geo**ex**map Technical Documentation

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Malia Cortez, MS & Sam Chao, BA
geo**ex**lab @ Epidemiology Program, Public Health Sciences Division,
Fred Hutchinson Cancer Center
geoexmap@fredhutch.org

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Introduction

This document contains technical documentation—including data dictionaries and detailed methodology—for geo**ex**map, a geospatial mapping tool for visualizing many health and environmental factors in the Fred Hutchinson Cancer Center catchment area (Washington state). It is strictly built with open-source software and publicly available data.

Geoexmap contains the latest available data, with most variables being from 2020 or later. See the data documentation for details.

Geoexmap was built using R 4.4.3, with packages `shiny`[1], `htmltools`[2], `reactable`[3], `tidyverse`[4], `sf`[5], `markdown`[6], `leaflet`[7], `leaflet.extras`[8], `leaflet.extras2`[9], `plotly`[10], `RColorBrewer`[11], `bslib`[12], `bsicons`[13], `dplyr`[14], `shinyjs`[15], `leaflegend`[16], `rlang`[17], and `rintrojs`[18].

Selected datasets were created with some processing from Google Earth Engine[19] (free account).

Methodology

Sociodemographics

Measures, Dataset(s), and Processing Steps

Measure	**Data Source + Link**	**Processing**
Total population	ACS Population Variables[20] (2024)	1. Dataset loaded into R as a geographic dataset 2. Loaded the Washington Census Tracts from the *tigris* R package from the Census Bureau for it to be joined with the processed data later 3. Checked if the coordinate systems are the same between the Washington Census Tract and the ACS_Age_Sex_Boundaries shapefile.

		4. Transformed the shapefile to the same system. 5. Cropped the shapefile to include Washington State only. 6. Selected columns of interest such as total population and male and female age group breakdown. 7. Calculated the percentage of each age and sex group.
Age		8. Used the dataset named “shapefile_wa” loaded into R previously 9. Mutated each column to become the percentage of male and female per five-year gap (example: 0 - 4 years old males and females) in the total population.
Sex		1. Used the dataset named “shapefile_wa” loaded into R previously. 2. Added the two columns for percentage of male in the total population and the percentage of females in the total population. 3. Dataset saved to processed folder as a geographic dataset (geopackage).
Race and ethnicity	ACS Race and Hispanic Origin Variables[21] (2024)	1. Loaded the dataset called “ACS_Race_and_Hispanic_Origin_Variables_-_Boundaries\Tract.shp" from the American Community Survey (ACS). 2. Transformed the coordinate system to WGS 84. 3. Cropped the dataset to include Washington State only. 4. Renamed columns from numbers to legible ethnic groups.

		5. Added columns representing the percentage of each group against the total population. 6. Selected the final columns in the order of (number, percentage) for each group. 7. Dataset saved to processed folder

Health Outcomes

Measures, Dataset(s), and Processing Steps

Measure	Data Source (Year)	Processing
Arthritis	CDC PLACES[22] (2023)	1. Dataset loaded into R as a geographic dataset. 2. Dataset checked against Census Bureau TIGER/Line file derived from R "tigris"[23] to ensure coverage of all 2020 Washington census tracts. 3. Dataset saved to processed folder as a geographic dataset (geopackage).
Asthma		
High blood pressure		
Cancer (non-skin) or melanoma		
High cholesterol		
Chronic obstructive pulmonary disease		
Coronary heart disease among adults		
Depression among adults		
Diagnosed diabetes among adults		
Obesity among adults		
All teeth lost among adults aged ≥65 years		
Stroke among adults		
Cancer incidence	Washington State Cancer Registry[24] (2025 incidence, 2023 mortality)	1. Age-adjusted cancer incidence and mortality data for all cancer sites was downloaded by stage at diagnosis and gender (where available), at the most recent 5-year time-period (2018-2022) and county level.
Cancer mortality		

		2. Some site-specific data is only available at the multi-county level due to suppression of smaller values. These data were downloaded at the multi-county level, and the counties included in these groups were noted to map values to individual counties later. See the WSCR Technical Notes document for more details. 3. Data for both incidence and mortality were loaded into R by reading the first 30 lines, detecting key words ("Data Type", "Cancer Site", "Geography", "Age Group", "Year", "Gender", "Race", "Observations"), and skipping all preceding lines for each file 4. All files were then row-bound into one singular dataset 5. To map multi-county regions to individual counties, 6 vectors were created for each multi-county region with its corresponding counties: 6. West: Clallam, Jefferson, Grays Harbor, Mason, Thurston, Pacific, Lewis, Cowlitz, Skamania, Clark 7. Kitsap-Pierce: Kitsap, Pierce

		8. King: King 9. North: Whatcom, Skagit, Snohomish, Island, San Juan 10. Central: Chelan, Douglas, Grant, Kittitas, Yakima, Benton, Franklin, Klickitat 11. East: Okanogan, Ferry, Stevens, Pend Oreille, Lincoln, Spokane, Adams, Whitman, Walla Walla, Columbia, Garfield, Asotin 12. Table was then expanded (one row for each county within a multi-county region) and individual counties corresponding to each region were added as a column 13. Finally, blank cell values (“”) were excluded, and NA values for Stage at Diagnosis were changed to “All” (empty values for stage mean that only “all” stages were available for that cancer site) 14. Separate tables for incidence and mortality were saved as tables (.csv)

Health Behaviors

Measures, Dataset(s), and Processing Steps

Measure	**Data Source + Link**	**Processing**
Binge drinking		

Cigarette smoking No leisure-time physical activity Short sleep duration	CDC PLACES[22] (2023)	1. Dataset loaded into R as a geographic dataset. 2. Dataset checked against Census Bureau TIGER/Line file to ensure coverage of all 2020 Washington census tracts. 3. Dataset saved to processed folder as a geographic dataset (geopackage).

Prevention

Measures, Dataset(s), and Processing Steps

Measure	Data Source + Link	Processing
Lack of health insurance	CDC PLACES[22] (2023)	1. Dataset loaded into R as a geographic dataset 2. Dataset checked against Census Bureau TIGER/Line file to ensure coverage of all 2020 Washington census tracts 3. Dataset saved to processed folder as a geographic dataset (geopackage)
Routine checkup within the past year		
Visited dentist or dental clinic in the past year		
Taking medicine to control high blood pressure		
Cholesterol screening		
Mammography use		
Colorectal cancer screening		

Healthcare Access

Measures, Dataset(s), and Processing Steps

Measure	Data Source + Link	Processing
Clinics	Downloadable Data Sets | Washington State Department of Health[25] (Current)	1. Datasets were downloaded as separate geodatabases 2. Data were transformed to coordinate system WGS 84 (EPSG: 4326) 3. Data were saved as geographic layers to final geopackage
EMS Stations		
Hospitals		
Pharmacies		
WIC Clinics		
WIC Retailers		
Cancer Programs	American College of Surgeons | Cancer Care Facilities[26] (Current)	1. Narrowed search to “Cancer Care” for “Hospital/Facility Type” with “Location” as “Washington” 2. Used Excel to manually create a dataset with facility names and addresses using search results, ensuring facilities only in Washington state are included 3. Loaded Excel sheet into R

		4. Geocoded addresses using `tidygeocoder`'s `geocode()` with method = "arcgis" 5. Converted dataset with latitude/longitude to a geographic object in R 6. Saved data as a geographic dataset (geopackage)
Federally Qualified Health Centers (FQHCs)	FQHC | Washington State Geospatial Open Data Portal[27] (2018)	1. Data was downloaded as a table (.csv) 2. Data was transformed to a geographic dataset based on latitude and longitude columns 3. Data was transformed to the coordinate system WGS 84 (EPSG: 4326) 4. Data was saved as a geographic layer to final dataset

