



Congressional District Health Dashboard Technical Document

Updated February 20, 2024

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SECTION 1: Introduction

Document Mission

This document is written for individuals interested in the technical details of the Dashboard. It provides information on which data sources, sub-tables, variables, and formulas were used to operationalize all Dashboard metrics and explains the rationale for analytic decisions.

Users are invited to contact the Dashboard (info@CDhealthdashboard.com) with general feedback or questions not addressed below.

Metric Overview

The Dashboard presents measures in one of three different formats: percentage, rate, or index. The type of measure is determined by the data that are analyzed to derive each estimate. Most metrics are aggregated to the congressional district level from census tract or county data; measures are also available by demographic subgroups or at the tract level if the underlying data allow for such disaggregation. For more information years of data available for each metric, see the [Downloadable Data Codebook](#), Appendix A.

Domain	Metric Name	Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Clinical Care	Dental Care	Percentage of adults who report visiting a dentist in the past year	PLACES Project, Centers for Disease Control and Behavioral Risk Factor Surveillance System	Yes	Not Available	From Tract
	Medicaid Enrollment - % of Total Population	Percentage of individuals enrolled in Medicaid in the past quarter	American Community Survey and Centers for Medicare & Medicaid Services	No	Not Available	From Tract & State
	Prenatal Care	Percentage of births for which prenatal care began in the first trimester	Nativity Data, National Vital Statistics System, National Center for Health Statistics	No	Race/Ethnicity	From County
	Preventive Services, 65+	Percentage of adults ≥65 years who are up to date on a core set of clinical preventive services	PLACES Project, Centers for Disease Control and Behavioral Risk Factor Surveillance System	Yes	Sex	From Tract
	Routine Checkup, 18+	Percentage of adults who report visiting a doctor for routine checkup in the past year	PLACES Project, Centers for Disease Control and Behavioral Risk Factor Surveillance System	Yes	Not Available	From Tract
	Uninsured	Percentage of population ≤64 years without health insurance	American Community Survey, U.S. Census Bureau	Yes	Age, Sex, Race/Ethnicity	From Tract
Health Behavior	Binge Drinking	Percentage of adults who report binge drinking in the past 30 days	PLACES Project, Centers for Disease Control and Behavioral Risk Factor Surveillance System	Yes	Not Available	From Tract
	Physical Inactivity	Percentage of adults who report no leisure-time physical activity in the past 30 days	PLACES Project, Centers for Disease Control and Behavioral Risk Factor Surveillance System	Yes	Not Available	From Tract
	Smoking	Percentage of adults who report current smoking	PLACES Project, Centers for Disease Control and Behavioral Risk Factor Surveillance System	Yes	Not Available	From Tract

Domain	Metric Name	Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
	Teen Births	Births to females 15-19 years per 1,000 females in that age group	Natality Data, National Vital Statistics System, National Center for Health Statistics	No	Race/Ethnicity	From County
Health Outcomes	Breast Cancer Deaths	Deaths due to breast cancer in females per 100,000 female population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Race/Ethnicity	From County
	Cardiovascular Disease Deaths	Deaths due to cardiovascular disease per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Sex, Race/Ethnicity	From County
	Colorectal Cancer Deaths	Deaths due to colorectal cancer per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Sex, Race/Ethnicity	From County
	Diabetes	Percentage of adults who report having diabetes	PLACES Project, Centers for Disease Control and Behavioral Risk Factor Surveillance System	Yes	Not Available	From Tract
	Firearm Homicides	Deaths due to firearm homicide per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Sex, Race/Ethnicity	From County
	Firearm Suicides	Deaths due to firearm suicide per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Sex, Race/Ethnicity	From County
	Frequent Mental Distress	Percentage of adults who report ≥14 days of poor mental health in the past 30 days	PLACES Project, Centers for Disease Control and Behavioral Risk Factor Surveillance System	Yes	Not Available	From Tract
	Frequent Physical Distress	Percentage of adults who report ≥14 days of poor physical health in the past 30 days	PLACES Project, Centers for Disease Control and Behavioral Risk Factor Surveillance System	Yes	Not Available	From Tract
	High Blood Pressure	Percentage of adults who report high blood pressure	PLACES Project, Centers for Disease Control and Behavioral Risk Factor Surveillance System	Yes	Not Available	From Tract
	Life Expectancy	Average years of life expectancy at birth	U.S. Small-Area Life Expectancy Estimates Project (USALEEP)	Yes	Not Available	From Tract
	Low Birthweight	Percentage of live births with low birthweight (<2500 grams)	Natality Data, National Vital Statistics System, National Center for Health Statistics	No	Race/Ethnicity	From County
	Obesity	Percentage of adults who report a body mass index (BMI) ≥30 kg/m ²	PLACES Project, Centers for Disease Control and Behavioral Risk Factor Surveillance System	Yes	Not Available	From Tract
	Opioid Overdose Deaths	Deaths due to opioid overdose per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System,	No	Sex, Race/Ethnicity	From County

Domain	Metric Name	Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
			National Center for Health Statistics			
	Premature Deaths (All Causes)	Years of potential life lost before age 75 per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Sex, Race/Ethnicity	From County
Physical Environment	Air Pollution - Ozone	Average daily maximum concentration (parts per billion) of ground-level ozone throughout a month	George Mason University	Yes	Not Available	From Tract
	Air Pollution - Particulate Matter	Average daily concentration ($\mu\text{g}/\text{m}^3$) of fine particulate matter (PM2.5) per cubic meter of air throughout a month	George Mason University	Yes	Not Available	From Tract
	Housing with Potential Lead Risk	Percentage of housing stock with potential elevated lead risk	American Community Survey, U.S. Census Bureau	Yes	Not Available	From Tract
	Lead Exposure Risk Index	Index (1-10) reflecting poverty-adjusted risk of housing-based lead exposure	American Community Survey, U.S. Census Bureau	Yes	Not Available	From Tract
Social and Economic Factors	Broadband Connection	Percentage of households with high speed broadband internet connection (cable, fiber optic, DSL)	American Community Survey, U.S. Census Bureau	Yes	Not Available	From Tract
	Children in Poverty	Percentage of children living in households $\leq 100\%$ of the federal poverty level	American Community Survey, U.S. Census Bureau	Yes	Race/Ethnicity	From Tract
	Chronic Absenteeism	Percentage of public school students who miss 10% or more school days in an academic year. Note: this metric is at the congressional district (not school district) level.	National Center for Education Statistics, U.S. Department of Education	No	Sex, Race/Ethnicity	N/A
	High School Completion	Percentage of adults ≥ 25 years with high school diploma or equivalent, or higher degree	American Community Survey, U.S. Census Bureau	Yes	Sex, Race/Ethnicity	From Tract
	Income Inequality	Index (-100 to +100) reflecting households with income at the extremes of the national income distribution (the top or bottom 20%)	American Community Survey, U.S. Census Bureau	Yes	Not Available	From Tract
	Neighborhood Racial/Ethnic Segregation	Index (0-100) reflecting the geographic clustering of racial/ethnic groups across the area	American Community Survey, U.S. Census Bureau	No	Not Available	From Tract
	Racial/Ethnic Diversity	Index (0-100) reflecting how evenly distributed the population is across the racial/ethnic groups living in this area	American Community Survey, U.S. Census Bureau	Yes	Not Available	From Tract
	Rent Burden	Percentage of households where $\geq 30\%$ of income is spent on rent	American Community Survey, U.S. Census Bureau	Yes	Not Available	From Tract
	Unemployment	Percentage of population ≥ 16 years who are unemployed but seeking work	American Community Survey, U.S. Census Bureau	Yes	Sex, Race/Ethnicity	From Tract

Metric Selection Criteria

The following metric inclusion criteria were used to compile accurate, consistent, and comparable data across 5 overarching domains:

- Rigorous methods underlying the original data collection
- Data available to the Dashboard analytic team
- Evidence of importance and validity in academic literature
- Metrics that are amenable to intervention
- Time lag between the Dashboard release and data collection ≤ 5 years
- Updated regularly, preferably at least every 2 years
- Balanced across the 5 domains (clinical care, health behaviors, health outcomes, physical environment and social and economic factors)
- When possible:
 - Aligned with other existent population health reporting frameworks (e.g., County Health Rankings & Roadmaps, Vital Signs, Culture of Health)
 - Disaggregated by census tracts or demographics
 - Available for all desired geographies

Dashboard Team

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Updates to Technical Documentation

This technical document is updated iteratively as needed. The date of the most recent update is noted on its first page and footer.

Please see the Appendix for an outline of changes made to each version of this document.

Feedback or Errors

Users are encouraged to contact the Dashboard with comments or questions regarding www.congressionaldistricthealthdashboard.org and any documents available for download from it, including this Technical Document, at info@CDhealthdashboard.org.

Downloading Dashboard Data

Users should note that much of the data outlined in this document is available for free download at www.congressionaldistricthealthdashboard.org/data-access.

Users should consult the Downloadable Data Codebook, available at www.congressionaldistricthealthdashboard.org/data-access, for more detail.

Please contact the Dashboard at info@CDhealthdashboard.org with any questions or concerns.

Citing Dashboard Data and Technical Document

The Dashboard should be cited when the data or graphics are used, including in published presentations, articles, research, blogs, policy documents, and other print or digital media.

We encourage use of Dashboard data and visualizations, and suggest the following citation:

Department of Population Health, NYU Langone Health. Congressional District Health Dashboard. www.congressionaldistricthealthdashboard.org. Accessed [INSERT DATE OF ACCESS].

To cite our Technical Document, we suggest the following:

Dashboard Team. *Congressional District Health Dashboard Technical Document*. New York: Congressional District Health Dashboard; [YEAR]. Available at www.congressionaldistricthealthdashboard.org/technical-documentation. Accessed [INSERT DATE OF ACCESS].

SECTION 2: Congressional District Overview

Introduction to Congressional Districts

Congressional districts are regions designated by state governments intended to proportionally represent the state population in the House of Representatives, the lower house of Congress. Though the process of redistricting varies by state, all are required by United States federal law to redraw their district lines for the election immediately after each Decennial Census. Public Law (PL) 94-171 (December 1975) requires that the Census Bureau provides block level data to states within one year of the Census day, from which states will build their respective congressional districts.¹

PL 94-171 also guides the reapportionment of seats (i.e. congressional districts) across states¹. First, the national “ideal population size” for a district is calculated by dividing the recent Decennial Census national population by 435 (i.e. the number of congressional districts designated in the House of Representatives). Each state is mandated at least 1 district. From there, the number of districts in each state is determined by dividing state populations by the “ideal population size” and incorporating the “Equal Proportion Method” from the Census.²

The 118th Congress

The Dashboard currently provides metric data for the 118th Congress. The 118th Congress is the session of Congress elected November 2022 and inaugurated in January 2023. This election is the first election with districts derived from the 2020 Census. At the time of launch, the Census Bureau had not released 118th Congress geography information, so the Dashboard gathered geography information state-by-state. See Analytic Decisions for more.

Nonvoting Delegates

Metrics presented on the Congressional District Health Dashboard are intended to be national in scope, but unfortunately, for a supermajority of our metrics, data are unavailable for “nonvoting bodies” that send nonvoting delegates to Congress. For this reason, the Congressional District Health Dashboard has elected to not include these bodies at this time (see list below). One exception is the District of Columbia (DC), which is available in most national data sources, and therefore the Dashboard has elected to include the DC nonvoting district on the website.

These bodies include:

Current nonvoting bodies designating delegates to the House of Representatives, in alphabetical order:

- American Samoa
- The Cherokee Nation (*designate, awaiting confirmation*)
- Guam
- the Northern Mariana Islands
- Puerto Rico

Current nonvoting bodies not currently designating a delegate to the United States Congress:

- The Choctaw Nation

Note: the Congressional District Health Dashboard is exploring ways to expand data access for these districts. Please reach out to us if you have any suggestions.

SECTION 3: Analytic Decisions

Data Disclaimer

Estimates presented in the Dashboard are subject to the same limitations as those inherent in source datasets. We identify the most likely sources of bias as necessary for each metric, and users should consult the data sources to understand potential biases more fully.

Aggregating to Congressional District Estimates: Methods and Approaches

The Congressional District Health Dashboard calculates most congressional district estimates by aggregating census tract or county level estimates (“source geographies”) to the congressional district level, as these are the geographies for which data are most widely available and nationally comprehensive. You can see which metrics are derived from which geography under each metric-specific section, and in the metric table in the introduction. We use census tract data whenever possible, as they are smaller geographies and better nest within congressional districts. This makes tracts more likely to generate accurate congressional estimates, especially for smaller demographic subgroups.

Our method is conceptually similar to a dasymetric approach,³ in which population distributions from underlying geographies (in this case, census blocks) are used to derive population-weighted estimates by aggregating from the source geography.^{4,5}

Creating Block-CD Equivalency Files

In order to derive 118th congressional district estimates, the Dashboard team first acquired information linking 2020 Census blocks to 118th congressional districts. At the time of launch, the Census Bureau had not released 118th Congress geography products. Instead, the Dashboard team obtained block equivalency files (or spatial files, when necessary) directly from each state. A more detailed list of the state files and the location of access can be found in the Appendix.

Once the Census released national block equivalency files for the 118th Congress,⁶ the Dashboard team validated our state-based files against the national block equivalency file and found 99.9999% of blocks were matched to the correct congressional district. Please email info@CDhealthdashboard.org for more information.

Creating Population Crosswalks

We used the 118th block-CD equivalency files to create population crosswalks that represent the population count of each source geography (tract or county) that overlaps with different congressional districts. We accessed 2020 block population counts from the 2020 Decennial Census P2 Table (*Hispanic or Latino, and Not Hispanic or Latino, by Race*) using the variables below. We then combined these population counts with the block-CD equivalency files, and summed to create tract-CD and county-CD population crosswalks.

