Tables B11016 and S1906.

Policy Insights

The New Measure for Food Insecurity

1. Provides a timely and cost-effective alternative to current food insecurity quantification.
2. Allows local governments to target specific areas of high food insecurity with more precision than the county data alone.
3. Presents new insight into areas that are not currently food insecure but are at risk for becoming food insecure so local governments can intervene before people are in need.
4. Helps local governments to use benefits (SNAP, WIC) to address food insecurity more efficiently.

Curated Data Enterprise Capabilities

- Household Living Budget (HLB) at census tract level
- HLB component calculations by household composition & size
- Creation of synthetic data using Iterative Proportional Fitting
- Food insecurity determination using HLB
- Maps and visualization of results

References

Barthélemy, J., & Suesse, T. (2018). mipfp: An R package for multidimensional array fitting and simulating multivariate Bernoulli distributions. *Journal of Statistical Software*, *86*, 1-20.

Berkowitz SA, Seligman HK, Choudhry NK. Treat or eat: food insecurity, cost-related medication underuse, and unmet needs. Am J Med. 2014;127:303-310.

Capital Area Food Bank, Hunger Report 2023. Accessed at https://www.capitalareafoodbank.org/.

Coleman-Jensen, Alisha, Matthew P. Rabbitt, Christian A. Gregory, and Anita Singh. "Household food security in the United States." USDA Economic Research Report 155, 2022.

Heerman WJ, Wallston KA, Osborn CY, et al. Food insecurity is associated with diabetes self-care behaviours and glycaemic control. Diabet Med. 2016;33:844-850.

Herman D, Afulani P, Coleman-Jensen A, Harrison GG. Food insecurity and cost-related medication underuse among nonelderly adults in a nationally representative sample. Am J Public Health. 2015;105:e48-e59.

Keller S, Prewitt K, Thompson J, Jost S, Barrett C, Nusser S, Salvo J, & Shipp S. A 21st Century Census Curated Data Enterprise. A Bold New Approach to Create Official Statistics, Technical Report BI-2022-1115. Proceedings of the Biocomplexity Institute, University of Virginia; 2022. DOI: https://doi.org/10.18130/r174-yk24.

Kushel MB, Gupta R, Gee L, Haas JS. Housing instability and food insecurity as barriers to health care among low-income Americans. J Gen Intern Med. 2006;21:71-77.

Pfuntner A, Wier LM, Steiner C. Costs for Hospital Stays in the United States, 2010. Statistical brief no. 146. Rockville, MD: Agency for Healthcare Research and Quality; 2013.

Seligman HK, Bolger AF, Guzman D, Lo´pez A, Bibbins- Domingo K. Exhaustion of food budgets at month's end and hospital admissions for hypoglycemia [published erratu appears in Health Aff (Millwood). 2014;33:1304]. Health Aff (Millwood). 2014;33:116-123.

Seligman HK, Schillinger D. Hunger and socioeconomic disparities in chronic disease. N Engl J Med. 2010;363:6-9.