Natural Environment

Measures, Dataset(s) and Processing Steps

Measure	**Data Source + Link**	**Processing**
Particulate matter <2.5 microns in diameter ($PM_{2.5}$)	Washington University in St. Louis (WUSTL) Atmospheric Composition Analysis Group[28] (2022)	1. Dataset was loaded as a netCDF file into R 2. Data was captured in latitude-longitude form and put into an array 3. Data was converted to an R spatial raster (SpatRaster) 4. Raster data was cropped (filtered) to the geographic extent of Washington census tracts

		5. The mean PM 2.5 value was extracted for each census tract, excluding values on borders (touches = FALSE) 6. Data was saved as a geographic dataset (geopackage)
Nitrogen dioxide (NO_2) Carbon monoxide (CO) Sulfur dioxide (SO_2)	CACES RCM/LUR Data Download[29] (2020)	1. Data downloaded as a table (.csv) 2. Data was inspected for missingness a. Out of 1458 census tracts (2010 geography), 1435 had data available b. 23 census tracts were missing 3. To address missing data, spatial imputation was performed by creating a spatial weights matrix with queen's contiguity, taking advantage of neighbors having similar values for pollution ○ Additional missingness from neighbors of neighbors having missing values (n = 8) was addressed by using weighted k-nearest neighbors' values (k = 5) 4. With missingness addressed, the data was then converted to 2020 geographies using the NHGIS 2010 to 2020 tract crosswalk[30] ○ Data was joined to the crosswalk using the 2010 Federal Information Processing Series (FIPS) code, keeping all rows from the crosswalk (i.e., left join) ○ Data was multiplied by the crosswalk's `parea` interpolation weight column, indicating the proportion area in the source (2010 tracts) that lies in the target (2020 tracts)

		○ Data was grouped by the 2020 tract FIPS code and summed (na.rm = TRUE to avoid missing values) with the multiplied data to obtain air pollution values for the 2020 geometry 5. Converted data was then joined to geographic dataset of Washington tracts 6. Data was saved as a geographic dataset (geopackage)
Ozone (O_3)	Daily Census Tract-Level Ozone Concentrations, 2016 - 2020: CDC[31] (2020)	1. Data was downloaded as a table (.csv) 2. Data was filtered to Washington State 3. Data was grouped by census tract 4. Added a new column called "average_ozone" to be the mean of the column "DS_O3_pred" 5. Data was merged to wa.tracts.2020 by joining census tract as the ID. 6. Data was saved as a geographic dataset (geopackage)
Wildfire smoke	Stanford ECHO Lab[32] (2023)	1. Data was downloaded as a table (.csv) 2. Data was manipulated according to processing instructions from: README 3. Annual average smoke concentrations were calculated for each census tract 4. Data was joined with geographic Washington tract data 5. Data was saved as a geographic dataset (geopackage)
Ultraviolet radiation (UV)	TEMIS -- Daily UV index and UV dose data from satellite[33] (2024)	1. Data was downloaded as a netCDF 2. Data was captured in lat/long form and captured in a 3D array (latitude x longitude x days)

		3. Took the mean of the third dimension to get yearly average UVI 4. Array was saved as a raster and converted to spatial raster (SpatRaster) 5. Flipped raster vertically as SpatRaster flips rasters 6. Cropped to geographic extent of Washington census tracts 7. The mean UVI value was extracted for each census tract, excluding values on borders (touches = FALSE) and added as a new column to the tracts dataset 8. Data saved as a geographic dataset (geopackage)
Natural disaster risk	National Risk Index Census Tracts | HEAT.gov[34] (2024)	1. Loaded dataset as shapefile to R. 2. Transformed the coordinate system to match the Washington State Census Tract coordinate system (crs = 4326, WGS84). 3. Cropped dataset to Washington State only. 4. Used the grepl function to filter the columns to ones that include "risks". 5. Data saved as a geographic dataset (geopackage).
Temperature Precipitation Dew point	PRISM Climate Group at Oregon State University[35] (2020)	1. For temperature, we processed temperature maximum, minimum, and mean of each tract. 2. For each temperature metric, data was loaded as a raster file. 3. Using the projectRaster function, the coordinate system was transformed to match the destination (wa.tracts.2020). 4. Converted the data to SpatRaster for spatial processing.

		5. Checked if the projection is the same as wa.tracts.2020. 6. Cropped the SpatRaster file to Washington State only. 7. Calculated the mean value of each temperature metric in a raster pixel within a tract boundary, resulted in one value per tract. 8. Data saved as a geographic dataset. 9. For precipitation, data was loaded as a raster file. 10. Projection was transformed to match the destination's projection (wa.tracts.2020). 11. Converted the data to SpatRaster for spatial processing. 12. Cropped the SpatRaster file to Washington State only. 13. Calculated the mean value of each precipitation metric in a raster pixel within a tract boundary, resulted in one value per tract. 14. Data saved as a geographic dataset "wa.tracts.2020.PRISM" 15. For Dew point, the steps were the same as precipitation.
Micro/macro plastics	NOAA NCEI Marine Microplastic Concentrations[36] (2025)	1. Using the interactive map, drew a bounding box around Washington and microplastic samples in Pacific Ocean close to west Washington border 2. Downloaded samples within the bounding box

		3. Included samples less than or equal to 70,398.2 meters from Washington boundaries 4. Saved data as a geographic dataset (geopackage)
Radon	National Radon Exposure Model[37] (2021)	1. The original data was provided at the ZIP code tabulation area (ZCTA) level. The first step is to convert ZCTA-level radon data to tract-level radon data a. ZCTA to tract relationship files (2010 ZCTA to 2010 tract) were downloaded from the Census Bureau. b. The ZCTA relationship file was joined to the radon data by ZIP code c. Since radon is measured in households, we used the percentage of housing units in the tract as the weighted variable (tract proportion of housing units from the ZCTA) d. These weighted values were multiplied by radon concentrations and summed for each 2010 tract to obtain values at the 2010 tract level for radon concentrations 2. Next, 2010 tract geometries were converted to 2020 tract geometries, first addressing tracts that had missing data a. 2010 tract level radon concentrations were joined with the 2010 TIGRIS shapefile, adding geographic features b. To address missing data, spatial imputation was performed by creating a spatial weights matrix with queen's contiguity, taking advantage of neighbors having similar values for radon pollution

		c. Additional missingness from neighbors of neighbors having missing values from tracts in Washington's islands (n = 8) was addressed by using weighted k-nearest neighbors (KNN) values (k = 5) 3. With missingness addressed, the data was then converted to 2020 geographies using the NHGIS 2010 to 2020 tract crosswalk[30] a. Data was joined to the crosswalk using the 2010 Federal Information Processing Series (FIPS) code, keeping all rows from the crosswalk (i.e., left join) b. Data was multiplied by the crosswalk's `parea` interpolation weight column, indicating the proportion area in the source (2010 tracts) that lies in the target (2020 tracts) c. Data was grouped by the 2020 tract FIPS code and summed (na.rm = TRUE to avoid missing values) with the multiplied data to obtain radon pollution values for the 2020 geometry 4. Converted data was then joined to geographic dataset of Washington tracts 5. Data was saved as a geographic dataset (geopackage)
PFAS in drinking water	Unregulated Contaminant Monitoring Rule Data Finder[38] (2021) Community Water System Service Area Boundaries[39] (2024)	6. Unregulated Contaminant Monitoring Rule 5 (UCMR5) data for Washington and community water system boundaries were downloaded and linked based on public water system (PWS) ID 7. Lithium and observations with "<MRL" as the result were excluded

		8. Grouped by 2020 tract FIPS code and calculated the mean PFAS concentrations (µg/L) with na.rm = TRUE to capture all detected PFAS in a tract 9. The above dataset was merged with the Washington tracts shapefile from TIGRIS, keeping all rows from the Washington tracts shapefile (i.e., left join) 10. Created a new binary column named "PFAS". Values in this column are TRUE if the mean PFAS result is not NA, and FALSE otherwise. 11. Data was saved as a geographic dataset (geopackage)