Demo Group	Variable(s)	Variable Definition(s)
Total	P2_001N	<i>Total Population</i>
Hispanic	P2_002N	<i>Hispanic or Latino</i>
White	P2_006N	<i>White, not Hispanic or Latino</i>
Black	P2_006N	<i>Black, not Hispanic or Latino</i>
Asian	P2_008N P2_009N	<i>Asian, not Hispanic or Latino</i> <i>Native Hawaiian or Other Pacific Islander, not Hispanic or Latino</i>
Other	P2_007N	<i>American Indian or Alaska Native, not Hispanic or Latino</i>

P2_010N	Some Other Race, not Hispanic or Latino
P2_011N	2 or More Races

Population Crosswalk Modification for Estimates in 2010 Census Vintage

Some metrics presented on the Dashboard are only available in 2010 Census vintages. To create population crosswalks between 2010 census tracts or counties and 118th congressional districts (which are in 2020 vintages), we incorporated a 2010 to 2020 block interpolation weight obtained from IPUMS’s National Historic Geographic Information Systems (NHGIS) geographic crosswalks.⁷ This weight represents the expected proportion of the 2010 block’s population and housing units located in each 2020 block. Metrics using this modified method are noted in metric-specific sections.

Formula

To derive congressional district estimates, we assigned estimates from source geographies (tract or county) to their overlapping congressional districts using the aforementioned population crosswalks. We then created a population weight (P) for the appropriate demographic group by dividing the overlapping population count by the full congressional district population count. Population counts from source geographies with missing estimates were dropped from the calculation.

We multiplied this population weight by the source geography estimate (tract or county), then summed all weighted estimates to calculate the final derived congressional district estimate (see Equation). This method is applied to rate and percentage metric calculations. Unless otherwise noted in metric-specific sections, the Dashboard calculates the full metric at the source geography, and then aggregates to congressional districts. Some metrics require combining multiple variables to calculate the estimate. If one variable is missing (NA) then we exclude it from the source geography estimate calculation.

$$Est_{derived, CD} = \sum est_{source\ geo} * P_{(source\ geo\ population\ in\ CD | CD\ population)}$$

Formula Modification for Count Data

The Dashboard sometimes calculates derived congressional district *count* estimates, which requires a modification to the population weight formula indicated above. The weight in this instance represents the proportion of the full source geography population (tract or county) contained in the area of that geography *overlapping* with the congressional district. This adjustment is to properly reflect the non-proportional count estimate.

Confidence Intervals for Aggregated Estimates

The Dashboard does not release confidence intervals (CIs) for any aggregated estimates, due to substantial imprecision in calculated margins of error (MOEs), which is induced in using a standard sum of squares approach.

Censoring/Flagging Aggregated Estimates with Missing Contributing Data

The Dashboard team censors or flags congressional district derived estimates that are missing sufficient contributing data, which can impact estimate accuracy. Please email info@CDhealthdashboard.org for more information about our censorship development process.

Criteria differ by source geography. County to congressional district estimates are censored and flagged with more stringent criteria because counties (as compared to tracts) overlap more poorly with each

congressional district. Therefore, each missing county estimate has greater impact on the full congressional district estimate. For metric estimates that require combining multiple subgroup/component variables, populations for subgroup/component variables that are missing may not contribute to censoring or flagging.

Criteria for Censoring and Flagging Derived Estimates <i>% Population Missing From Source Geography Data</i>		
	Censor	Flag
Tract	>25%	> 10% and < 25%
County	>10%	> 0% and < 10%

Censored estimates are removed from the website and downloadable data. Flagged estimates are noted in “Tips and Cautions for using the Data” on the website, or in downloadable data. Users should consult the Downloadable Data Codebook, available at www.congressionaldistricthealthdashboard.org/data-access, for more detail.

Note that these criteria differ from the criteria for metrics calculated from the National Vital Statistics System. Please see that data source section for more details.

Validating Estimates

The Dashboard team completed extensive analyses to validate our methods and analytic decisions for deriving congressional district estimates. Please email us at info@CDhealthdashboard.org to learn more.

At-large District Codes + Estimates

Some states send only one representative to the House of Representatives because their populations do not meet the “ideal population size.” These states are considered “at-large” districts. The Congressional District Health Dashboard made the decision to use “[state FIPS code]01” to designate these districts, as opposed to the Census Bureau’s designation of “[state FIPS code]00”, for internal consistency.

Because at-large districts share boundaries with their state, the Dashboard presents state estimates for these at-large districts. See “State + National Estimates” below for more information on calculating state estimates.

Census Tract Estimates

Census tract estimates are provided on the website and for download for select metrics. Demographic subgroup estimates are not provided for census tracts due to the small population counts. Users should note that some census tract estimates may be unstable due to low population count and sampling bias. Interested users can access downloadable data and census tract confidence intervals (when available) to better assess estimate reliability. See www.congressionaldistricthealthdashboard.org/data-access for more detail.

Census Tract-CD Assignment

Census tracts in 2020 geographies were assigned to 118 congressional districts using the 2020 block-CD equivalency file detailed in section “Creating Block Equivalency Files”. Census tracts in 2010 geographies were assigned to congressional districts by transforming 2010 blocks into 2020 blocks using the 2010 to 2020 block interpolation weights obtained from IPUMS’s National Historic Geographic Information Systems (NHGIS) geographic crosswalks.⁷ Then, the 2020 block-CD equivalency file was used.

The Census infrequently modifies Census tract IDs/FIPS codes between Decennial Censuses to fix errors and account for county geography changes.⁸ To maintain consistency across the website, the Dashboard standardizes all data sources' FIPS codes back into original Decennial Census vintages. Interested users can email info@CDhealthdashboard.org for more information.

National + State Estimates

National estimates on the Dashboard represent the unweighted average of congressional district estimates by metric and year for the total population only. Estimates for identical or similar metrics that use the nation as a sampling frame may produce different estimates. Average estimates are calculated after censoring criteria are applied. See the section "Censoring/Flagging Estimates with Missing Contributing Data" for more details.

State estimates on the Dashboard may represent either:

- the unweighted average of congressional district estimates by metric and year for total population
- an aggregation of tract-level total population estimates, using the same method as congressional districts outlined in "SECTION 3: Analytic Decisions"
- total population estimates calculated directly from the data source using a state sampling frame

See "Geography-Specific Notes" under each metric section to learn more.

Confidence Intervals

Confidence intervals (CIs), also known as confidence limits, provide a measure of the variation around a given estimate of a population value. For consistency, this document exclusively uses the term confidence intervals.

Confidence intervals are provided in downloadable data for census tracts and states, where available. As noted in section "Confidence Intervals for Aggregated Estimates", confidence intervals are not calculated for aggregated estimates.

CI Calculation

Dashboard CIs are reported at the 90% level. Ninety-five percent CIs are most commonly reported in the scientific literature. However, the Dashboard reports 90% CIs for a number of reasons. Most notably, the Census Bureau recommends calculation of 90% CIs when using American Community Survey data.⁹ The Dashboard opted to construct 90% CIs from standard errors where necessary to ensure consistency between measures. There are a number of formulas for deriving CIs; selection depends on properties of the underlying data source. See Section 4 below for specifics on the formula used.

Confidence intervals for percentages were manually restricted to minimum 0 and maximum 100 when raw values exceeded these bounds. As a rule, CIs were not calculated for the Dashboard's index values because indices reflect a weighted composite of measures that are then scaled, making CI calculation relatively complicated and less meaningful.

Metric Subgroup Race/Ethnicity Categories

Where possible, the Dashboard disaggregates metrics by the following demographic groups: Asian (Asian or Native Hawaiian or Pacific Islander (NHOP)); Black/African American; Hispanic/Latino; white (not Hispanic or Latino); and other (some other race, 2 or more races, or American Indian/Alaska Native

(AIAN)).¹⁰ Federal guidelines for reporting data by demographics¹⁰ mandate separate categories for AIAN and NHOPI. However, the geographic areas used to generate Dashboard estimates generally lack large enough populations for reporting stable estimates for these groups. The Dashboard therefore combines NHOPI with Asian and AIAN with “other race” and two or more races, as data availability allows. See the metric-specific sections for more details.

District Snapshot: District Facts

Congressional district demographic data on the District Snapshots: District Facts pages are calculated by aggregating ACS tract-level 5-year estimates via the method described in the section “Getting to Congressional District level Data: Methods and Approaches.” Variables selection was informed by consultations with demographic experts and community partners (see more in a [blog from our city website](#)). *Asian, American Indian and Alaska Native, and Native Hawaiian or Other Pacific Islander* subgroups reflect persons who either identify as this race alone or in combination with other races or ethnicities, allowing for greater representation that aligns with group identities. This may result in totals that exceed 100%. See the below table for demographic group name and variable details.

Demographic Group	Variable(s)	Variable Definitions
Total population	DP05_0001	<i>Estimate!!SEX AND AGE!!Total population</i>
American Indian and Alaska Native	DP05_0068	<i>Estimate!!Race alone or in combination with one or more other races!!Total population!!American Indian and Alaska Native</i>
Asian	B02018_001	<i>Estimate!!Total Groups Tallied: (ASIAN ALONE OR IN ANY COMBINATION BY SELECTED GROUPS)</i>
Black or African American	DP05_0038	<i>Estimate!!RACE!!Total population!!One race!!Black or African American</i>
Hispanic	B03001_003	<i>Estimate!!Total:!!Hispanic or Latino:</i>
Native Hawaiian or Other Pacific Islander	B02019_001	<i>Estimate!!Total Groups Tallied: (NATIVE HAWAIIAN AND OTHER PACIFIC ISLANDER ALONE OR IN ANY COMBINATION BY SELECTED GROUPS)</i>
Other race alone	DP05_0057	<i>Estimate!!RACE!!Total population!!One race!!Some Other Race</i>
White, non-Hispanic	DP05_0079	<i>Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!White alone</i>
Two or more races	DP05_0035	<i>Estimate!!RACE!!Total population!!Two or More Races</i>
Age 0-17	DP05_0019E	<i>Estimate!!SEX AND AGE!!Total population!!Under 18 years</i>
Age 18-64	DP05_0001E - DP05_0024E - DP05_0019E	<i>See other rows</i>
Age 65+	DP05_0024E	<i>Estimate!!SEX AND AGE!!Total population!!65 years and over</i>

Website CD + Tract Maps

118 congressional district and 2020 Census tract website maps were created by combining the Dashboard-created 2020 national block-CD equivalency file with 2020 block spatial files. Block shapes were dissolved into congressional districts, or 2020 tracts in congressional districts, then ocean and great lake shorelines were removed using a 5m national cartographic map from the US Census.¹¹ For 2010 tracts in congressional districts, a spatial intersect and additional cleaning steps were performed between 2010 tract and 118 congressional district boundaries. Please email us at info@CDhealthdashboard.org to learn more.

Analytic Software

All analyses were performed in R using tidyverse, tidycensus, tigris, and sf packages, among others.¹¹⁻¹⁵

SECTION 4: Metric Analyses, by Data Source

American Community Survey

General Notes

The American Community Survey (ACS) is administered by the US Census Bureau⁹. Data are retrieved from the census API using R and the tidycensus package.^{16, 13} Variable labels from the API (e.g., Estimate; SEX AND AGE - Total population), not names (e.g., S2801_C01_017E), are outlined in metric sections.

Race/Ethnicity Definition

Tables ending in the following letters were used to calculate metrics by race/ethnicity

- Asian: Values in tables ending in D (Asian alone) and E (Native Hawaiian and other Pacific Islander alone) were summed
- Black/African American: Tables ending in B (Black or African American alone)
- Hispanic: Tables ending in I (Hispanic or Latino)
- Other: Values in tables ending in C (American Indian and Alaska Native alone), F (Some other race alone), and G (Two or more races) were summed
- White: Tables ending in H (White alone, not Hispanic or Latino)

Users should note that, unless specified otherwise, estimates for some demographic groups derived from ACS data are not mutually exclusive with estimates for Hispanic/Latino ethnicity. Thus, individuals represented in the following racial categories who also identify as Hispanic may also contribute to counts for the Hispanic demographic subgroup: Asian, Black, Native Hawaiian or Pacific Islander, two or more races, or some other race.

Confidence Interval Calculation

90% CIs for relevant ACS data were calculated according to the formula: estimate \pm MOE. When confidence intervals extended less than 0 or greater than 100 for % metrics, these were set to 0 or 100, respectively. CIs are not calculated for indices.

When combining multiple ACS variables, approximated MOE's for summed count data and derived proportions/ratios in ACS data were calculated as per the US Census Bureau's publication.¹⁷ The functions moe_sum, moe_prop, and moe_ratio from the tidycensus package were used.¹³

Relevant formulas are presented verbatim here for users' reference:

Calculating MOE's for Summed Count Data¹⁷ (p. A-14)

$$MOE_{\text{aggregated count}} = \pm \sqrt{\sum_c MOE_c^2}, \text{ "where } MOE_c \text{ is the MOE of the } c^{\text{th}} \text{ component estimate"}$$

Calculating MOE's for Derived Proportions¹⁷ (p. A-14, A-15)

$$MOE_{\text{derived proportion}} = \pm \frac{\sqrt{MOE_{\text{numerator}}^2 - (\hat{p}^2 * MOE_{\text{denominator}}^2)}}{\hat{x}_{\text{denominator}}}$$

“where $MOE_{numerator}$ is the MOE of the numerator; $MOE_{denominator}$ is the MOE of the denominator; $\hat{p} = \frac{\hat{X}_{numerator}}{\hat{X}_{denominator}}$ is the derived proportion; $\hat{X}_{numerator}$ is the estimate used as the numerator of the derived proportion; $\hat{X}_{denominator}$ is the estimate used as the denominator of the derived proportion.”

Note: Estimates with particularly large margins of error sometimes resulted in an incalculable value of $\sqrt{MOE_{numerator}^2 - (\hat{p}^2 * MOE_{denominator}^2)}$ because $MOE_{numerator}^2 - (\hat{p}^2 * MOE_{denominator}^2)$ resulted in a negative value. In these cases, per the Census’ recommendation, the formula for derived ratios was used instead, which provides a conservative estimate of the MOE.

Calculating MOE’s for Derived Ratios¹⁷ (p. A-15)

$$MOE_{derived\ ratio} = \pm \frac{\sqrt{MOE_{numerator}^2 + (\hat{R}^2 * MOE_{denominator}^2)}}{\hat{X}_{denominator}}$$

Geography-Specific Notes

Census Tracts

Census tract estimates and confidence intervals (for non-index metrics) are calculated or provided for each metric using ACS data at the tract-level.