Built Environment

Measures, Dataset(s) and Processing Steps

Measure	**Data Source + Link**	**Processing**
Neighborhood walkability	EPA National Walkability[40] (2019)	1. EPA's walkability index was downloaded 2. Data is represented at the block group level, so we began by creating a variable for the tract-level FIPS code (first 11 digits). These correspond to 2010 geography tracts 3. For each tract FIPS, we calculated the mean score for every component required to calculate the walkability index (intersection density, proximity to transit, employment mix, and employment-household mix) 4. For every tract, we manually calculated a walk score according to the EPA's methodology:

		5. Walkability Index Score = $w/3) + (x/3) + (y/6) + (z/6)$ Where: a. w = ranked score for intersection density b. x = ranked score for proximity to transit stops c. y = ranked score for employment mix d. z = ranked score for employment and household mix 6. After the calculation, we obtained a walkability index score for each census tract 7. The next step was to interpolate walkability scores for most recent geographies using the NHGIS 2010 to 2020 tract crosswalk a. Data was joined to the crosswalk using the 2010 Federal Information Processing Series (FIPS) code, keeping all rows from the crosswalk (i.e., left join) b. Data was multiplied by the crosswalk's `wt_pop` interpolation weight column, indicating the proportion of the population in the source (2010 tracts) that lies in the target (2020 tracts) c. Data was grouped by the 2020 tract FIPS code and summed (na.rm = TRUE to avoid missing values) with the multiplied data to obtain air pollution values for the 2020 geometry

		8. Data was saved as a geographic dataset (geopackage)
Pesticide use	WTN Portal[41] (2023)	1. Data was downloaded as a table (.csv) 2. Data was joined to the census tract shapefile based on 2020 tract FIPS code 3. Data was saved as a geographic dataset (geopackage)
Green space/Normalized Difference Vegetation Index (NDVI)	Sentinel-2 MSI: Google Earth Engine[42] (2024)	*Prerequisites: Google Earth Free Account* Google Earth Engine: 1. Uploaded a shapefile of Washington state previously obtained from R library "tigris" 2. Created a function to calculate the NDVI (Band8 – Band4) / (Band8 + Band4) 3. Filtered the dataset for the month of July 2024 to capture the most variation in greenness 4. Calculated the NDVI for all days in using normalizedDifference() 5. Averaged these values to obtain one NDVI for all pixels 6. Clipped dataset to Washington state shapefile 7. Exported the raster as a .tiff RStudio: 8. Loaded raster into R 9. After checking the projections matched with the Washington census tracts shapefile, extracted the mean NDVI for each census tract (touches = FALSE) and saved the value in a new column

		10. Data was saved as a geographic dataset (.gpkg)
Blue space	Global Surface Water[43] (2021)	1. Data was downloaded for Washington state by tile in raster format (.tif) 2. The rasters were merged 3. A 100-meter buffer around each census tract was created. 4. Created a binary raster which classifies a pixel as blue space if the pixel has a value greater than or equal to 50 (i.e., water occurred in that pixel at least 50% of the time between 1984 and 2021)[44] 5. Extracted the mean value in each buffered census tract using the binary raster, denoting the proportion area of blue space 6. Saved data as a geographic dataset (.gpkg)
Outdoor light at night (LAN) i.e., nighttime radiance	NASA VIIRS: Google Earth Engine[45] (2024)	*Prerequisites: Google Earth Free Account* Google Earth Engine: 1. Uploaded Washington shapefile to GEE previously obtained from R "tigris" 2. Loaded the image collection from January 1 to December 31 of 2023 3. Took the mean of the image collection to obtain 1 image of LAN for 2023 4. Clipped the raster to Washington state 5. Exported the raster as a .tiff RStudio: 6. Loaded raster into R 7. After checking the projections matched with the Washington census tracts shapefile, extracted the mean LAN for

		each census tract (touches = FALSE) and saved the value in a new column 8. Data was saved as a geographic dataset (.gpkg)
Noise	National Transportation Noise Exposure Map Download | Environmental & Occupational Health Sciences[46] (2020)	1. Data was downloaded as a table 2. Data was checked against TIGER/LINE shapefiles to ensure coverage of all 2020 census tracts 3. Data was joined with census tract shapefile 4. Data was saved as a geographic dataset (geopackage)
Land use/land cover	National Land Cover Database[47] (2024)	1. Data was loaded into R as a raster 2. Washington tracts shapefile was transformed to match raster projection 3. Raster was cropped to Washington state 4. Extracted coverage fraction of raster for each census tract 5. Percent of each land type was calculated for each tract 6. Data was pivoted wider to have each land type as a column 7. Data was merged with Washington census tracts shapefile 8. A data frame with NLCD classes and names was created based on NLCD 2024 classification, with code and name columns: a. 11: Open water b. 12: Perennial ice c. 21: Developed open land d. 22: Low developed land e. 23: Moderately developed land f. 24: Highly developed land

		g. 31: Barren land h. 41: Deciduous forest i. 42: Evergreen forest j. 43: Mixed forest k. 52: Shrubland l. 71: Grassland m. 81: Pasture n. 82: Cropland o. 90: Woody wetlands p. 95: Herbaceous wetlands 9. NLCD classes data frame was joined with calculated land percentage data frame to generate readable names 10. Data was saved as a geographic dataset (geopackage)
Transit access	WA Geospatial Open Data Portal[48] (2024)	1. Data was downloaded as a table 2. Data was saved as a geographic dataset (latitude and longitude coordinates)
Superfund sites	EPA NPL Boundaries[49] (2018)	1. Data was downloaded and loaded into R as a geodatabase 2. Data was filtered for Superfund sites within WA (state code 53) 3. Data was saved as a geographic dataset (geopackage)
Parks	Esri: USA Parks[50] (2024)	1. Data was downloaded as a geopackage 2. Performed a union operation between the parks and the Washington tracts shapefile 3. Filtered the previous data, only including parks within Washington (i.e., where the Washington shapefile contains parks) 4. Data was written as a geographic dataset (geopackage)
Alcohol retailers	WA Liquor and Cannabis Board[51] (?)	1. Data for “Spirits Retailer”s was downloaded as a table (.csv)

		2. Used address, city, state, and zip-code to geocode locations of alcohol retailers with `tidygeocoder`'s `geocode()` function, with method = "arcgis" 3. Created a geographic dataset (`sf`) with the latitude/longitude coordinates 4. Data was saved as a geographic dataset (geopackage)
Food environment	USDA Food Access Research Atlas[52] (2019)	1. Data loaded into R as an Excel file 2. Selected the following variables: a. lapop1 - low access, pop at 1 mile, number b. lapop1share - low access, pop at 1 mile, share c. lalowi1 - low access, low income pop at 1 mile, number d. lalowi1share - low access, low income pop at 1 mile, share e. lakids1 - low access, children 0-17 at 1 mile, number f. lakids1share - Low access, children age 0-17 at 1 mile, share g. laseniors1 - Low access, seniors age 65+ at 1 mile, number h. laseniors1share - Low access, seniors age 65+ at 1 mile, share i. lawhite1 - Low access, White population at 1 mile, number j. lawhite1share - Low access, White population at 1 mile, share k. lablack1 - Low access, Black or African American population at 1 mile, number

		l. lablack1share - Low access, Black or African American population at 1 mile, share m. laasian1 - Low access, Asian population at 1 mile, number n. laasian1share - Low access, Asian population at 1 mile, share o. lanhopi1 - Low access, Native Hawaiian and Other Pacific Islander population at 1 mile, number p. lanhopi1share - Low access, Native Hawaiian and Other Pacific Islander population at 1 mile, share q. laaian1 - Low access, American Indian and Alaska Native population at 1 mile, number r. laaian1share - Low access, American Indian and Alaska Native population at 1 mile, share s. laomultir1 - Low access, Other/Multiple race population at 1 mile, number t. laomultir1share - Low access, Other/Multiple race population at 1 mile, share u. lahisp1 - Low access, Hispanic or Latino population at 1 mile, number v. lahisp1share - Low access, Hispanic or Latino population at 1 mile, share w. lahunv1 - Vehicle access, housing units without and low access at 1 mile, number

		x. lahunv1share - Vehicle access, housing units without and low access at 1 mile, share y. lasnap1 - Low access, housing units receiving SNAP benefits at 1 mile, number z. lasnap1share - Low access, housing units receiving SNAP benefits at 1 mile, share 3. Assigned NA values to "NULL" 4. Converted variables to numeric where appropriate 5. Merged with 2010 Washington tract shapefile 6. Saved data as a geographic dataset (.gpkg)

Social Environment

Measures, Dataset(s), and Processing Steps

Measure	Data Source	Processing
Food insecurity	CDC PLACES[22] (2023)	1. Dataset loaded into R as a geographic dataset. 2. Dataset checked against Census Bureau TIGER/Line file to ensure coverage of all 2020 Washington census tracts. 3. Dataset saved to processed folder as a geographic dataset (geopackage).
Housing insecurity		
Utility services threat (past 12 months)		
Lack of reliable transportation		
Lack of social and emotional support		
No broadband internet	SDOH Measures for Census Tract, ACS 2017-2021 | CDC[53] (2021)	1. Dataset loaded into R as a geographic dataset (shapefile).
Crowding among housing units		
Housing cost burden		

No high school diploma Poverty (<150% of poverty level) Single-parent households Unemployment		2. Dataset was filtered for Washington census tracts. 3. Unnecessary rows were removed ("Racial or ethnic minority status" and "Aged 65 years or older"). 4. Dataset was pivoted from long to wide format. 5. Data was saved as a geographic dataset (geopackage).
Environmental Justice Index (EJI)	EJI Data Download | Place and Health | ATSDR (cdc.gov)[54] (2022)	1. Data was downloaded and loaded into R as a table (.csv) 2. Data was joined with the Washington tracts shapefile 3. Data was saved as a geographic dataset (geopackage)
Social Vulnerability Index (SVI)	CDC and ATSDR SVI[55] (2022)	1. Data was downloaded and loaded into R as a table (.csv) 2. Data was joined with the Washington tracts shapefile 3. Data was saved as a geographic dataset (geopackage)
Median household income	B19013: Median Household Income - Census Bureau Table[56] (2023)	1. Dataset was loaded into R as a table (.csv). 2. Modified column for the tract FIPS to keep only the 11 digit GEOID 3. Selected GEOID and median household income columns 4. Removed rows with "-" in the income column 5. Modify "250,000+" income to just "250,000" 6. Converted income column to numeric

		7. Merged income data with Washington tracts shapefile 8. Saved data as a geographic dataset (geopackage)
Racial residential segration	segregation: Entropy-Based Segregation Indices (r-project.org) NHGIS | Race by block group[57] (2020)	1. Race data by block group was downloaded 2. For each tract FIPS, the Duncan's multi-group dissimilarity index[58] was calculated (`DMulti()` from the `OasisR` package) 3. Data was joined to Washington shapefile dataset 4. Saved data as a geographic dataset (geopackage)
Redlining	Historic Redlining Scores for 2010 and 2020 US Census Tracts (openicpsr.org)[59] (2020)	1. Dataset was loaded into R as a geographic dataset (shapefile) 2. Transformed coordinate system to WGS 84. 3. Filtered shapefile for Washington state census tracts 4. Dataset saved as a geographic dataset (geopackage)
Housing + Transportation Index	H+T Index - Center for Neighborhood Technology[60] (2022)	1. Data was loaded as a table (.csv) 2. Quotation marks were removed form the "tract" column to avoid syntax errors in future handling 3. Data was merged with 2020 Washington tracts shapefile 4. Data was saved as a geographic dataset (geopackage)
Social capital	Harvard Dataverse | Social Capital Indices[61] (2022)	1. Data was downloaded and loaded into R as a table (.csv) 2. Data was joined with the Washington tracts shapefile

		3. Data was saved as a geographic dataset (geopackage)
Crimes	Washington UCR[62] (2023)	1. Data was downloaded as a table 2. Data was filtered for most recent year (2023 at time of download) 3. Data was separated into Part I and Part II offenses as defined by FBI[63] to avoid displaying sensitive topics. Detailed data by offense type is still available for download. Categorizations are: 4. Part I: Murder, manslaughter, forcible sex, robbery, assault, burglary, theft, arson, human trafficking, kidnapping & abduction, and animal cruelty 5. Part II: Counterfeiting and forgery, destruction of property, weapon law violations, prostitution, non-forcible sex, bribery, drug violations, gambling violations, violation of no-contact, extortion & blackmail 6. Animal cruelty was included in Part I offenses due to its classification as a felony starting in 2019, and being "counted alongside felony crimes such as arson, burglary, assault, and homicide"[64] 7. Total number of Part I and Part II offenses were calculated 8. The rate of Part I and Part II offenses per 1,000 population

		was calculated, consistent with previous crime rate calculations against persons, property, and society[65] 9. Data was saved as a geographic dataset (geopackage)
Urbanicity / Rurality	Total population[20] (2023)	1. Population density[66] was calculated as persons per square mile (area was given in the Washington census tracts TIGER/Line shapefile).

Data Dictionary

2020 Census Tract Data

Data linked to 2020 census tracts.

Domain	Element	Data Type/Format (Units)	Description
N/A	GEOID	Character	The census tract Federal Information Processing Series (FIPS) code. Used to uniquely identify a census tract.
Natural Environment	Particulate.Matter.2.5	Numeric/Decimal ($\mu g/m^3$)	Concentration of particulate matter less than 2.5 microns wide.
Natural Environment	Green.Space	Numeric/Decimal (Unitless)	Green space vegetation health and intensity measured using the Normalized Difference Vegetation Index (NDVI). Higher values indicate lands covered by leafy, green

			vegetation, and lower values indicate lands covered by little or no vegetation. Negative values indicate the presence of water, clouds, or snow.
Natural Environment	Nighttime.Radiance	Numeric/Decimal ($nW/cm^2/sr$)	Outdoor light at night, also known as light pollution.
Social Environment	Food.Stamps	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of received food stamps in the past 12 months among adults
Social Environment	Food.Insecurity	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of food insecurity in the past 12 months among adults
Social Environment	Housing.Insecurity	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of housing insecurity in the past 12 months among adults
Social Environment	Utility.Services.Threat	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of utility services threat in the past 12 months among adults
Social Environment	Lacking.Reliable.Transportation	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of lack of reliable transportation in the past 12 months among adults
Social Environment	Lack.of.Social.and.Emotional.Support	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of lack of social and emotional support among adults
Social Environment	Lack.of.Health.Insurance	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of lack of

			health insurance among adults aged 18-64 years
Prevention	Routine.Checkup.in.the.Past.Year	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of routine checkup within the past year among adults
Prevention	Visited.Dentist.in.Past.Year	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of visited dentist or dental clinic in the past year among adults
Prevention	Taking.Medicine.to.Control.High.Blood.Pressure	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of taking medicine to control high blood pressure among adults with high blood pressure
Prevention	Cholesterol.Screening	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of cholesterol screening within the past 5 years among adults
Prevention	Mammography.Use.among.Women.50.to.74	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of mammography use among women aged 50–74 years
Prevention	Colorectal.Cancer.Screening.among.Adults.45.to.75	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of colorectal cancer screening among adults aged 45–75 years
Health Behaviors	Binge.Drinking.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of binge drinking among adults
Health Behaviors	Cigarette.Smoking.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of current cigarette smoking among adults