Congressional Districts

Unless otherwise specified in the metric section below, percent or index estimates are aggregated from the tract level to generate congressional district estimates. See “SECTION 3: Analytic Decisions” for more details on this method. Confidence intervals are not calculated.

States

State estimates and confidence intervals (for non-index metrics) are calculated or provided for each metric using ACS data at the state-level.

Broadband Connection

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of households with high speed broadband internet connection (cable, fiber optic, DSL)	American Community Survey	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

The following variable from data table S2801 was used to represent Broadband Connection:

- Estimate!!Percent!!Total households!!TYPE OF INTERNET SUBSCRIPTIONS!!With an Internet subscription:!!Broadband of any type!!Broadband such as cable, fiber optic or DSL

The associated margin of error variable was pulled to calculate confidence intervals.

Analysis

No additional analysis was conducted by the Dashboard.

See above “Geography-Specific Notes” section under “American Community Survey: General Notes” for information on calculation differences between Census tracts, congressional districts, and states.

Children in Poverty

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of children living in households ≤100% of the federal poverty level	American Community Survey	Yes	Race/Ethnicity	From Tract

Data Table(s) + Variable(s)

Data table B17020 and associated race/ethnicity-specific tables were used to calculate Children in Poverty. See above “Race/Ethnicity Definition” section for information on which tables are used for each subgroup.

The following variables in each data table were summed to calculate the numerator:

- Estimate!!Total!!Income in the past 12 months below poverty level!!Under 6 years
- Estimate!!Total!!Income in the past 12 months below poverty level!!6 to 11 years
- Estimate!!Total!!Income in the past 12 months below poverty level!!12 to 17 years

To calculate the denominator, the following variables in each data table were summed with the numerator variables:

- Estimate!!Total!!Income in the past 12 months at or above poverty level!!Under 6 years
- Estimate!!Total!!Income in the past 12 months at or above poverty level!!6 to 11 years
- Estimate!!Total!!Income in the past 12 months at or above poverty level!!12 to 17 years

For non-aggregated geographies, when any of the above variables used for summation were missing, the entire summed estimate was set to missing. Associated margins of error variables are used to calculate confidence intervals associated with these values.

Analysis

$$\text{Children in Poverty} = \frac{\text{Children age < 18 living in households below the poverty threshold}}{\text{Total number of children age < 18 living in households}} \times 100\%$$

See above “Geography-Specific Notes” section under “American Community Survey: General Notes” for information on calculation differences between Census tracts, congressional districts, and states.

High School Completion

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of adults ≥25 years with high school diploma or equivalent, or higher degree	American Community Survey	Yes	Sex, Race/Ethnicity	From Tract

Data Table(s) + Variable(s)

Data table S1501 was used to calculate High School Completion, for the total population and disaggregated by sex. Data tables C15002 were used to calculate High School Completion disaggregated by race/ethnicity. See above “American Community Survey: Race/Ethnicity Definition” section for information on which tables are used for each subgroup.

The following variables were used to represent estimates by sex and for total population:

- Estimate!!Percent!!Population 25 years and over!!High school graduate or higher
- Estimate!!Percent Male!!Population 25 years and over!!High school graduate or higher
- Estimate!!Percent Female!!Population 25 years and over!!High school graduate or higher

The following variables were summed to calculate the numerators for disaggregated race/ethnicity estimates:

- Estimate!!Total!!Male!!High school graduate (includes equivalency)
- Estimate!!Total!!Male!!Some college or associate's degree
- Estimate!!Total!!Male!!Bachelor's degree or higher
- Estimate!!Total!!Female!!High school graduate (includes equivalency)
- Estimate!!Total!!Female!!Some college or associate's degree
- Estimate!!Total!!Female!!Bachelor's degree or higher

The following variable was used to represent the denominator for disaggregated race/ethnicity estimates:

- Estimate!!Total

For non-aggregated geographies, when any of the above variables used for summation were missing, the entire summed estimate was set to missing. Associated margins of error variables are used to calculate confidence intervals associated with these values.

Analysis

$$\text{High School Completion} = \frac{\text{Residents aged 25 or older with high school diploma (or equivalent) or higher}}{\text{Total population aged 25 or older}} \times 100$$

See above “Geography-Specific Notes” section under “American Community Survey: General Notes” for information on calculation differences between Census tracts, congressional districts, and states.

Housing with Potential Lead Risk

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of housing stock with potential elevated lead risk	American Community Survey	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Data table B25034 was used to calculate Housing with Potential Lead Risk.

The following variables were used to categorize housing stock by age:

- Estimate!!Total!!Built 1939 or earlier

- Estimate!!Total!!Built 1940 to 1949
- Estimate!!Total!!Built 1950 to 1959
- Estimate!!Total!!Built 1960 to 1969
- Estimate!!Total!!Built 1970 to 1979
- Estimate!!Total!!Built 1980 to 1989
- Estimate!!Total!!Built 1990 to 1999
- Estimate!!Total!!Built 2000 to 2009
- Estimate!!Total!!Built 2010 to 2013 (*data year 2020 only*)
- Estimate!!Total!!Built 2014 or later (*data year 2020 only*)
- Estimate!!Total!!Built 2010 to 2019 (*data year 2021 and 2022*)
- Estimate!!Total!!Built 2020 or later (*data year 2021 and 2022*)

The following variable was used to represent total housing stock:

- Estimate!!Total

Analysis

The lead analysis was performed as per methodology initially developed by the Washington State Department of Health.¹⁸ Vox Media worked in conjunction with Washington State Department of Health to apply this methodology on a national scale.¹⁹ The Dashboard adapted Vox Media’s Python code available on Github²⁰ for the present analysis, which was conducted by the Dashboard using R v4.1.0 and originally validated using Python v3.6.²¹ The Washington State Department of Health’s analysis uses variables from 2014 and research from 2002 to inform age of housing weights and lead dust hazard guidance.¹⁸ In updating the analysis to represent all housing stock built in 2010 or later for years subsequent to 2014, variables were added for housing stock built using table B25034. See the above *Data Table(s) + Variable(s)* section. Age of housing weights were updated using the 2021 American Healthy Homes Survey II, published by the U.S. Department of Housing and Urban Development.²² The updated weights reflect the most recent lead dust hazard guidance, which significantly lowers the acceptable threshold. This update complies with EPA guidance.²³

Housing with Potential Lead Risk is a Dashboard metric sub-analysis based on the Washington State Department of Health/Vox Media analysis intended to report the percentage of housing stock at risk for lead due to the age of the housing. Users can note that this value is the “housing_risk” variable in the original posted Python code.²⁰ We count the number of housing units in each of four time periods: pre-1940, 1940-59, 1960-79, 1980 or newer. The count of housing units in each time period is weighted by the likelihood of lead exposure due to building age (weights are extrapolated from American Healthy Homes Survey II, 2021. *Please note that available ACS building age variables do not perfectly align with suggested weights. Email info@CDhealthdashboard.com for further details.*). This results in an overall percent of housing likely to have some risk of lead exposure.

$$\text{Housing with Potential Lead Risk} = \frac{\text{Weighted sum of housing stock at risk for lead}}{\text{Total housing stock}} \times 100$$

For non-aggregated geographies, margins of error (MOE) for these estimate values were derived using the following protocol: calculating adjusted MOE’s for each housing-age group that had summed estimates; weighting those MOE’s with the same weights used to calculate the numerator; and then calculating an MOE for a derived proportion. See section “ACS: Confidence Interval Calculation” for this equation in full.

Geography-Specific Notes

Census Tracts

Census tract estimates and confidence intervals are calculated using ACS data at the tract-level. The Dashboard Team determined that estimates with a 3.25% or greater absolute increase from year to year were unstable and therefore are censored.

Congressional Districts

Estimates are aggregated from the tract level (after censorship is applied) to generate congressional district estimates. See “SECTION 3: Analytic Decisions” for more details on this method. Confidence intervals are not calculated

States

State estimates and confidence intervals are calculated using ACS data at the state-level.

Income Inequality

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Index (-100 to +100) reflecting households with income at the extremes of the national income distribution (the top or bottom 20%)	American Community Survey	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Data table B19001 was used to calculate Income Inequality.

The following variables were summed to calculate the number of households above the 80th percentile:

- Estimate!!Total!!\$150,000 to \$199,999
- Estimate!!Total!!\$200,000 or more

The following variables were summed to calculate the number of households below the 20th percentile:

- Estimate!!Total!!Less than \$10,000
- Estimate!!Total!!\$10,000 to \$14,999
- Estimate!!Total!!\$15,000 to \$19,999
- Estimate!!Total!!\$20,000 to \$24,999
- Estimate!!Total!!\$25,000 to \$29,999

The following variable was used as the total households with known income level:

- Estimate!!Total

Analysis

Income Inequality at the Extremes (ICE) was calculated as per Krieger and colleagues.²⁴

The formula for ICE is as follows:

$$\text{ICE} = \frac{\text{Number of households in 80th income percentile} - \text{Number of Households in 20th income percentile}}{\text{Total households with known income level in geographic area}} \times 100$$

Where values of ICE range from -100 to 100.

Cut points were selected from table B19001 to most closely represent the 20th and 80th household income percentiles²⁸, as reported by US Census Bureau data Table H-1 (All Races).²⁵

20 th Percentile Cut Point	80 th Percentile Cut Point
<\$29,999	>\$150,000

See above “Geography-Specific Notes” section under “American Community Survey: General Notes” for information on calculation differences between Census tracts, congressional districts, and states.

Lead Exposure Risk Index

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Index (1-10) reflecting poverty-adjusted risk of housing-based lead exposure	American Community Survey	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Data table B25034 was used to calculate housing risk. S1701 was used for calculating poverty risk.

The following variables were used to categorize housing stock by age:

- Estimate!!Total!!Built 1939 or earlier
- Estimate!!Total!!Built 1940 to 1949
- Estimate!!Total!!Built 1950 to 1959
- Estimate!!Total!!Built 1960 to 1969
- Estimate!!Total!!Built 1970 to 1979
- Estimate!!Total!!Built 1980 to 1989
- Estimate!!Total!!Built 1990 to 1999
- Estimate!!Total!!Built 2000 to 2009
- Estimate!!Total!!Built 2010 to 2013 (*data year 2020 only*)
- Estimate!!Total!!Built 2014 or later (*data year 2020 only*)
- Estimate!!Total!!Built 2010 to 2019 (*data year 2021 and 2022*)
- Estimate!!Total!!Built 2020 or later (*data year 2021 and 2022*)

The following variable was used to represent total housing stock:

- Estimate!!Total

The following variable was used to represent individuals living in poverty:

- Estimate!!Total!!Population for whom poverty status is determined!!All individuals with income below the following poverty ratios!!125 percent of poverty level

The following variable was used to represent total population for poverty risk calculations:

- Estimate!!Total!!Population for whom poverty status is determined

Analysis

We took the Dashboard Housing with Potential Lead Risk metric (see earlier section for details on weights and lead threshold guidance) and factored in information about the percentage of the population living at or below 125% of the federal poverty level (poverty risk). We z-standardized poverty

risk and housing with potential lead risk variables, weighted each by weights extrapolated from American Healthy Homes Survey II, 2021²², and summed these two components to get a raw lead risk score. We then ranked these scores from 1, or lowest risk, to 10, or highest risk, to create a scale of overall lead exposure risk.

$$\text{Housing risk} = \frac{\text{Weighted sum of housing stock at risk for lead}}{\text{Total housing stock}} \times 100$$

$$\text{Poverty risk} = \frac{\text{Population below 125\% of poverty level}}{\text{Total population}} \times 100$$

Raw lead risk score = weighted and z-scored housing risk + weighted and z-scored poverty risk

Lead Exposure Risk Index = decile ranked raw lead risk score

Geography-Specific Notes

Census Tracts

Decile index values are calculated at the tract-level. The Dashboard Team determined that estimates with a +/-2 decile change or greater from year to year were unstable and therefore are censored.

Congressional Districts

The raw lead risk score (pre-decile ranks) is calculated at the tract-level and these weighted estimates are then aggregated from tract to generate congressional district estimates. A decile index ranking is then generated for all congressional districts. See “SECTION 3: Analytic Decisions” for more details on geographic aggregation.

States

State level index values represent the unweighted average of congressional district estimates for that state. This choice was made to allow for more meaningful comparison between congressional districts and their corresponding states.

Neighborhood Racial/Ethnic Segregation

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Index (0-100) reflecting the geographic clustering of racial/ethnic groups across the area	American Community Survey	No	Not Available	From Tract

Data Table(s) + Variable(s)

Data table DP05 and the following variables were used to calculate racial/ethnic segregation using 5 race/ethnicity categories (see above “Race/Ethnicity Definition” section for details about combining categories):

- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!Black or African American alone
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!American Indian and Alaska Native alone
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!Asian alone
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!Native Hawaiian and Other Pacific Islander alone

- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!Some other race alone
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!Two or more races
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!White alone
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Hispanic or Latino (of any race)

Analysis

Segregation was quantified as per Iceland’s formula for H, the entropy index.²⁶

Iceland defines the entropy index as follows: “The entropy index is the weighted average deviation of each unit’s entropy from the metropolitan-wide entropy, expressed as a fraction of the metropolitan area’s total entropy.”²⁶ The equation for H provides a raw value between 0-1. The segregation (entropy index) values that are presented on the Dashboard represent H*100 to provide segregation scores that range from 0 to 100.

Neighborhood Racial/Ethnic Segregation on the Dashboard is calculated using the following formula, adapted from the entropy index, where the smaller geography is tracts, and the larger geography is the geography presented on the website (i.e. cities or congressional districts):

$$\text{Neighborhood Racial/Ethnic Segregation} = \sum_{i=1}^n \frac{t_i(E-E_i)}{ET} \times 100$$

Where:

- t_i refers to the total population of tract i
- T is the larger geography’s total population
- n is the number of tracts
- E is the larger geography’s diversity (entropy) score
- E_i is tract i ’s diversity (entropy) score

Iceland defines entropy scores for a given geography (or tract) as follows:

$$E \text{ (entropy/diversity)} = \sum_{r=1}^r (\pi_r) \ln \left[\frac{1}{\pi_r} \right]$$

Where:

- π_r refers to a particular racial/ethnic group’s proportion of the geography’s population²⁶

As per footnote 5 in Iceland, ²⁶ $\ln \left[\frac{1}{\pi_r} \right]$ is set to 0 when the proportion of a particular group is in a given geography π_r is 0.