Health Behaviors	No.Leisure.time.Physical.Activity.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of no leisure-time physical activity among adults
Health Behaviors	Short.Sleep.Duration	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of short sleep duration among adults
Health Outcomes	Arthritis.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of arthritis among adults
Health Outcomes	Asthma.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of current asthma among adults
Health Outcomes	High.Blood.Pressure.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of high blood pressure among adults
Health Outcomes	Cancer.or.Melanoma.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of cancer (non-skin) or melanoma among adults
Health Outcomes	High.Cholesterol.among.Screened.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of high cholesterol among adults who have ever been screened
Health Outcomes	COPD.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of chronic obstructive pulmonary disease among adults
Health Outcomes	Coronary.Heart.Disease.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of coronary heart disease among adults
Health Outcomes	Depression.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of depression among adults

Health Outcomes	Diagnosed.Diabetes.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of diagnosed diabetes among adults
Health Outcomes	Obesity.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of obesity among adults
Health Outcomes	All.Teeth.Lost.among.Adults.65.and.Older	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of all teeth lost among adults aged >=65 years
Health Outcomes	Stroke.among.Adults	Numeric/Decimal (Percent)	Model-based estimate for crude prevalence of stroke among adults
Sociodemographics	Total.Population	Numeric/Integer (Count)	Total population
Sociodemographics > Race and Ethnicity	Hispanic.or.Latino	Numeric/Integer (Count)	Hispanic or Latino population count
Sociodemographics > Race and Ethnicity	Percent.Hispanic.or.Latino	Numeric/Decimal (Percent)	Percent Hispanic or Latino population
Sociodemographics > Race and Ethnicity	White.NonHispanic	Numeric/Integer (Count)	White population count
Sociodemographics > Race and Ethnicity	Percent.White.NonHispanic	Numeric/Decimal (Percent)	Percent White population
Sociodemographics > Race and Ethnicity	Black.NonHispanic	Numeric/Integer (Count)	Black population count
Sociodemographics > Race and Ethnicity	Percent.Black.NonHispanic	Numeric/Decimal (Percent)	Percent Black population
Sociodemographics > Race and Ethnicity	American.Indian.Alaska.Native.NonHispanic	Numeric/Integer (Count)	American Indian Alaska Native population count
Sociodemographics > Race and Ethnicity	Percent.American.Indian.Alaska.Native.NonHispanic	Numeric/Decimal (Percent)	Percent American Indian Alaska Native population
Sociodemographics > Race and Ethnicity	Asian.NonHispanic	Numeric/Integer (Count)	Asian population count

Sociodemographics > Race and Ethnicity	Percent.Asian.NonHispanic	Numeric/Decimal (Percent)	Percent Asian population
Sociodemographics > Race and Ethnicity	Native.Hawaiian.Pacific.Islander.NonHispanic	Numeric/Integer (Count)	Native Hawaiian Pacific Islander population count
Sociodemographics > Race and Ethnicity	Percent.Native.Hawaiian.Pacific.Islander.NonHispanic	Numeric/Decimal (Percent)	Percent Native Hawaiian Pacific Islander population
Sociodemographics > Race and Ethnicity	Other.Race.NonHispanic	Numeric/Integer (Count)	Other Race population count
Sociodemographics > Race and Ethnicity	Percent.Other.Race.NonHispanic	Numeric/Decimal (Percent)	Percent Other Race population
Sociodemographics > Race and Ethnicity	Two.or.More.Races.NonHispanic	Numeric/Integer (Count)	Two or more races population count
Sociodemographics > Race and Ethnicity	Percent.Two.or.More.Races.NonHispanic	Numeric/Decimal (Percent)	Percent two or more races population
Sociodemographics > Race and Ethnicity	White.Hispanic.or.Latino	Numeric/Integer (Count)	White Hispanic or Latino population count
Sociodemographics > Race and Ethnicity	Percent.White.Hispanic.or.Latino	Numeric/Decimal (Percent)	Percent White Hispanic or Latino
Sociodemographics > Race and Ethnicity	Black.Hispanic.or.Latino	Numeric/Integer (Count)	Black Hispanic or Latino population count
Sociodemographics > Race and Ethnicity	Percent.Black.Hispanic.or.Latino	Numeric/Decimal (Percent)	Percent Black Hispanic or Latino population
Sociodemographics > Race and Ethnicity	American.Indian.Alaska.Native.Hispanic.or.Latino	Numeric/Integer (Count)	American Indian Alaska Native Hispanic or Latino population count
Sociodemographics > Race and Ethnicity	Percent.American.Indian.Alaska.Native.Hispanic.or.Latino	Numeric/Decimal (Percent)	Percent American Indian Alaska Native Hispanic or Latino population
Sociodemographics > Race and Ethnicity	Asian.Hispanic.or.Latino	Numeric/Integer (Count)	Asian Hispanic or Latino population count
Sociodemographics > Race and Ethnicity	Percent.Asian.Hispanic.or.Latino	Numeric/Decimal (Percent)	Percent Asian Hispanic or Latino population

Sociodemographics > Race and Ethnicity	Native.Hawaiian.Pacific.Islander.Hispanic.or.Latino	Numeric/Integer (Count)	Native Hawaiian Pacific Islander Hispanic or Latino population count
Sociodemographics > Race and Ethnicity	Percent.Native.Hawaiian.Pacific.Islander.Hispanic.or.Latino	Numeric/Decimal (Percent)	Percent Native Hawaiian Pacific Islander Hispanic or Latino population
Sociodemographics > Race and Ethnicity	Other.Race.Hispanic.or.Latino	Numeric/Integer (Count)	Other race, Hispanic or Latino population count
Sociodemographics > Race and Ethnicity	Percent.Other.Race.Hispanic.or.Latino	Numeric/Decimal (Percent)	Percent other race, Hispanic or Latino
Sociodemographics > Race and Ethnicity	Two.or.More.Races.Hispanic.or.Latino	Numeric/Integer (Count)	Two or more races, Hispanic or Latino population count
Sociodemographics > Race and Ethnicity	Percent.Two.or.More.Races.Hispanic.or.Latino	Numeric/Decimal (Percent)	Percent two or more races, Hispanic or Latino
Sociodemographics > Age	Total.Male.Population	Numeric/Integer (Count)	Male population count
Sociodemographics > Age	Percent.Male	Numeric/Decimal (Percent)	Percent male population
Sociodemographics > Age	Total.Female.Population	Numeric/Integer (Count)	Female population count
Sociodemographics > Age	Percent.Female	Numeric/Decimal (Percent)	Percent female population
Sociodemographics > Age	Total.0.to.4.years	Numeric/Integer (Count)	Count of population 0 to 4 years old
Sociodemographics > Age	Percent.0.to.4.years	Numeric/Decimal (Percent)	Percent of population 0 to 4 years old
Sociodemographics > Age	Total.5.to.9.years	Numeric/Integer (Count)	Count of population 5 to 9 years old
Sociodemographics > Age	Percent.5.to.9.years	Numeric/Decimal (Percent)	Percent of population 5 to 9 years old
Sociodemographics > Age	Total.10.to.14.years	Numeric/Integer (Count)	Count of population 10 to 14 years old
Sociodemographics > Age	Percent.10.to.14.years	Numeric/Decimal (Percent)	Percent of population 10 to 14 years old

Sociodemographics > Age	Total.15.to.19.years	Numeric/Integer (Count)	Count of population 15 to 19 years old
Sociodemographics > Age	Percent.15.to.19.years	Numeric/Decimal (Percent)	Percent of population 15 to 19 years old
Sociodemographics > Age	Total.20.to.24.years	Numeric/Integer (Count)	Count of population 20 to 24 years old
Sociodemographics > Age	Percent.20.to.24.years	Numeric/Decimal (Percent)	Percent of population 20 to 24 years
Sociodemographics > Age	Total.25.to.29.years	Numeric/Integer (Count)	Count of population 25 to 29 years old
Sociodemographics > Age	Percent.25.to.29.years	Numeric/Decimal (Percent)	Percent of population 25 to 29 years old
Sociodemographics > Age	Total.30.to.34.years	Numeric/Integer (Count)	Count of population 30 to 34 years old
Sociodemographics > Age	Percent.30.to.34.years	Numeric/Decimal (Percent)	Percent of population 30 to 34 years old
Sociodemographics > Age	Total.35.to.39.years	Numeric/Integer (Count)	Count of population 35 to 39 years old
Sociodemographics > Age	Percent.35.to.39.years	Numeric/Decimal (Percent)	Percent of population 35 to 39 years old
Sociodemographics > Age	Total.40.to.44.years	Numeric/Integer (Count)	Count of population 40 to 44 years old
Sociodemographics > Age	Percent.40.to.44.years	Numeric/Decimal (Percent)	Percent of population 40 to 44 years old
Sociodemographics > Age	Total.45.to.49.years	Numeric/Integer (Count)	Count of population 45 to 49 years old
Sociodemographics > Age	Percent.45.to.49.years	Numeric/Decimal (Percent)	Percent of population 45 to 49 years old
Sociodemographics > Age	Total.50.to.54.years	Numeric/Integer (Count)	Count of population 50 to 54 years old
Sociodemographics > Age	Percent.50.to.54.years	Numeric/Decimal (Percent)	Percent of population 50 to 54 years old
Sociodemographics > Age	Total.55.to.59.years	Numeric/Integer (Count)	Count of population 55 to 59 years old

Sociodemographics > Age	Percent.55.to.59.years	Numeric/Decimal (Percent)	Percent of population 55 to 59 years old
Sociodemographics > Age	Total.60.to.64.years	Numeric/Integer (Count)	Count of population 60 to 64 years old
Sociodemographics > Age	Percent.60.to.64.years	Numeric/Decimal (Percent)	Percent of population 60 to 64 years old
Sociodemographics > Age	Total.65.to.69.years	Numeric/Integer (Count)	Count of population 65 to 69 years old
Sociodemographics > Age	Percent.65.to.69.years	Numeric/Decimal (Percent)	Percent of population 65 to 69 years old
Sociodemographics > Age	Total.70.to.74.years	Numeric/Integer (Count)	Count of population 70 to 74 years old
Sociodemographics > Age	Percent.70.to.74.years	Numeric/Decimal (Percent)	Percent of population 70 to 74 years old
Sociodemographics > Age	Total.75.to.79.years	Numeric/Integer (Count)	Count of population 75 to 79 years old
Sociodemographics > Age	Percent.75.to.79.years	Numeric/Decimal (Percent)	Percent of population 75 to 79 years old
Sociodemographics > Age	Total.80.to.84.years	Numeric/Integer (Count)	Count of population 80 to 84 years old
Sociodemographics > Age	Percent.80.to.84.years	Numeric/Decimal (Percent)	Percent of population 80 to 84 years old
Sociodemographics > Age	Total.85.and.older	Numeric/Integer (Count)	Count of population 85 and older
Sociodemographics > Age	Percent.85.and.older	Numeric/Decimal (Percent)	Percent of population 85 and older
Social Environment	Social.Vulnerability.Index	Numeric/Decimal (index/unitless)	Social vulnerability index (SVI).
Social Environment	Environmental.Justice.Index	Numeric/Decimal (index/unitless)	Environmental justice index (EJI).
Natural Environment	UV.Index	Numeric/Decimal (index/unitless)	Ultraviolet radiation index.
Natural Environment	Radon	Numeric/Decimal (Bq/m^3)	Radon gas concentration.

Built Environment	Walkability	Numeric/Decimal (index/unitless)	Census tract walkability.
Built Environment	Pesticide.Exposure	Numeric/Decimal (lbs/m^2)	Pesticide (insecticide, herbicide, fungicide, bactericide, rodenticide) use.
Social Environment	Racial.Residential.Segregation	Numeric/Decimal (index/unitless)	Racial segregation of a census tract calculated by Theil's H entropy index.
Built Environment	N.Noise.More.than.LAeq.45.to.50.db	Numeric/Integer (Count)	Number of people living in an tract with transportation noise between 45 and 50db LAeq.
Built Environment	N.Noise.More.than.LAeq.50.to.60.db	Numeric/Integer (Count)	Number of people living in an tract with transportation noise between 50 and 60db LAeq.
Built Environment	N.Noise.More.than.LAeq.60.to.70.db	Numeric/Integer (Count)	Number of people living in an tract with transportation noise between 60 and 70db LAeq.
Built Environment	N.Noise.More.than.LAeq.70.to.80.db	Numeric/Integer (Count)	Number of people living in an tract with transportation noise between 70 and 80db LAeq.
Built Environment	N.Noise.More.than.LAeq.80.to.90.db	Numeric/Integer (Count)	Number of people living in an tract with transportation noise between 80 and 90db LAeq.
Built Environment	N.Noise.More.than.LAeq.90.db	Numeric/Integer (Count)	Number of people living in a tract with transportation noise greater than 90db LAeq.
Built Environment	Pct.Noise.More.than.LAeq.45.to.50.db	Numeric/Decimal (Percent)	Percent of people living in an tract with transportation noise between 45 and 50db LAeq.
Built Environment	Pct.Noise.More.than.LAeq.50.to.60.db	Numeric/Decimal (Percent)	Percent of people living in an tract with transportation noise between 50 and 60db LAeq.

Built Environment	Pct.Noise.More.than.LAeq.60.to.70.db	Numeric/Decimal (Percent)	Percent of people living in an tract with transportation noise between 60 and 70db LAeq.
Built Environment	Pct.Noise.More.than.LAeq.70.to.80.db	Numeric/Decimal (Percent)	Percent of people living in an tract with transportation noise between 70 and 80db LAeq.
Built Environment	Pct.Noise.More.than.LAeq.80.to.90.db	Numeric/Decimal (Percent)	Percent of people living in an tract with transportation noise between 80 and 90db LAeq.
Built Environment	Pct.Noise.More.than.LAeq.90.db	Numeric/Decimal (Percent)	Percent of people living in a tract with transportation noise greater than 90db LAeq.
Social Environment	Unemployment	Numeric/Decimal (Percent)	Prevalence of unemployment
Social Environment	No.broadband.internet	Numeric/Decimal (Percent)	Prevalence of households with no broadband internet of any type
Social Environment	No.high.school.diploma	Numeric/Decimal (Percent)	Prevalence of population with no high school diploma
Social Environment	Single.parent.households	Numeric/Decimal (Percent)	Prevalence of single parent households
Social Environment	Crowding	Numeric/Decimal (Percent)	Prevalence of crowding among housing units (occupied housing units with 1.01 to 1.50 and 1.51 or more occupants per room)
Social Environment	Poverty	Numeric/Decimal (Percent)	Prevalence of poverty (below 150% of poverty level)
Social Environment	Housing.cost.burden	Numeric/Decimal (Percent)	Prevalence of households with annual income less than $75,000 that spend 30% or more of their household income on housing