Geography-Specific Notes

Congressional Districts

First, each racial/ethnic group’s tract-level proportions (π_r) are calculated from tract-level DP05 population counts. Then, tract-level DP05 racial/ethnic group population counts aggregated to the congressional district-level and each racial/ethnic group’s congressional district proportions (π_r) are calculated. See “SECTION 3: Analytic Decisions” for more details on geographic aggregation.

These tract and congressional district proportion values (π_r) are used to calculate census tract congressional district entropy/diversity scores (E_i and E), which are used in the segregation formula above. The total population of each tract (t_i) and total population of each congressional district (T) in the segregation formula are derived from counts from the 2020 Decennial Census P2 Table rather than aggregated DP05 counts, to account for the appropriate geographic overlap of each tract in a congressional district.

States

State level segregation estimates represent the unweighted average of congressional district segregation estimates for that state. This choice was made to allow for more meaningful comparison between congressional district scores and their corresponding state score.

Racial/Ethnic Diversity

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Index (0-100) reflecting how evenly distributed the population is across the racial/ethnic groups living in this area	American Community Survey	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Data table DP05 was used to calculate Racial/Ethnic Diversity values.

The following variables were used to calculate racial/ethnic diversity using 5 race/ethnicity categories (see above “American Community Survey: Race/Ethnicity Definition” for details about combining categories):

- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!Black or African American alone
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!American Indian and Alaska Native alone
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!Asian alone
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!Native Hawaiian and Other Pacific Islander alone
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!Some other race alone
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!Two or more races
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Not Hispanic or Latino!!White alone
- Estimate!!HISPANIC OR LATINO AND RACE!!Total population!!Hispanic or Latino (of any race)

Analysis

Racial/Ethnic Diversity represents how much of the maximum possible entropy (or diversity) is exhibited in a given area. A lower value (closer to 0) indicates that all residents belong to one racial/ethnic group (low diversity) and a higher value (closer to 100) indicates that all racial/ethnic groups are in equal proportion (high diversity). This metric does not incorporate geographic distributions of racial/ethnic groups. Diversity (or entropy) was quantified using Iceland’s formulas for entropy scores (see below).²⁶

$$\text{Racial/Ethnic Diversity} = \frac{\text{Entropy score (E)}}{\text{Maximum possible entropy score}} \times 100$$

Where:

Maximum possible entropy score is $\ln(5)$, as there are 5 racial/ethnic groups in the calculation
 E is the geography’s diversity (entropy) score

Iceland defines entropy scores for a given geography (or tract) as follows:

$$E \text{ (entropy/diversity)} = \sum_{r=1}^r (\pi_r) \ln \left[\frac{1}{\pi_r} \right]$$

Where:

π_r refers to a particular racial/ethnic group’s proportion of the geography population²⁶

As per footnote 5 in Iceland, ²⁶ $\ln \left[\frac{1}{\pi_r} \right]$ is set to 0 when the proportion of a particular group is in a given geography π_r is 0.

Geography-Specific Notes

Census Tracts

Racial/Ethnic Diversity is calculated at the tract-level.

Congressional Districts

DP05 population counts for each racial/ethnic group are aggregated from the tract-level to generate congressional district population counts for each race/ethnic group. See “SECTION 3: Analytic Decisions” for more details on geographic aggregation. These counts are then used to calculate each racial/ethnic group’s proportion of the congressional district (π_r). This value is used in the formula above for congressional district diversity.

States

Racial/Ethnic Diversity is calculated at the state-level.

Rent Burden

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of households where $\geq 30\%$ of income is spent on rent	American Community Survey	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Data table DP04 was used to calculate Rent Burden.

The following variables were summed to calculate the numerator:

- Estimate!!GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME (GRAPI)!!Occupied units paying rent (excluding units where GRAPI cannot be computed)!!30.0 to 34.9 percent
- Estimate!!GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME (GRAPI)!!Occupied units paying rent (excluding units where GRAPI cannot be computed)!!35.0 percent or more

The following variable was used to represent the denominator:

- Estimate!!GROSS RENT AS A PERCENTAGE OF HOUSEHOLD INCOME (GRAPI)!!Occupied units paying rent (excluding units where GRAPI cannot be computed)

For non-aggregated geographies, when any of the above variables used for summation were missing, the entire summed estimate was set to missing. Associated margins of error variables are used to calculate confidence intervals associated with these values.

Analysis

$$\text{Rent Burden} = \frac{\text{Households for which rent} \geq 30\% \text{ of household income}}{\text{Total renter-occupied housing units with reported income}} \times 100\%$$

See above “Geography-Specific Notes” section under “American Community Survey: General Notes” for information on calculation differences between Census tracts, congressional districts, and states.

Unemployment

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of population ≥16 years who are unemployed but seeking work	American Community Survey	Yes	Sex, Race/Ethnicity	From Tract

Data Table(s) + Variable(s)

Data table S2301 was used to report Unemployment total population and disaggregated by race/ethnicity and sex.

The following variables were used to represent Unemployment for total population and by race for White, Hispanic, and Black:

- Estimate!!Unemployment rate!!Population 16 years and over
- Estimate!!Unemployment rate!!Population 16 years and over!!RACE AND HISPANIC OR LATINO ORIGIN!!Black or African American alone
- Estimate!!Unemployment rate!!Population 16 years and over!!RACE AND HISPANIC OR LATINO ORIGIN!!White alone, not Hispanic or Latino
- Estimate!!Unemployment rate!!Population 16 years and over!!RACE AND HISPANIC OR LATINO ORIGIN!!Hispanic or Latino origin (of any race)

Unemployment by race for Asian and Other is represented by the weighted average of the following variables across the racial subcategories that comprise the full group.

Asian:

- Estimate!!Unemployment rate!!Population 16 years and over!!RACE AND HISPANIC OR LATINO ORIGIN!!Asian alone
- Estimate!!Unemployment rate!!Population 16 years and over!!RACE AND HISPANIC OR LATINO ORIGIN!!Native Hawaiian and Other Pacific Islander alone

Other:

- Estimate!!Unemployment rate!!Population 16 years and over!!RACE AND HISPANIC OR LATINO ORIGIN!!American Indian and Alaska Native alone
- Estimate!!Unemployment rate!!Population 16 years and over!!RACE AND HISPANIC OR LATINO ORIGIN!!Some other race alone
- Estimate!!Unemployment rate!!Population 16 years and over!!RACE AND HISPANIC OR LATINO ORIGIN!!Two or more races

Weights are calculated from the relative proportion of each racial subcategory within the summed total population of the full group as per ACS table DP05, using the following variables:

Asian:

- Estimate!!RACE!!Total population!!One race!!Asian
- Estimate!!RACE!!Total population!!One race!!Native Hawaiian and Other Pacific Islander

Other:

- Estimate!!RACE!!Total population!!One race!!American Indian and Alaska Native
- Estimate!!RACE!!Total population!!One race!!Some other race
- Estimate!!RACE!!Total population!!Two or more races

The following variables were used to represent Unemployment by sex. Please note the different age category availability for sex-specific estimates:

- Estimate!!Unemployment rate!!Population 20 to 64 years!!SEX!!Male
- Estimate!!Unemployment rate!!Population 20 to 64 years!!SEX!!Female

For non-aggregated metrics, when any of the above variables used for summation were missing, the entire summed estimate was set to missing. Associated margins of error variables are used to calculate confidence intervals associated with these values.

Analysis

For all estimates except Asian and Other, no additional analysis was conducted by the Dashboard. The formula for combining racial subcategories for Asian and Other is as follows:

$$\text{Unemployment}_{\text{full group}} = \sum_{i=1}^n \left(\text{unemployment}_{\text{subcategory } i} * \frac{\text{population}_{\text{subcategory } i}}{\sum_{i=1}^n \text{population}_{\text{subcategory } i}} \right)$$

Where:

i = racial/ethnic subcategory contributing to the full racial/ethnic group

See above “Geography-Specific Notes” section under “American Community Survey: General Notes” for information on calculation differences between Census tracts, congressional districts, and states.

Uninsured

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of population ≤64 years without health insurance	American Community Survey	Yes	Age, Sex, Race/Ethnicity	From Tract

Data Table(s) + Variable(s)

Uninsured refers specifically to health insurance status, not lack of any type of insurance.

Total population

Data table S2701 was used to report percent of the civilian noninstitutionalized population without health insurance for ages 0-64; this stratum is referred to as “Total”.

To calculate Uninsured, the following variables are summed from table S2701 to calculate the numerator:

- Estimate!!Uninsured!!Civilian noninstitutionalized population!!AGE!!Under 19 years
- Estimate!!Uninsured!!Civilian noninstitutionalized population!!AGE!!19 to 25 years
- Estimate!!Uninsured!!Civilian noninstitutionalized population!!AGE!!26 to 34 years
- Estimate!!Uninsured!!Civilian noninstitutionalized population!!AGE!!35 to 44 years
- Estimate!!Uninsured!!Civilian noninstitutionalized population!!AGE!!45 to 54 years
- Estimate!!Uninsured!!Civilian noninstitutionalized population!!AGE!!55 to 64 years

To calculate Uninsured, the following variables are summed from table S2701 to calculate the denominator:

- Estimate!!Total!!Civilian noninstitutionalized population!!AGE!!Under 19 years
- Estimate!!Total!!Civilian noninstitutionalized population!!AGE!!19 to 25 years
- Estimate!!Total!!Civilian noninstitutionalized population!!AGE!!26 to 34 years
- Estimate!!Total!!Civilian noninstitutionalized population!!AGE!!35 to 44 years
- Estimate!!Total!!Civilian noninstitutionalized population!!AGE!!45 to 54 years
- Estimate!!Total!!Civilian noninstitutionalized population!!AGE!!55 to 64 years

By age category

Data table S2701 was used to report percent of the civilian noninstitutionalized population without health insurance, disaggregated by age.

To calculate Uninsured by age category, the following variables are presented as reported in the S2701 data table:

- Estimate!!Percent Uninsured!!Civilian noninstitutionalized population!!AGE!!Under 19 years
- Estimate!!Percent Uninsured!!Civilian noninstitutionalized population!!AGE!!19 to 25 years
- Estimate!!Percent Uninsured!!Civilian noninstitutionalized population!!AGE!!26 to 34 years
- Estimate!!Percent Uninsured!!Civilian noninstitutionalized population!!AGE!!35 to 44 years

To calculate Uninsured age 45-64, the following variables are summed from table S2701 to calculate the numerator:

- Estimate!!Uninsured!!Civilian noninstitutionalized population!!AGE!!45 to 54 years
- Estimate!!Uninsured!!Civilian noninstitutionalized population!!AGE!!55 to 64 years

To calculate Uninsured age 45-64, the following variables are summed from table S2701 to calculate the denominator:

- Estimate!!Total!!Civilian noninstitutionalized population!!AGE!!45 to 54 years
- Estimate!!Total!!Civilian noninstitutionalized population!!AGE!!55 to 64 years

By sex

Data table B27001 was used to report uninsured, disaggregated by sex.

To calculate Uninsured by sex, the following variables from table B27001 are summed to calculate the numerator, where [SEX] = "Male" or "Female":

- Estimate!!Total!![SEX]!!Under 6 years!!No health insurance coverage
- Estimate!!Total!![SEX]!!6 to 18 years!!No health insurance coverage
- Estimate!!Total!![SEX]!!19 to 25 years!!No health insurance coverage
- Estimate!!Total!![SEX]!!26 to 34 years!!No health insurance coverage
- Estimate!!Total!![SEX]!!35 to 44 years!!No health insurance coverage
- Estimate!!Total!![SEX]!!45 to 54 years!!No health insurance coverage
- Estimate!!Total!![SEX]!!55 to 64 years!!No health insurance coverage

To calculate Uninsured by sex, the following variables from table B27001 are summed to calculate the denominator:

- Estimate!!Total!![SEX]!!Under 6 years
- Estimate!!Total!![SEX]!!6 to 18 years
- Estimate!!Total!![SEX]!!19 to 25 years
- Estimate!!Total!![SEX]!!26 to 34 years
- Estimate!!Total!![SEX]!!35 to 44 years
- Estimate!!Total!![SEX]!!45 to 54 years

By race/ethnicity

Data tables C27001B, C27001C, C27001D, C27001E, C27001F, C27001H, and C27001I were used to calculate uninsured, disaggregated by race/ethnicity. See above “Race/Ethnicity Definition” section for information on which tables are used for each subgroup.

To calculate Uninsured by race/ethnicity, the following variables are summed from the C27001 series to calculate the numerator:

- Estimate!!Total!!Under 19 years!!No health insurance coverage
- Estimate!!Total!!19 to 64 years!!No health insurance coverage

To calculate Uninsured by race/ethnicity, the following variables are summed from the race/ethnicity-specific tables from the C27001 series to calculate the denominator:

- Estimate!!Total!!Under 19 years
- Estimate!!Total!!19 to 64 years

For non-aggregated geographies, when any of the above variables used for summation were missing, the entire summed estimate was set to missing. Associated margins of error variables are used to calculate confidence intervals associated with these values.

Analysis

$$\text{Uninsured} = \frac{\text{Persons that have no current health insurance coverage}}{\text{Total population}} \times 100$$

See above “Geography-Specific Notes” section under “American Community Survey: General Notes” for information on calculation differences between Census tracts, congressional districts, and states.

American Community Survey and Centers for Medicare & Medicaid Services

General Notes

The American Community Survey (ACS) is administered by the US Census Bureau⁹. Data are retrieved from the census API using R and the tidycensus package.^{16, 13} Variable labels from the API (e.g., Estimate; SEX AND AGE - Total population), not names (e.g., S2801_C01_017E), are outlined in metric sections.

The Centers for Medicare & Medicaid Services (CMS) requires that all states report monthly data on enrollment within the state Medicaid program. These data are publicly available for download.²⁷

Medicaid Enrollment - % of Total Population

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of individuals enrolled in Medicaid in the past quarter	American Community Survey and Centers for Medicare & Medicaid Services	No	Not Available	From Tract & State

Data Table(s) + Variable(s)

The following variable was used from the monthly “State Medicaid and CHIP Applications, Eligibility Determinations, and Enrollment Data” dataset to access state-level Medicaid enrollment counts. Data were filtered to finalized data (Final_Report IS Y).

- total_medicaid_enrollment

The following variable from ACS data table S2704 5-year estimates was used to represent total population:

- Estimate!!Total!!Civilian noninstitutionalized population

The following variable from ACS data table S2704 5-year estimates was used to re-allocate state-level estimates to other geographies:

- Estimate!!Public Coverage!!COVERAGE ALONE OR IN COMBINATION!!Medicaid/means-tested public coverage alone or in combination

Analysis

The percentage of individuals enrolled in Medicaid is calculated by dividing enrollment counts (converted to quarterly by calculating three-month averages of monthly enrollment counts) by the total population, represented for this metric by “civilian noninstitutionalized population”. Enrollment counts are differentially derived for congressional districts and states (see Geography-Specific Notes below).

$$\text{Medicaid Enrollment \%} = \frac{\text{Medicaid Enrollment Count}}{\text{Civilian Noninstitutionalized Population}} \times 100$$

Geography-Specific Notes

Congressional Districts

Congressional district-level Medicaid enrollment data are available directly from the American Community Survey, but are underestimates of the true enrollment numbers due to the sampling design of the survey.²⁸ For this reason, our estimation of Medicaid enrollment counts at the congressional

district-level uses a combination of American Community Survey data and Centers for Medicare & Medicaid Services data.

We first pulled census tract ACS Medicaid enrollment counts and aggregated from the tract level to generate congressional district estimates. See “SECTION 3: Analytic Decisions” for more details on geographic aggregation. Using these values, along with directly pulled ACS state-level enrollment counts, we then calculated the proportion of each state’s Medicaid enrollees contained in each congressional district within that state.

$$\text{ACS Proportion}_{\text{CD}} = \frac{\text{ACS Medicaid Enrollment}_{\text{CD}}}{\text{ACS Medicaid Enrollment}_{\text{State}}}$$

We then applied these proportions to the statewide enrollment counts from CMS to get enrollment counts for each congressional district.

$$\text{Medicaid Enrollment}_{\text{CD}} = \text{ACS Proportion}_{\text{CD}} * \text{CMS Medicaid Enrollment}_{\text{State}}$$

Final percent estimates are created by dividing the derived Medicaid enrollment counts by total population ACS estimates that are aggregated from the tract level to generate congressional district counts. See “SECTION 3: Analytic Decisions” for more details on this method.

States

State enrollment counts for the numerator are pulled directly from CMS data. Total population denominators use ACS data at the state-level.

Behavioral Risk Factor Surveillance System (BRFSS)

General Notes

The Behavioral Risk Factor Surveillance System (BRFSS) is a national telephone survey created by the Centers for Disease Control and Prevention, and administered by state and territorial governments. It uses a complex sampling design to ensure that survey results are representative of each state's population.²⁹ Estimates for New Jersey in 2019 and Florida in 2021 are not available as the states did not collect enough BRFSS data to meet minimum requirements for inclusion.

BRFSS variables were downloaded directly from the BRFSS website in SAS transport format. Each BRFSS survey year is a separate dataset.³⁰

Using BRFSS data requires applying the following survey design variables: `_LLCPWT` for weighting, `_STSTR` for stratification, and `_PSU` for primary sampling unit (clustering).²⁹ Metric estimates were calculated as proportions using the *survey* package for R,³¹ with survey design variables applied.

Except for Preventive Services, 65+, all metric denominators were calculated from the number of non-missing, non-“don't know/not sure” responses to each respective BRFSS variable.

Confidence Interval Calculation

90% confidence interval of proportions were calculated using Wald formula:

$$p \pm 1.645 * \sqrt{\frac{p * (1 - p)}{n}}$$

Geography-Specific Notes

States

BRFSS data were used to calculate state estimates to accompany the census tract and congressional district estimates calculated using PLACES Project data. The PLACES Project uses BRFSS data to create small area estimates (see “PLACES, Centers for Disease Control and Prevention” section for more).

Binge Drinking

Metric Description	Data Source
Percentage of adults who report binge drinking in the past 30 days	Behavioral Risk Factor Surveillance Survey, Centers for Disease Control

Data Table(s) + Variable(s)

Numerators were calculated from the number of respondents grouped as “Yes” (coded 1) in the BRFSS calculated variable `_RFBING5`.

Analysis

$$\text{Binge Drinking} = \frac{\text{Weighted sum of adults who report binge drinking in the past 30 days}}{\text{Total adult population}} * 100$$

Dental Care

Metric Description	Data Source
Percentage of adults who report visiting a dentist in the past year	Behavioral Risk Factor Surveillance Survey, Centers for Disease Control

Data Table(s) + Variable(s)

Numerators were calculated from the number of respondents who answered “Within the past year” (coded 1) to LASTDEN4.

Analysis

$$\text{Dental Care} = \frac{\text{Weighted sum of adults who report visiting a dentist in the past year}}{\text{Total adult population}} * 100$$

Diabetes

Metric Description	Data Source
Percentage of adults who report having diabetes	Behavioral Risk Factor Surveillance Survey, Centers for Disease Control

Data Table(s) + Variable(s)

Numerators were calculated from the number of respondents who answered “Yes” (coded 1) to DIABETE4.

Analysis

$$\text{Diabetes} = \frac{\text{Weighted sum of adults who report having diabetes}}{\text{Total adult population}} * 100$$

Frequent Mental Distress

Metric Description	Data Source
Percentage of adults who report ≥14 days of poor mental health in the past 30 days	Behavioral Risk Factor Surveillance Survey, Centers for Disease Control

Data Table(s) + Variable(s)

Numerators were calculated from the number of respondents grouped as “14+ days when mental health not good” (coded 3) in the BRFSS calculated variable _MENT14D.

Analysis

$$\text{Frequent Mental Distress} = \frac{\text{Weighted sum of adults who report } \geq 14 \text{ days of poor mental health in the past 30 days}}{\text{Total adult population}} * 100$$

Frequent Physical Distress

Metric Description	Data Source
Percentage of adults who report ≥14 days of poor physical health in the past 30 days	Behavioral Risk Factor Surveillance Survey, Centers for Disease Control

Data Table(s) + Variable(s)

Numerators were calculated from the number of respondents grouped as “14+ days when physical health not good” (coded 3) in the BRFSS calculated variable _PHYS14D.

Analysis

$$\text{Frequent Physical Distress} = \frac{\text{Weighted sum of adults who report } \geq 14 \text{ days of poor physical health in the past 30 days}}{\text{Total adult population}} * 100$$

High Blood Pressure

Metric Description	Data Source
Percentage of adults who report high blood pressure	Behavioral Risk Factor Surveillance Survey, Centers for Disease Control

Data Table(s) + Variable(s)

Numerators were calculated from the number of respondents who answered “Yes” (coded 1) to BPHIGH4.

Analysis

$$\text{High Blood Pressure} = \frac{\text{Weighted sum of adults who report high blood pressure}}{\text{Total adult population}} * 100$$

Obesity

Metric Description	Data Source
Percentage of adults who report a body mass index (BMI) ≥ 30 kg/m ²	Behavioral Risk Factor Surveillance Survey, Centers for Disease Control

Data Table(s) + Variable(s)

Numerators were calculated from the number of respondents grouped as “Obese” (coded 1) in the BRFSS calculated variable _BMI5CAT.

Analysis

$$\text{Obesity} = \frac{\text{Weighted sum of adults who report a body mass index (BMI) } \geq 30 \text{ kg/m}^2}{\text{Total adult population}} * 100$$

Physical Inactivity

Metric Description	Data Source
Percentage of adults who report no leisure-time physical activity in the past 30 days	Behavioral Risk Factor Surveillance Survey, Centers for Disease Control

Data Table(s) + Variable(s)

Numerators were calculated from the number of respondents who answered “No” (coded 2) to EXERANY2.

Analysis

$$\text{Physical Inactivity} = \frac{\text{Weighted sum of adults who report no leisure-time physical activity in the past 30 days}}{\text{Total adult population}} * 100$$

Preventive Services, 65+

Metric Description	Data Source
Percentage of adults ≥ 65 years who are up to date on a core set of clinical preventive services	Behavioral Risk Factor Surveillance Survey, Centers for Disease Control

Data Table(s) + Variable(s)

Numerators for preventative services were calculated as a count of respondents meeting the following conditions, by year:

2018:

- Both of the following:
 - Flu vaccine in the past year (FLUSHOT6 == 1)
 - Pneumococcal polysaccharide vaccine (PPV) ever (PNEUVAC4 == 1)
- **and**, one of the following:
 - Fecal occult blood test (FOBT) within the past year (LSTBLDS3 == 1)
 - Sigmoidoscopy within past 5 years (HADSGCO1 == 1 & LASTSIG3 <= 4) **and** FOBT within the past three years (LSTBLDS <= 3)
 - Colonoscopy within the past 10 years (HADSGCO1 == 2 & LASTSIG3 <= 5)
- **and**, for women only (SEXVAR==2):
 - Mammogram in past 2 years (HOWLONG <= 2)

2020:

- Both of the following:
 - Flu vaccine in the past year (FLUSHOT7 == 1)
 - Pneumococcal polysaccharide vaccine (PPV) ever (PNEUVAC4 == 1)
- **and**, one of the following:
 - Fecal occult blood test (FOBT) within the past year (LSTBLDS4 == 1)
 - FIT-DNA test within 3 years (SDNATEST <= 3)
 -
 - Sigmoidoscopy within past 5 years (SIGMTEST <= 3)
 - Sigmoidoscopy within past 10 years (SIGMTEST <= 4) **and** FOBT within the past year (LSTBLDS4 == 1)
 - Colonoscopy within the past 10 years (COLNTEST <= 4)
 - CT Colonoscopy within past 5 years (VCLNTEST <= 4)
- **and**, for women only (SEXVAR == 2):
 - Mammogram in past 2 years (HOWLONG <= 2)

Analysis

$$\text{Preventive Services, 65+}_{\text{Total}} = \frac{\text{Weighted sum of adults} \geq 65 \text{ years who are up to date on a core set of clinical preventive services}}{\text{Total population of adults} \geq 65 \text{ years}} * 100$$

$$\text{Preventive Services, 65+}_{\text{Male}} = \frac{\text{Weighted sum of men} \geq 65 \text{ years who are up to date on a core set of clinical preventive services}}{\text{Total population of men} \geq 65 \text{ years}} * 100$$

$$\text{Preventive Services, 65+}_{\text{Female}} = \frac{\text{Weighted sum of women} \geq 65 \text{ years who are up to date on a core set of clinical preventive services (including mammogram)}}{\text{Total population of women} \geq 65 \text{ years}} * 100$$

Routine Checkup, 18+

Metric Description	Data Source
Percentage of adults who report visiting a doctor for routine checkup in the past year	Behavioral Risk Factor Surveillance Survey, Centers for Disease Control

Data Table(s) + Variable(s)

Numerators were calculated from the number of respondents who answered “Within the past year” (coded 1) to CHECKUP1.

Analysis

$$\text{Routine Checkup, 18+} = \frac{\text{Weighted sum of adults who report visiting a doctor for routine checkup in the past year}}{\text{Total adult population}} * 100$$

Smoking

Metric Description	Data Source
Percentage of adults who report current smoking	Behavioral Risk Factor Surveillance Survey, Centers for Disease Control

Data Table(s) + Variable(s)

Numerators were calculated from the number of respondents grouped as “Yes” (coded 2) in the BRFSS calculated variable _RFSMOK3.

Analysis

$$\text{Smoking} = \frac{\text{Weighted sum of adults who report current smoking}}{\text{Total adult population}} * 100$$

George Mason University Air Quality Team

General Notes

These data were created by fusing ground observations from the US Environmental Protection Agency (EPA) [Air Quality System \(AQS\) network](#) and computer model prediction from the National Oceanic and Atmospheric Administration (NOAA) [National Air Quality Forecast Capability \(NAQFC\)](#) by the [George Mason University air quality team](#).

Estimates calculated by the George Mason University air quality team will differ from [EPA CMAQ RSIG](#) and GMU North America Chemical Reanalysis (NACR), which are commonly used, publicly available data sources for air pollution. While the RSIG presently includes a longer data period, North America Chemical Reanalysis (NACR) uses more up-to-date emission and real-time forecasting data to provide data in a timelier manner (up to yesterday). Both RSIG and NACR provide air pollution data for 12 kilometer square areas, which is larger than many census tracts. EPA CMAQ RSIG further smooths the data to provide census tract-level estimates, while NACR are provided at the 12-kilometer square area level only. As such, adjacent census tracts might share the same ozone pollution value (ppb) or PM_{2.5} pollution value (µg/m³)

Geography-Specific Notes

Census Tracts

Census tract estimates are presented as received.

Congressional Districts

Estimates are aggregated from the tract level to generate congressional district estimates. See “SECTION 3: Analytic Decisions” for more details on this method.

States

Estimates are aggregated from the tract level to generate state estimates. See “SECTION 3: Analytic Decisions” for more details on this method.

Air pollution - Ozone

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Average daily maximum concentration (parts per billion) of ground-level ozone throughout a month	George Mason University Air Quality Team	Yes	Not Applicable	From Tract

Data Table(s) + Variable(s)

The data from the George Mason University air quality team provides monthly average of daily maximum tract-level estimates for all tracts in the contiguous United States, except Alaska and Hawaii...

Analysis

The model prediction data are used to fill in gaps between air quality monitors, in particular in rural and suburban areas. The model estimates spatial and temporal variations of air pollution based on three major components: emission, meteorology and chemistry. A list of emission sources is provided in table below (“List of emission sources used to estimate ozone”). The meteorology data are provided by the Weather Research and Forecast (WRF) model. The chemistry model is based on the US EPA Community Multiscale Air Quality (CMAQ) model. To merge the model and monitoring data, the optimal

interpolation (OI) method is used to generate a fused surface concentration across the Continental United States at 12km gridding. The gridded data are converted into census tract level by averaging all grid points included in the tract.