Natural Environment	Maximum.temperature	Numeric/Decimal (°F)	Maximum temperature for a census tract.
Natural Environment	Minimum.temperature	Numeric/Decimal (°F)	Minimum temperature for a census tract.
Natural Environment	Average.temperature	Numeric/Decimal (°F)	Average temperature for a census tract.
Natural Environment	Precipitation	Numeric/Decimal (in.)	Precipitation for a census tract.
Natural Environment > Air Pollutants	Wildfire.smoke	Numeric/Decimal ($\mu g/m^3$)	Wildfire smoke concentration estimate.
Natural Environment > Air Pollutants	Nitrogen.dioxide	Numeric/Decimal (ppb)	Nitrogen dioxide (NO_2) concentration estimate.
Natural Environment > Air Pollutants	Sulfur.dioxide	Numeric/Decimal (ppb)	Sulfur dioxide (SO_2) concentration estimate.
Natural Environment > Air Pollutants	Carbon.monoxide	Numeric/Decimal (ppm)	Carbon monoxide (CO) concentration estimate.
Natural Environment > Air Pollutants	Ozone	Numeric/Decimal (ppb)	Ozone (O_3) concentration estimate.
Social Environment	Population.density	Numeric/Decimal (persons/mi^2)	Population density calculated by persons per square mile
Natural Environment	Avalanche.Risk.Score	Number/Decimal ($)	Expected annual monetary loss due to avalanches, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Coastal.Flooding.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to coastal flooding, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Cold.Wave.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to cold waves, scaled by community risk factor

			(social vulnerability and community resilience).
Natural Environment	Drought.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to drought, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Earthquake.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to earthquakes, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Hail.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to hail, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Heat.Wave.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to heat waves, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Hurricane.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to hurricanes, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Ice.Storm.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to ice storms, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Landslide.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to landslides, scaled

			by community risk factor (social vulnerability and community resilience).
Natural Environment	Lightning.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to lightning, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Riverine.Flooding.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to riverine flooding, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Strong.Wind.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to strong winds, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Tornado.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to tornadoes, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Tsunami.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to tsunamis, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Volcanic.Activity.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to volcanic activity, scaled by community risk factor (social vulnerability and community resilience).

Natural Environment	Wildfire.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to wildfires, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	Winter.Weather.Risk.Score	Numeric/Decimal ($)	Expected annual monetary loss due to winter weather, scaled by community risk factor (social vulnerability and community resilience).
Natural Environment	bluespace	Numeric/Decimal (percentage)	Proportion of census tract (with a 100-meter buffer) with blue space for longer than 50% of the year.
Social Environment	social_capital	Numeric/Decimal (unitless)	Social capital index, indicating the overall strength of social infrastructures ("social ties that enable trust, mutual aid, and collective action")[67] within communities of a census tract.
Natural Environment	PFAS_dw	Character/Binary (true/false)	Presence of PFAS in any community water system that serves a census tract.
Social Environment	Median.HH.Income	Numeric/Decimal ($)	Median household income. Income over $250,000 is censored and only shows as $250,000.
Social Environment	HT_Index	Numeric/Integer (unitless)	Housing and transportation affordability index.
Social Environment	Historic.Redlining.Score	Numeric/Decimal (unitless)	Historical redlining score (ranging from 1/A to 4/D) from the Home Owners' Loan Corporation.

Built Environment	pct_Open_Water	Numeric/Decimal (percentage)	Percent of census tract land classified as open water
Built Environment	pct_Developed_Open	Numeric/Decimal (percentage)	Percent of census tract land classified as developed open land (e.g., golf courses)
Built Environment	pct_Developed_Low	Numeric/Decimal (percentage)	Percent of census tract land classified as minimally developed
Built Environment	pct_Developed_Medium	Numeric/Decimal (percentage)	Percent of census tract land classified as moderately developed
Built Environment	pct_Developed_High	Numeric/Decimal (percentage)	Percent of census tract land classified as highly developed
Built Environment	pct_Barren	Numeric/Decimal (percentage)	Percent of census tract land classified as barren
Built Environment	pct_Evergreen_Forest	Numeric/Decimal (percentage)	Percent of census tract land classified as evergreen forest
Built Environment	pct_Shrub	Numeric/Decimal (percentage)	Percent of census tract land classified as shrubland
Built Environment	pct_Grassland	Numeric/Decimal (percentage)	Percent of census tract land classified as grassland
Built Environment	pct_Pasture	Numeric/Decimal (percentage)	Percent of census tract land classified as pasture
Built Environment	pct_Crops	Numeric/Decimal (percentage)	Percent of census tract land classified as cropland
Built Environment	pct_Woody_Wetlands	Numeric/Decimal (percentage)	Percent of census tract land classified as woody wetlands
Built Environment	pct_Herbaceous_Wetlands	Numeric/Decimal (percentage)	Percent of census tract land classified as herbaceous wetlands
Built Environment	pct_Deciduous_Forest	Numeric/Decimal (percentage)	Percent of census tract land classified as deciduous forest
Built Environment	pct_Mixed_Forest	Numeric/Decimal (percentage)	Percent of census tract land classified as mixed forest

Built Environment	pct_Perennial_Ice	Numeric/Decimal (percentage)	Percent of census tract land classified as perennial ice
N/A	geom	N/A	Geometric attributes

2010 Census Tract Data

Data linked to 2010 census tracts.

Domain	**Element**	**Data Type/Format (Units)**	**Description**
Built environment > Food environment	POP2010	Numeric/Integer (count)	Population count from 2010 census
Built environment > Food environment	OHU2010	Numeric/Integer (count)	Occupied housing unit count from 2010 census
Built environment > Food environment	lapop1	Numeric/Decimal (count)	Low access, pop at 1 mile, number
Built environment > Food environment	lapop1share	Numeric/Decimal (percentage)	Low access, pop at 1 mile, share
Built environment > Food environment	lalowi1	Numeric/Decimal (count)	Low access, low income pop at 1 mile, number
Built environment > Food environment	lalowi1share	Numeric/Decimal (percentage)	Low access, low income pop at 1 mile, share
Built environment > Food environment	lakids1	Numeric/Decimal (count)	Low access, children 0-17 at 1 mile, number
Built environment > Food environment	lakids1share	Numeric/Decimal (percentage)	Low access, children age 0-17 at 1 mile, share
Built environment > Food environment	laseniors1	Numeric/Decimal (count)	Low access, seniors age 65+ at 1 mile, number
Built environment > Food environment	laseniors1share	Numeric/Decimal (percentage)	Low access, seniors age 65+ at 1 mile, share
Built environment > Food environment	lawhite1	Numeric/Decimal (count)	Low access, White population at 1 mile, number
Built environment > Food environment	lawhite1share	Numeric/Decimal (percentage)	Low access, White population at 1 mile, share

Built environment > Food environment	lablack1	Numeric/Decimal (count)	Low access, Black or African American population at 1 mile, number
Built environment > Food environment	lablack1share	Numeric/Decimal (percentage)	Low access, Black or African American population at 1 mile, share
Built environment > Food environment	laasian1	Numeric/Decimal (count)	Low access, Asian population at 1 mile, number
Built environment > Food environment	laasian1share	Numeric/Decimal (percentage)	Low access, Asian population at 1 mile, share
Built environment > Food environment	lanhopi1	Numeric/Decimal (count)	Low access, Native Hawaiian and Other Pacific Islander population at 1 mile, number
Built environment > Food environment	lanhopi1share	Numeric/Decimal (percentage)	Low access, Native Hawaiian and Other Pacific Islander population at 1 mile, share
Built environment > Food environment	laaian1	Numeric/Decimal (count)	Low access, American Indian and Alaska Native population at 1 mile, number
Built environment > Food environment	laaian1share	Numeric/Decimal (percentage)	Low access, American Indian and Alaska Native population at 1 mile, share
Built environment > Food environment	laomultir1	Numeric/Decimal (count)	Low access, Other/Multiple race population at 1 mile, number
Built environment > Food environment	laomultir1share	Numeric/Decimal (percentage)	Low access, Other/Multiple race population at 1 mile, share
Built environment > Food environment	lahisp1	Numeric/Decimal (count)	Low access, Hispanic or Latino population at 1 mile, number
Built environment > Food environment	lahisp1share	Numeric/Decimal (percentage)	Low access, Hispanic or Latino population at 1 mile, share
Built environment > Food environment	lahunv1	Numeric/Decimal (count)	Vehicle access, housing units without and low access at 1 mile, number
Built environment > Food environment	lahunv1share	Numeric/Decimal (percentage)	Vehicle access, housing units without and low access at 1 mile, share
Built environment > Food environment	lasnap1	Numeric/Decimal (count)	Low access, housing units receiving SNAP benefits at 1 mile, number