List of emission sources used to estimate ozone

Year of Update	Emission Sources Included
2022	<p>Anthropogenic Sources: Agriculture, transportation (vehicle/air/railroad/marine), electricity generation units (EGUs), non-EGU point sources, oil/gas, residential wood combustion</p> <p>Natural Sources: Biogenic; Sea-salt; Wildfires</p>

Air pollution – PM2.5

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Average daily concentration ($\mu\text{g}/\text{m}^3$) of fine particulate matter (PM2.5) per cubic meter of air throughout a month	George Mason University Air Quality Team	Yes	Not Applicable	From Tract

Data Table(s) + Variable(s)

The data from the George Mason University air quality team provides monthly average of daily maximum tract-level 8-hour concentration of PM2.5 per cubic meter for all tracts in the contiguous United States, except Alaska and Hawaii..

Analysis

The model prediction data are used to fill in gaps between air quality monitors, in particular in rural and suburban areas. The model estimates spatial and temporal variations of air pollution based on three major components: emission, meteorology and chemistry. A list of emission sources is provided in Table below (“List of emission sources used to estimate PM_{2.5}”). The meteorology data are provided by the Weather Research and Forecast (WRF) model. The chemistry model is based on the US EPA Community Multiscale Air Quality (CMAQ) model. To merge the model and monitoring data, the optimal interpolation (OI) method is used to generate a fused surface concentration across the Continental United States at 12km gridding. The gridded data are converted into census tract level by averaging all grid points included in the tract.

List of emission sources used to estimate PM_{2.5}

Year of Update	Emission Sources Included
2022	<p>Anthropogenic Sources: Agriculture, transportation (vehicle/air/railroad/marine), electricity generation units (EGUs), non-EGU point sources, oil/gas, residential wood combustion</p>

	Natural Sources: biogenic; sea-salt; windblown dust; biomass burning
--	--

2018 data previously presented on the Dashboard were derived from the Environmental Protection Agency, Community Multiscale Air Quality Remote Sensing Information Gateway (CMAQ RSIG). These data can be requested via email at info@cityhealthdashboard.com.

National Center for Education Statistics and U.S. Department of Education

General Notes

Chronic Absenteeism represents the percent of public school students who miss 10% or more school days in an academic year. Public schools for this metric include both charter and district schools. Private schools are not included due to insufficient data availability. This metric should not be used to evaluate school district performance.

Chronic Absenteeism estimates are calculated using school level chronic absenteeism count data published by the U.S. Department of Education initiative Ed Data Express³² (data group 814), and enrollment data from the National Center for Education Statistics (NCES).³³

Chronic Absenteeism

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of public school students who miss 10% or more school days in an academic year	National Center for Education Statistics, U.S. Department of Education	No	Sex, Race/Ethnicity	Not Applicable

Data Table(s) + Variable(s)

School-level chronic absenteeism counts are retrieved from the U.S. Department of Education website, ED Data Express for each school year. School level enrollment counts are accessed through NCES enrollment data for the associated school year. The two datasets are joined using the NCES school id number.

Analysis

The Dashboard assigned schools to congressional districts and states for each school year using ArcGIS Pro 3.0.0 software and school data from the National Center for Education Statistics (NCES). Only schools with full geographic coordinates (latitudes and longitudes) were included.

School latitude and longitude data was uploaded to ArcGIS and converted to XY Data. Dashboard congressional district shape files were uploaded to ArcGIS and a Near Analysis was completed between the XY Data and shape layers using a location and geodesic method. Schools located within the geographic boundaries were assigned to that congressional district. Schools were then assigned to corresponding states based on their congressional district.

Schools that meet the following criteria, as detailed in the NCES data, are removed from the crosswalk:

- Private schools
- Pre-K and adult education schools
- Schools classified as special education schools
- Schools that are classified as “closed”, “inactive”, or otherwise not operating during the given school year
- Schools that are primarily virtual (note: schools that temporarily taught remotely during the COVID 19 pandemic are not excluded)
- Schools were additionally removed from the calculation if either the numerator or denominator value was missing or if the chronic absenteeism estimate was greater than 100% and therefore considered unstable.

Chronic absenteeism is calculated by summing the students reported by schools as chronically absent, then dividing by the total number of students enrolled at those schools at time of reporting. See the following formula:

$$\text{Chronic Absenteeism} = \frac{\sum_{i=1}^n \text{Students who miss 10\% or more school days in an academic year}}{\sum_{i=1}^n \text{Total students enrolled}}$$

Where: n = the number of schools assigned to that geography

Estimates are suppressed if the numerator (number of students chronically absent) is less than 20 students.

Geography-Specific Notes

Congressional Districts

See Analysis section above. Some congressional district estimates are suppressed if their associated state estimate was considered unreliable. See States section below.

States

See Analysis section above. Some state level estimates along with their associated congressional districts are suppressed due to concerns about underlying data reliability. The Dashboard recognizes that our chronic absenteeism estimates will not exactly match the numbers reported by state level Departments of Education. This is due to a variety of reasons, most prominently: 1) variations in school or student exclusion criteria; 2) different reported definitions of chronic absenteeism; 3) a lag in data updates in the National source.

As part of the validation process, the Dashboard Team compared reported state Department of Education chronic absenteeism numbers³⁴, where available, with our own. Estimates were censored when the difference between the two numbers was large and unexplainable by the reasons above. Please email info@CDhealthdashboard.com if you would like to learn more.

National Vital Statistics System (NVSS)

General Notes

Vital statistics are calculated from data derived from national deaths (Multiple Cause of Death Data (MCDD)) and births (Natality Data (ND)) records. The Dashboard obtained vital statistics micro-data files from the National Center for Health Statistics (NCHS) restricted-use vital statistics data.³⁵ Metric estimates are calculated by the Dashboard data analytical team.

Users of these data are asked to acknowledge NCHS and the vital statistics jurisdictions as the data source in published reports and studies for which the files were used. NCHS and the vital statistics jurisdictions should also be cited in reports, articles, and news releases in electronic and print media describing the studies or results of the studies. The following is the recommended citation:

National Center for Health Statistics. [*Name of data file(s)*] (*[year(s)]*), as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program. <https://www.cdc.gov/nchs/nvss/nvss-restricted-data.htm>

Pooled Estimates

Due to low events count in certain demographic subgroups and data suppression policy from NCHS, the Dashboard calculated 1-year estimates for total population, and 3-year pooled estimates for race and sex subgroups. For example, the breast cancer death rate for total population for 2020 was calculated from the 2020 multiple cause of death dataset. However the breast cancer death rate for Asian for 2020 was calculated from a combined dataset that consisted of 2018, 2019 and 2020 multiple cause of death datasets.

Population Denominators

Population denominators for all NVSS metrics were derived from the Census Bureau's Population Estimates Program (PEP).³⁶ For 3-year pooled estimates for race and sex subgroups, PEP estimates were combined to accurately reflect the population size of the area. For example, if the data were derived from a combined dataset that consisted of 2018, 2019, 2020 multiple cause of death data, the corresponding population denominators were from combined estimates from 2018, 2019, 2020 PEP population estimates.

Race/Ethnicity Definition

Estimates by race for Asian, Black, Hispanic, White and Other for mortality metrics were calculated from Multiple Cause of Death Data (MCDD) Race Recode 40 (position: 489-490) and Hispanic Origin/Race Recode (position: 488). Definitions are as follows:

- White: Non-Hispanic (including Hispanic origin unknown) White;
- Black: Non-Hispanic (including Hispanic origin unknown) Black;
- Hispanic: Mexican, Puerto Rican, Cuban, Central or South American and other Hispanic origin;
- Asian: Asian Indian, Chinese, Filipino, Japanese, Korean, Vietnamese, other or multiple Asian, Hawaiian, Guamanian, Samoan, and other or multiple islander;
- Other: American Indian or Alaskan Native (AIAN) and more than one race;

Estimates by race for Asian, Black, Hispanic, White and Other for natality metrics were calculated from Natalty Data, Mother's Race Recode 6 (MRACE6, position 107) and Mother's Hispanic Origin Recode (MHISP_R, position 115). Definitions are as follows:

- White: Non-Hispanic (including Hispanic origin unknown) White;
- Black: Non-Hispanic (including Hispanic origin unknown) Black;
- Hispanic: Mexican, Puerto Rican, Cuban, Central and South American, and other Hispanic origin;
- Asian: Asian, Native Hawaiian and Other Pacific Islander (NHOPI) ;
- Other: American Indian or Alaskan Native (AIAN) and More than one race

The following race/ethnicity definitions were used as the population denominators by race for Asian, Black, Hispanic, White and Other for all NVSS metrics from the Census Bureau's Population Estimates Program (PEP).

- White: NHWA
- Black: NHBA
- Hispanic: H
- Asian: NHAA or NHNA
- Other: NHIA or NHTOM
- Total: TOT

Standardized Population Weights

The Dashboard calculated direct age-adjusted death rates for all mortality metrics except for firearm homicides and firearm suicides. Below is the standardized population weight used for age-adjustment.

Variable “YPLL-75 weight” and “standard life expectancy at age of deaths (years)” were used to calculate premature deaths (all cause) and “weight” was used to calculate all other mortality rates.

Table of US 2010 Standardized Population

Age Group	Number	Weight	YPLL-75 weight	Standard life expectancy at age of deaths (years)
Total	308745538			
< 5 years	20201362	0.0654	0.0696	72.5
5 to 9 years	20348657	0.0659	0.0701	67.5
10 to 14 years	20677194	0.0670	0.0713	62.5
15 to 19 years	22040343	0.0714	0.0760	57.5
20 to 24 years	21585999	0.0699	0.0744	52.5
25 to 29 years	21101849	0.0683	0.0727	47.5
30 to 34 years	19962099	0.0647	0.0688	42.5
35 to 44 years	41070606	0.1330	0.1415	35
45 to 54 years	45006716	0.1458	0.1551	25
55 to 64 years	36482729	0.1182	0.1257	15
65 to 74 years	21713429	0.0703	0.0748	5
75 to 84 years	13061122	0.0423	0	0
85 years and over	5493433	0.0178	0	0

Censoring/Flagging Estimates

Estimates that involve fewer than 10 deaths or births are suppressed due to privacy restrictions imposed by the National Center for Health Statistics. When the population denominators, such as the total

number of live births, consist of fewer than 50 individuals, they are also suppressed. Estimates are flagged when death/birth count is less than 50.

Censored estimates are removed from the website and downloadable data. Flagged estimates are noted in “Tips and Cautions for using the Data” on the website, or in downloadable data. Users should consult the Downloadable Data Codebook, available at www.congressionaldistricthealthdashboard.org/data-access, for more detail.

Note that these criteria differ from the methods described under “SECTION 3: Analytic Decisions: Censoring/Flagging Aggregated Estimates with Missing Contributing Data”

Confidence Interval Calculation

Multiple Cause of Death Data

We calculated 90% CI using formula below:

$$LCL90 = \text{estimate} - (1.645 \times SE(\text{estimate}))$$

$$UCL90 = \text{estimate} + (1.645 \times SE(\text{estimate}))$$

Standard errors (SE) for age-adjusted rates:

This formula below applied to breast cancer, colorectal cancer, cardiovascular disease, and opioid overdose deaths metrics were calculated according to following formula outlined by Lilienfeld and Stolley³⁷ in a document published by the Utah Department of Health³⁸:

SE(estimate)

$$= \sqrt{\left[\sum \left((\text{age-group specific US 2010 standardized population weight})^2 * \frac{\text{age-group specific crude mortality rate}^2}{\text{age-group specific total number of deaths}} \right) \right]}$$

SE for premature deaths (all causes) were calculated according to the following formula outlined by Vohlonen, Bäckmand, & Korhonen:³⁹

$$SE(\text{estimate}) = \sqrt{\left[\sum \left(\frac{\text{age-group specific crude mortality rate}^2}{\text{age-group specific total number of deaths}} * (w_1 * w_2) \right) \right]}$$

w_1 = Age-group specific premature deaths weight--years of life lost

w_2 = US 2010 standardized population YPLL age-group specific weight

SE for crude rates:

This formula below applied firearm suicides and firearm homicides were calculated according to the following formula outlined by Poisson distributions.

$$SE(\text{estimate}) = \frac{\sqrt{\text{numerator}}}{\text{denominator}} * 100,000$$

Nativity Data

CIs for low birthweight and prenatal care metrics were calculated as follows:

$$LCL90 = \text{estimate} - 1.645 * \sqrt{\text{estimate} * ((100 - \text{estimate}) / \text{numerator})}$$

$$UCL90 = \text{estimate} + 1.645 * \sqrt{\text{estimate} * ((100 - \text{estimate}) / \text{numerator})}$$

CIs for teen births metric were calculated as follows:

$$LCL90 = (1000 / \text{denominator}) * (\text{numerator} - (1.645 * \sqrt{\text{numerator}}))$$

$$UCL90 = (1000 / \text{denominator}) * (\text{numerator} + (1.645 * \sqrt{\text{numerator}}))$$

Geography-Specific Notes

Congressional Districts

Age-adjusted or crude rates were calculated at the county level for all metrics and then aggregated from the county level to generate congressional district estimates.⁴⁰ See “SECTION 3: Analytic Decisions” for more details on this method. Confidence intervals are not calculated.

States

The state estimates and confidence intervals were derived directly from death and birth records, not from aggregation.

Breast Cancer Deaths

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Deaths due to breast cancer in females per 100,000 female population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Race/Ethnicity	From County

Data Table(s) + Variable(s)

The following underlying cause of death ICD-10 codes were summed to calculate Breast Cancer Deaths (females only): C500, C501, C502, C503, C504, C506, C508, & C509. ICD-10 codes were selected for inclusion as per the 2016 SEER Program Coding and Staging Manual.⁸¹

Analysis

$$\text{Breast Cancer Deaths} = \left(\sum_1^i \frac{\text{death}_i}{\text{population}_i} * w_i \right) * 100,000$$

Where:

i = total number of age groups ($i = 13$)

death_i = the number of breast cancer deaths for female population in the i^{th} age group

population_i = the total female population in the i^{th} age group

w_i = US 2010 standardized population weights

See above “Geography-Specific Notes” section under “National Vital Statistics System: General Notes” for information on calculation differences between congressional districts and states.

Cardiovascular Disease Deaths

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Deaths due to cardiovascular disease per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Sex, Race/Ethnicity	From County

Data Table(s) + Variable(s)

The following underlying cause of death ICD-10 codes were summed to calculate Cardiovascular Disease Deaths:

I110, I119, I130, I131, I132, I139, I10, I120, I129, I150, I159, I210, I211, I212, I213, I214, I219, I220, I229, I241, I248, I249, I200, I201, I209, I250, I251, I253, I254, I255, I258, I259, I500, I501, I509, I600, I602, I604, I605, I606, I607, I608, I609, I610, I611, I612, I613, I614, I615, I616, I618, I619, I620, I621, I629, I630, I631, I632, I633, I634, I635, I636, I638, I639, I64, I670, I671, I672, I673, I674, I675, I676, I677, I678, I679, I690, I691, I692, I693, I694, I698

ICD-10 codes were selected for inclusion based on Nolte & McKee⁴¹ as well as in consultation with the NYU School of Medicine’s Department of Population Health.

Analysis

$$\text{Cardiovascular Disease Deaths} = \left(\sum_1^i \frac{\text{death}_i}{\text{population}_i} * w_i \right) * 100,000$$

Where:

i = total number of age groups ($i = 13$)

death_i = the number of cardiovascular disease deaths for population in the i^{th} age group

population_i = the total population in the i^{th} age group

w_i = US 2010 standardized population weights

See above “Geography-Specific Notes” section under “National Vital Statistics System: General Notes” for information on calculation differences between congressional districts and states.

Colorectal Cancer Deaths

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Deaths due to colorectal cancer per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Sex, Race/Ethnicity	From County

Data Table(s) + Variable(s)

The following underlying cause of death ICD-10 codes were summed to calculate Colorectal Cancer Deaths: C180, C181, C182, C183, C184, C185, C186, C187, C188, C189, C19, & C20. ICD-10 codes were selected for inclusion based on the publication by Siegel, et al⁴² and in consultation with the NYU School of Medicine’s Division of Gastroenterology.

Analysis

$$\text{Colorectal Cancer Deaths} = \left(\sum_1^i \frac{\text{death}_i}{\text{population}_i} * w_i \right) * 100,000$$

Where:

- i= total number of age groups (i = 13)
- death_i= the number of colorectal cancer deaths for population in the ith age group
- population_i = the total population in the ith age group
- w_i = US 2010 standardized population weights

See above “Geography-Specific Notes” section under “National Vital Statistics System: General Notes” for information on calculation differences between congressional districts and states.

Firearm Homicides

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Deaths due to firearm homicide per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Sex, Race/Ethnicity	From County

Data Table(s) + Variable(s)

The following underlying cause of death ICD-10 codes were summed to calculate Firearm Homicides: X93, X94 and X95. ICD-10 codes were selected for inclusion in consultation with the NYU School of Medicine with support from Everytown for Gun Safety.

Analysis

$$\text{Firearm Homicides} = \frac{\text{death}}{\text{population}} * 100,000$$

Where:

- death = the number of firearm related homicides in total population
- population = total population

See above “Geography-Specific Notes” section under “National Vital Statistics System: General Notes” for information on calculation differences between congressional districts and states.

Firearm Suicides

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Deaths due to firearm suicide per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Sex, Race/Ethnicity	From County

Data Table(s) + Variable(s)

The following underlying cause of death ICD-10 codes were summed to calculate the total number of deaths from intentional self-harm by firearms: X72, X73 and X74. ICD-10 codes were selected for inclusion in consultation with the NYU School of Medicine with support from Everytown for Gun Safety.

Analysis

$$\text{Firearm Suicides} = \frac{\text{death}}{\text{population}} * 100,000$$

Where:

death = the number of firearm related homicides in total population
 population = total population

See above “Geography-Specific Notes” section under “National Vital Statistics System: General Notes” for information on calculation differences between congressional districts and states.

Opioid Overdose Deaths

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Deaths due to opioid overdose per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Sex, Race/Ethnicity	From County

Data Table(s) + Variable(s)

The following underlying cause of death ICD-10 codes were summed to calculate Opioid Overdose Deaths: X40, X41, X42, X43, X44, X60, X61, X62, X63, X64, X85, Y10, Y11, Y12, Y13, & Y14 in combination with T400, T401, T402, T403, T404, & T406 multiple cause of death codes. ICD-10 codes were selected for inclusion as per the CDC’s Guide to ICD-9-CM and ICD-10 Codes Related to Poisoning and Pain in addition to the Henry J Kaiser Family Foundation.^{43,44}

Due to reporting variability and rapid shifts in opioid use patterns, the reported estimated rates may not accurately reflect current opioids involved deaths.

Analysis

$$\text{Opioid Overdose Deaths} = \left(\sum_1^i \frac{\text{death}_i}{\text{population}_i} * w_i \right) * 100,000$$

Where:

i= total number of age groups (i = 13)
 death_i= the number of opioids involved deaths for population in the ith age group
 population_i = the total population in the ith age group
 w_i = US 2010 standardized population weights

See above “Geography-Specific Notes” section under “National Vital Statistics System: General Notes” for information on calculation differences between congressional districts and states.

Premature Deaths (All Causes)

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Years of potential life lost before age 75 per 100,000 population	Multiple Cause of Death Data, National Vital Statistics System, National Center for Health Statistics	No	Sex, Race/Ethnicity	From County

Data Table(s) + Variable(s)

Premature Deaths (All Causes) rate is defined as years of potential life lost before age 75 (YPLL-75) calculated as per Dranger and Remington’s approach.⁴⁵

Analysis

$$\text{Premature Deaths (All Causes)} = \left(\sum_1^i \frac{\text{death}_i}{\text{population}_i} * w_i * e_i \right) * 100,000$$

Where:

i= total number of age groups (i = 13)

death_i= the number of total deaths for population in the ith age group

population_i = the total population in the ith age group

w_i = US 2010 standardized population YPLL-75 age-group specific weight

e_i = standard life expectancy at age of deaths (years)

See above “Geography-Specific Notes” section under “National Vital Statistics System: General Notes” for information on calculation differences between congressional districts and states.

Low Birthweight

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of live births with low birthweight (<2500 grams)	Nativity Data, National Vital Statistics System, National Center for Health Statistics	No	Race/Ethnicity	From County

Data Table(s) + Variable(s)

All births with birthweights that are either missing, unknown, or not stated are excluded from the analysis.

Analysis

$$\text{Low Birthweight} = \frac{\text{number of live births with birthweight <2500 grams}}{\text{total number of live births}} * 100$$

See above “Geography-Specific Notes” section under “National Vital Statistics System: General Notes” for information on calculation differences between congressional districts and states.

Prenatal Care

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of births for which prenatal care began in the first trimester	Nativity Data, National Vital Statistics System, National Center for Health Statistics	No	Race/Ethnicity	From County

Data Table(s) + Variable(s)

Prenatal Care estimates represent a slight modification of one component of the Kotelchuck Index.⁴⁶ All births with missing or unknown prenatal care are excluded from the analysis. Prenatal care data for certain states across years are missing because these states had not implemented 2003 birth certificate revisions. For more information please refer to the natality public use data documentation files.⁴⁷⁻⁵²

Analysis

$$\text{Prenatal Care} = \frac{\text{number of live births with prenatal care beginning between 1 and 3 months}}{\text{total number of live births}} * 100$$

See above “Geography-Specific Notes” section under “National Vital Statistics System: General Notes” for information on calculation differences between congressional districts and states.

Teen Births

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Births to females 15-19 years per 1,000 females in that age group	Nativity Data, National Vital Statistics System, National Center for Health Statistics	No	Race/Ethnicity	From County

Data Table(s) + Variable(s)

See analysis below.

Analysis

$$\text{Teen Births} = \frac{\text{number of live births to mothers aged 15-19}}{\text{total female population aged 15-19}} * 100,000$$

See above “Geography-Specific Notes” section under “National Vital Statistics System: General Notes” for information on calculation differences between congressional districts and states.

PLACES, Centers for Disease Control and Prevention

General Notes

PLACES apply a multi-level regression with post-stratification (MPR) approach to develop small area estimates (SAE), like census tracts, for key measures captured in the Behavioral Risk Factor Surveillance System (BRFSS). Prior to the PLACES, BRFSS measures were only available at the county, Metropolitan Statistical level or above. For further details on the methodology, see Zhang et al (2014).⁵³ For more information regarding these metrics, please refer to the PLACES’s methodology pages.⁵⁴⁻⁵⁶

Estimates for New Jersey in 2019 and Florida in 2021 are not available as the states did not collect enough BRFSS data to meet minimum requirements for inclusion. The underlying data source, BRFSS, issued a warning for their 2020 data noting that 2020 data may not be comparable to other years due to difficulties collecting samples during the 2020 pandemic, and an underlying weighting method modification.⁵⁷

Confidence Interval Calculation

Confidence intervals were included with the estimates downloaded from the 500 Cities Project. However, the 500 Cities Project reports 95% confidence intervals, rather than the 90% confidence intervals reported by the Dashboard. Upper and lower limits of the 95% confidence intervals were used to calculate an approximate standard error (SE). The SE was then used to calculate 90% confidence intervals. See Preventive services, 65+ below for metric-specific confidence interval calculations.

$$SE = \frac{UCL95 - LCL95}{1.96 \times 2}$$

$$LCL90 = \text{Estimate} - (1.645 \times SE)$$

$$UCL90 = \text{Estimate} + (1.645 \times SE)$$

Where:

SE = approximate standard error

LCL95 = Reported lower limit for the 95% confidence interval

UCL95 = Reported upper limit for the 95% confidence interval

LCL90 = Calculated lower limit for the 90% confidence interval

UCL90 = Calculated upper limit for the 90% confidence interval

Geography-Specific Notes

Census Tracts

Census tract estimates are provided as received from PLACES. Confidence intervals are provided.

Congressional Districts

PLACES estimates are aggregated from the tract level to generate congressional district estimates, using the modified population crosswalk for estimates in 2010 Census vintage. See “SECTION 3: Analytic Decisions” for more details on this method. Confidence intervals are not provided.

States

State estimates are calculated directly from BRFSS. Please see the “Behavioral Risk Factor Surveillance System (BRFSS)” metric analysis section for more details. Confidence intervals are provided.

Binge Drinking

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of adults who report binge drinking in the past 30 days	PLACES Project, Centers for Disease Control	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Binge Drinking crude prevalence tract level data were downloaded directly from the PLACES website in the GIS friendly format.⁵⁸⁻⁶³

Analysis

Binge Drinking is reported as received.

See above “Geography-Specific Notes” section under “PLACES, Centers for Disease Control and Prevention: General Notes” for information on calculation differences between Census tracts and congressional districts.

Dental Care

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of adults who report visiting a dentist in the past year	PLACES Project, Centers for Disease Control	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Dental Care crude prevalence tract level data were downloaded directly from the PLACES website in the GIS friendly format.

Analysis

Dental Care is reported as received.

See above “Geography-Specific Notes” section under “PLACES, Centers for Disease Control and Prevention: General Notes” for information on calculation differences between Census tracts and congressional districts.

Diabetes

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of adults who report having diabetes	PLACES Project, Centers for Disease Control	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Diabetes crude prevalence tract level data were downloaded directly from the PLACES website in the GIS friendly format.

Analysis

Diabetes is reported as received.

See above “Geography-Specific Notes” section under “PLACES, Centers for Disease Control and Prevention: General Notes” for information on calculation differences between Census tracts and congressional districts.

Frequent Mental Distress

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of adults who report ≥14 days of poor mental health in the past 30 days	PLACES Project, Centers for Disease Control	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Frequent Mental Distress crude prevalence tract level data were downloaded directly from the PLACES website in the GIS friendly format.

Analysis

Frequent Mental Distress is reported as received.

See above “Geography-Specific Notes” section under “PLACES, Centers for Disease Control and Prevention: General Notes” for information on calculation differences between Census tracts and congressional districts.

Frequent Physical Distress

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of adults who report ≥14 days of poor physical health in the past 30 days	PLACES Project, Centers for Disease Control	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Frequent Physical Distress crude prevalence tract level data were downloaded directly from the PLACES website in the GIS friendly format.

Analysis

Frequent Physical Distress is reported as received.

See above “Geography-Specific Notes” section under “PLACES, Centers for Disease Control and Prevention: General Notes” for information on calculation differences between Census tracts and congressional districts.

High Blood Pressure

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of adults who report high blood pressure	PLACES Project, Centers for Disease Control	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

High Blood Pressure crude prevalence tract level data were downloaded directly from the PLACES website in the GIS friendly format.

Analysis

High Blood Pressure is reported as received.

See above “Geography-Specific Notes” section under “PLACES, Centers for Disease Control and Prevention: General Notes” for information on calculation differences between Census tracts and congressional districts.

Obesity

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of adults who report a body mass index (BMI) ≥ 30 kg/m ²	PLACES Project, Centers for Disease Control	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Obesity crude prevalence tract level data were downloaded directly from the PLACES website in the GIS friendly format.

Analysis

Obesity is reported as received.

See above “Geography-Specific Notes” section under “PLACES, Centers for Disease Control and Prevention: General Notes” for information on calculation differences between Census tracts and congressional districts.

Physical Inactivity

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of adults who report no leisure-time physical activity in the past 30 days	PLACES Project, Centers for Disease Control	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Physical Inactivity crude prevalence tract level data were downloaded directly from the PLACES website in the GIS friendly format.

Analysis

Physical Inactivity is reported as received.

See above “Geography-Specific Notes” section under “PLACES, Centers for Disease Control and Prevention: General Notes” for information on calculation differences between Census tracts and congressional districts.

Preventive Services, 65+

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of adults ≥65 years who are up to date on a core set of clinical preventive services	PLACES Project, Centers for Disease Control	Yes	Sex	From Tract

Data Table(s) + Variable(s)

Preventive Services, 65+ crude prevalence tract level data were downloaded directly from the PLACES website in the GIS friendly format.

Analysis

At the recommendation of the PLACES analytic team¹⁰², overall Preventive Services, 65+ values were calculated as a weighted average of preventive service use by women and preventive service use by men. Per PLACES, we used 2010 Decennial Census Survey for tract level population counts.

The weighted proportion formula is below:

$$p_{\text{weighted}} = \frac{\hat{p}_{\text{male 65+}} * n_{\text{male 65+}} + \hat{p}_{\text{female 65+}} * n_{\text{female 65+}}}{n_{\text{male 65+}} + n_{\text{female 65+}}}$$

Where:

p_{weighted} = weighted proportion of overall use of preventive services by men and women 65+

$p_{\text{male 65+}}$ = reported proportion of overall use of preventive services by men 65+ (from PLACES)

$p_{\text{female 65+}}$ = reported proportion of overall use of preventive services by women 65+ (from PLACES)

$n_{\text{male 65+}}$ = population, men 65+ (from 2010 DCS)

$n_{\text{female 65+}}$ = population, women 65+ (from 2010 DCS)

To calculate our pooled MOE, we performed a series of steps. Note that, for Preventive services, 65+ *only*, the MOE remains the same on both sides compared to other PLACES-derived metrics. PLACES uses other methods to generate their confidence limits⁶⁴, where the Dashboard uses population parameters to calculate MOE and confidence limits.

1. For male and female, convert *upper* MOE to standard error (SE)

$$SE = \frac{MOE_{\text{upper}} - \hat{p}}{1.96}$$

2. For male and female, transform standard error into variance (var)

$$\text{var} = (SE * \sqrt{n})^2$$

3. Pool the variances into a pooled standard deviation

$$SD_{\text{pooled}} = \sqrt{\frac{(n_{\text{male 65+}} - 1) * \text{var}_{\text{male}} + (n_{\text{female 65+}} - 1) * \text{var}_{\text{female}}}{n_{\text{male 65+}} + n_{\text{female 65+}} - 2}}$$

4. Transform pooled standard deviation into standard error

$$SE_{\text{pooled}} = SD_{\text{pooled}} * \sqrt{\frac{1}{n_{\text{male 65+}}} + \frac{1}{n_{\text{female 65+}}}}$$

5. Compute pooled MOE at the 90% confidence level.

$$MOE_{\text{pooled, 90\%}} = SE_{\text{pooled}} * 1.645$$

Where:

- n = population (by sex)
- SD_{pooled} = pooled standard deviation
- SE_{pooled} = pooled standard error
- MOE_{pooled} = pooled margin of error

See above “Geography-Specific Notes” section under “PLACES, Centers for Disease Control and Prevention: General Notes” for information on calculation differences between Census tracts and congressional districts.

Please note that PLACES modified their inclusion criteria for being up to date on core preventative services in 2020.

Routine Checkup, 18+

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Percentage of adults who report visiting a doctor for routine checkup in the past year	PLACES Project, Centers for Disease Control	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Routine Checkup, 18+ crude prevalence tract level data were downloaded directly from the PLACES website in the GIS friendly format.

Analysis

Routine Checkup, 18+ is reported as received.

See above “Geography-Specific Notes” section under “PLACES, Centers for Disease Control and Prevention: General Notes” for information on calculation differences between Census tracts and congressional districts.

Smoking

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	Geography Aggregation
Percentage of adults who report current smoking	PLACES Project, Centers for Disease Control	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Smoking crude prevalence tract level data were downloaded directly from the PLACES website in the GIS friendly format.

Analysis

Smoking is reported as received.

See above “Geography-Specific Notes” section under “PLACES, Centers for Disease Control and Prevention: General Notes” for information on calculation differences between Census tracts and congressional districts.

United States Small-Area Life Expectancy Project (USALEEP)

General Notes

Life expectancy estimates were estimated by the United States Small-Area Life Expectancy Project (USALEEP), a joint effort of The Robert Wood Johnson Foundation, National Association for Public Health Statistics and Information Systems (NAPHSIS) and the National Center for Health Statistics (NCHS) at the Centers for Disease Control (CDC). The methodology used to calculate tract-level data is published.⁶⁵

Life Expectancy

Metric Description	Data Source	Tract Estimates	Demographic Subgroups	CD Geography Aggregation
Average years of life expectancy at birth	U.S. Small-Area Life Expectancy Estimates Project (USALEEP)	Yes	Not Available	From Tract

Data Table(s) + Variable(s)

Tract-level data were downloaded from USALEEP; tract-level data and documentation files are available for free download.⁶⁶⁻⁶⁸

Analysis

Estimates are calculated by USALEEP and represent the average number of years a person can expect to live from birth.

Confidence Interval Calculation

Standard errors are included in downloadable USALEEP data. Ninety percent confidence intervals for were calculated as per the following formulas:

$$\text{LCL90} = \text{estimate} - (1.645 \times \text{SE}(\text{estimate}))$$

$$\text{UCL90} = \text{estimate} + (1.645 \times \text{SE}(\text{estimate}))$$

Where:

LCL90 = Calculated lower limit for the 90% confidence interval

UCL90 = Calculated upper limit for the 90% confidence interval

SE = approximate standard error

Geography-Specific Notes

Census Tracts

Census tract estimates are presented as received from USALEEP. Confidence intervals are calculated.

Congressional Districts

Life Expectancy estimates are aggregated from the tract level to generate congressional district estimates, using the modified population crosswalk for estimates in 2010 Census vintage. See "SECTION 3: Analytic Decisions" for more details on this method. Confidence intervals are not calculated.

States

State estimates are presented as received from USALEEP, but are downloaded from a different location than census tracts.⁶⁹ Confidence intervals are calculated.

SECTION 5: Appendix

State-Based 118th Block Equivalency Acquisition

State Name	Date of Access	Method of Access	File Type
Alaska	Not Applicable	assigned to an at large district	NA
Alabama	June 7, 2022	received from Alabama Senate Reapportionment Office	.xlsx
Arkansas	June 13, 2022	received from Arkansas GIS Office	.txt
Arizona	February 11, 2022	downloaded from the Arizona Independent Redistricting Commission website	.txt
California	March 21, 2022	downloaded from the California Commission, We Draw the Lines CA website	.xlsx
Colorado	March 21, 2022	downloaded from the Colorado Independent Redistricting Commission website	.txt
Connecticut	February 25, 2022	downloaded from the Connecticut General Assembly website	.csv
District of Columbia	Not Applicable	assigned to an at large district	NA
Delaware	Not Applicable	assigned to an at large district	NA
Florida	June 10, 2022	downloaded from Florida Office of Economic and Demographic Research website	.txt
Georgia	June 7, 2022	downloaded from Georgia General Assembly website	.xlsx
Hawaii	June 30, 2022	received from Hawaii State Legislature	.csv
Iowa	March 21, 2022	downloaded from Iowa Legislature website	.csv
Idaho	March 21, 2022	downloaded from Idaho Legislature website	.csv
Illinois	March 30, 2022	downloaded from Illinois Redistricting website	shapefile converted to .Rdata
Indiana	March 21, 2022	received from Indiana Secretary of State's Office	shapefile converted to .Rdata
Kansas	June 13, 2022	received from Kansas Legislative Research Department (Redistricting)	.csv
Kentucky	June 7, 2022	downloaded from Kentucky General Assembly website	.xlsx
Louisiana	June 10, 2022	downloaded from Louisiana State Legislature website	.txt
Massachusetts	March 21, 2022	downloaded from Massachusetts State Legislature website	.xlsx
Maryland	June 7, 2022	downloaded from Maryland Department of Planning website	.xlsx
Maine	March 21, 2022	received from Maine State Legislature	shapefile converted to .Rdata
Michigan	June 7, 2022	downloaded from Michigan Independent Citizens Redistricting Commission website	.txt
Minnesota	March 21, 2022	downloaded from Minnesota Legislature website	.csv
Missouri	June 7, 2022	downloaded from Missouri House of Representatives website	.xlsx

State Name	Date of Access	Method of Access	File Type
Mississippi	March 21, 2022	downloaded from Mississippi Automated Resource Information System website	.xlsx
Montana	June 28, 2022	downloaded from Montana Districting and Apportionment Commission	.csv
North Carolina	June 7, 2022	downloaded from North Carolina General Assembly	.csv
North Dakota	Not Applicable	assigned to an at large district	NA
Nebraska	June 28, 2022	downloaded from Nebraska Legislature website	.csv
New Hampshire	June 10, 2022	downloaded from New Hampshire Office of Strategic Initiatives website	.csv
New Jersey	June 29, 2022	downloaded from New Jersey Redistricting Commission website	.txt
New Mexico	June 10, 2022	downloaded from New Mexico Legislature website	.xlsx
Nevada	June 7, 2022	downloaded from Nevada Legislature Website	.xlsx
New York	June 8, 2022	downloaded from New York State Legislative Task Force on Demographic Research and Reapportionment	.xlsx
Ohio	June 10, 2022	downloaded from Ohio Redistricting Commission website	.xlsx
Oklahoma	March 21, 2022	downloaded from Oklahoma State Legislature website	.xlsx
Oregon	March 21, 2022	downloaded from Oregon State Legislature website	.txt
Pennsylvania	June 7, 2022	downloaded from Pennsylvania Redistricting website	.xlsx
Rhode Island	March 2, 2022	downloaded from the Rhode Island Redistricting Project website	shapefile converted to .Rdata
South Carolina	June 7, 2022	downloaded from the South Carolina House of Representatives Redistricting website	.xlsx
South Dakota	Not Applicable	assigned to an at large district	NA
Tennessee	June 7, 2022	downloaded from the Redistricting Data Hub	shapefile converted to .Rdata
Texas	June 7, 2022	downloaded from the Texas Redistricting website	.csv
Utah	June 8, 2022	downloaded from the Utah State Legislature website	.txt
Virginia	March 22, 2022	downloaded from Virginia Redistricting Commission website	.txt
Vermont	Not Applicable	assigned to an at large district	NA
Washington	March 22, 2022	downloaded from the Washington State Redistricting Commission website	.csv
Wisconsin	March 30, 2022	downloaded from the Wisconsin Governor's website	.csv
West Virginia	June 28, 2022	downloaded from West Virginia Legislature website	shapefile converted to .Rdata
Wyoming	Not Applicable	assigned to an at large district	NA

Acknowledgements

The Dashboard acknowledges Allegra Wilson, Sarah Conderino, Miriam Gofine, Dr. Ben Spoer, Taylor Lampe, Peggy Hsieh, Alexander Chen, Dr. Yuruo Li, Dr. Shoshanna Levine, Isabel Nelson, Anne Vierse, Eileen, Shea, Jay Stadelman, Noah Zazanis, Dr. Jessica Athens, Shauna Ford, Dr. Susan Kum, Leena Abbas, and Farhana Haque for their significant contributions to the Dashboard site and analyses.

The Dashboard acknowledges Rania Kanchi, Alexis Feinberg, and Priscilla Lopez for their significant contributions to the pilot Dashboard site and analyses.

The Dashboard acknowledges the Robert Wood Johnson Foundation and the program staff who support this project.

The Dashboard acknowledges Dr. S V Subramanian (Professor of Population Health and Geography at Harvard University) for his collaboration and expertise on geographic aggregation methods and congressional districts.

For additional expertise surrounding geographic aggregation methods, the Dashboard acknowledges Dr. David Van Riper and Dr. Jonathan Schroeder (IPUMS National Historical Geographic Information System (NHGIS)), Dr. Yan Wang and Dr. Hua Lu (PLACES Project), Glenn Rice (Missouri Census Data Center GeoCorr), and The American Community Survey.

The Dashboard acknowledges the following individuals for their technical assistance: Dr. Ingrid Ellen, Dr. Justin Feldman, Dr. Kevin Kromar, Dr. Jennifer Norton, Susan Kum, Dr. Pasquale Rummo, and the Dashboard Scientific Advisory Committee.

The Dashboard acknowledges Dr. Xingyou Zhang, Senior Mathematical Statistician, U.S. Department of Agriculture, Economic Research Service, for his expertise surrounding the “Air pollution – particulate matter” metric.

The Dashboard acknowledges Dr. Erin Fahle, Assistant Professor, St. John’s University, and Dr. sean f. reardon, Professor, Stanford University, for their expertise surrounding development of the education metrics, particularly third-grade reading scores.

The Dashboard acknowledges Dr. Celia Stall-Meadows (Tribal Research Department, Choctaw Nation), Dr. Carmela Alcántara (Associate Professor, Columbia University School of Social Work), Dr. Stella Yi (Assistant Professor, NYU School of Medicine), Dr. Simona Kwon (Associate Professor, NYU School of Medicine), Jennifer Wong (Senior Program Coordinator, NYU School of Medicine), Center for the Study of Asian American Health, and Dr. Sheri Daniels (Executive Director, Papa Ola Lokahi) for their expertise surrounding demographic maps.

Update History

Update Date	Update Notes
02-20-2024	<ul style="list-style-type: none"> • Medicaid Enrollment - % of Total Population: New metric added (Q4 2022 – Q3 2023) • ACS: <ul style="list-style-type: none"> ○ Addition of 2022 data ○ Calculation update for Lead Exposure Risk Index and Housing with Potential Lead Risk • PLACES Project: <ul style="list-style-type: none"> ○ Addition of 2021 data for all metrics except Dental Care and Preventative Services, 65+ ○ Calculation update for 2020 state Preventive Services, 65+ data • NVSS: Addition of 2021 data • Chronic Absenteeism: New metric added (School year ending in 2022) • Air Pollution – Ozone: New monthly metric added (Jan – Dec 2022) • Air Pollution – PM2.5: <ul style="list-style-type: none"> ○ Update of data source ○ Change in data time period from annual to monthly data (Jan – Dec 2022) • COVID Local Risk Index: Metric removed from website and downloadable data • District Snapshots – District Facts: <ul style="list-style-type: none"> ○ Updated data source and calculation method ○ New year of data (2022)
06-06-2023	<ul style="list-style-type: none"> • 08-23-2023 revision: corrected an error in segregation 2021 congressional district and state values that caused a slight inflation of scores. • ACS: Addition of 2021 data • PLACES Project: <ul style="list-style-type: none"> ○ Addition of 2020 data for all metrics except High Blood Pressure ○ Addition of 2017 data for High Blood Pressure • Air Pollution – Particulate Matter: Addition of 2019 data • Limited Supermarket Proximity: Metric removed from website and downloadable data. • Addition of Census tract estimates (where available) • Addition of state estimates (where available)
03-10-2023	<ul style="list-style-type: none"> • Limited Supermarket Proximity: Metric name updated from “Limited Access to Healthy Foods”; No change made to underlying construct
01-24-2023	<p>First release of the Congressional District Health Dashboard</p> <ul style="list-style-type: none"> • 36 metrics • Data for all congressional districts • One year of data released for all metrics

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