Built environment > Food environment	lasnap1share	Numeric/Decimal (percentage)	Low access, housing units receiving SNAP benefits at 1 mile, share
Built environment > Food environment	TractKids	Numeric/Integer (count)	Total count of children age 0-17 in tract
Built environment > Food environment	TractSeniors	Numeric/Integer (count)	Total count of seniors age 65+ in tract
Built environment > Food environment	TractWhite	Numeric/Integer (count)	Total count of White population in tract
Built environment > Food environment	TractBlack	Numeric/Integer (count)	Total count of Black or African American population in tract
Built environment > Food environment	TractAsian	Numeric/Integer (count)	Total count of Asian population in tract
Built environment > Food environment	TractNHOPI	Numeric/Integer (count)	Total count of Native Hawaiian and Other Pacific Islander population in tract
Built environment > Food environment	TractAIAN	Numeric/Integer (count)	Total count of American Indian and Alaska Native population in tract
Built environment > Food environment	TractOMultir	Numeric/Integer (count)	Total count of Other/Multiple race population in tract
Built environment > Food environment	TractHispanic	Numeric/Integer (count)	Total count of Hispanic or Latino population in tract
Built environment > Food environment	TractHUNV	Numeric/Integer (count)	Total count of housing units without a vehicle in tract
Built environment > Food environment	TractSNAP	Numeric/Integer (count)	Total count of housing units receiving SNAP benefits in tract

County Data

Data linked to counties.

Domain	Element	Data Type/Format (Units)	Description
Health Outcomes > Cancer Incidence & Mortality	Cancer.Site	Character	Cancer site or location.
Health Outcomes > Cancer Incidence & Mortality	Stage.At.Diagnosis	Character	Stage of cancer at diagnosis.
Health Outcomes > Cancer Incidence & Mortality	Geography	Character	Either the name of the county or the multi-county region in cases of suppressed values.
Health Outcomes > Cancer Incidence & Mortality	Year	Character	Year range of data.
Health Outcomes > Cancer Incidence & Mortality	Age.Group	Character	Age group.
Health Outcomes > Cancer Incidence & Mortality	Gender	Character	Gender.
Health Outcomes > Cancer Incidence & Mortality	Race	Character	Race (data only available for all races).
Health Outcomes > Cancer Incidence & Mortality	Average.Annual.Population	Numeric/Integer (count)	Average annual population for the geography.
Health Outcomes > Cancer Incidence & Mortality	Age.Adj..Rate.per.100.000	Numeric/Integer (count)	Age-adjusted rate of cancer incidence or mortality per 100,000 population.
Health Outcomes > Cancer Incidence & Mortality	X95..CI	Character	95% confidence interval for the age-adjusted rate.

Health Outcomes > Cancer Incidence & Mortality	counties	Character	County name.
Social Environment > Crime	NAME	Character	County name.
Social Environment > Crime	GEOID	Character	County FIPS code.
Social Environment > Crime	POPULATION	Numeric/Integer (count)	County population count.
Social Environment > Crime	PRSNTOTAL	Numeric/Integer (count)	Total crimes against persons.
Social Environment > Crime	PRSNRATE	Numeric/Decimal (rate)	Rate of crimes against persons per 1,000 people.
Social Environment > Crime	SCTYTOTAL	Numeric/Integer (count)	Total crimes against society.
Social Environment > Crime	SCTYRATE	Numeric/Decimal (rate)	Rate of crimes against society per 1,000 people.
Social Environment > Crime	PRPRTYTOTAL	Numeric/Integer (count)	Total crimes against property.
Social Environment > Crime	PRPRTYRATE	Numeric/Decimal (rate)	Rate of crimes against property per 1,000 people.
Social Environment > Crime	MURDER	Numeric/Integer (count)	Total murder offenses.
Social Environment > Crime	MANSLAUGHTER	Numeric/Integer (count)	Total manslaughter offenses.
Social Environment > Crime	FORCIBLE_SEX	Numeric/Integer (count)	Total forcible sex offenses.
Social Environment > Crime	ROBBERY	Numeric/Integer (count)	Total robbery offenses.
Social Environment > Crime	ASSAULT	Numeric/Integer (count)	Total assault offenses.
Social Environment > Crime	BURGLARY	Numeric/Integer (count)	Total burglary offenses.

Social Environment > Crime	THEFT	Numeric/Integer (count)	Total theft offenses.
Social Environment > Crime	ARSON	Numeric/Integer (count)	Total arson offenses.
Social Environment > Crime	HUMAN_TRAFFICKING	Numeric/Integer (count)	Total human trafficking offenses.
Social Environment > Crime	KIDNAPPING_ABDUCTION	Numeric/Integer (count)	Total kidnapping and abduction offenses.
Social Environment > Crime	ANIMAL_CRUELTY	Numeric/Integer (count)	Total animal cruelty offenses.
Social Environment > Crime	total_p1	Numeric/Integer (count)	Total Part 1 offenses, which include murder, manslaughter, forcible sex, robbery, assault, burglary, theft, arson, human trafficking, kidnapping & abduction, and animal cruelty.
Social Environment > Crime	p1_rate	Numeric/Decimal (rate)	Rate of Part 1 offenses per 1,000 people.
Social Environment > Crime	COUNTERFEITING_FORGERY	Numeric/Integer (count)	Total counterfeiting and forgery offenses.
Social Environment > Crime	DESTRUCTION_OF_PROPERTY	Numeric/Integer (count)	Total destruction of property offenses.
Social Environment > Crime	WEAPON_LAW_VIOLATION	Numeric/Integer (count)	Total weapon law violation offenses.
Social Environment > Crime	PROSTITUTION	Numeric/Integer (count)	Total prostitution offenses.
Social Environment > Crime	NON_FORCIBLE_SEX	Numeric/Integer (count)	Total non-forcible sex offenses.
Social Environment > Crime	BRIBERY	Numeric/Integer (count)	Total bribery offenses.
Social Environment > Crime	DRUG_VIOLATIONS	Numeric/Integer (count)	Total drug violation offenses.
Social Environment > Crime	GAMBLING_VIOLATIONS	Numeric/Integer (count)	Total gambling violation offenses.

Social Environment > Crime	VIOL_OF_NO_CONTACT	Numeric/Integer (count)	Total violation of no contact offenses.
Social Environment > Crime	EXTORTION_BLACKMAIL	Numeric/Integer (count)	Total extortion and blackmail offenses.
Social Environment > Crime	total_p2	Numeric/Integer (count)	Total Part 2 offenses, which include counterfeiting and forgery, destruction of property, weapon law violations, prostitution, non-forcible sex, bribery, drug violations, gambling violations, violation of no-contact, extortion and blackmail.
Social Environment > Crime	p2_rate	Numeric/Decimal (rate)	Rate of Part 2 offenses per 1,000 people.

Point or Polygon Data

Standalone point or polygon data that is not linked to a geographic unit (e.g., census tracts, counties).

Domain	**Element**	**Description**
Built environment	Transit stops	Locations of transit stops.
Built environment	Superfund sites	Locations of Superfund sites.
Built environment	Parks	Locations of parks.
Built environment	Alcohol retailers	Locations of alcohol retailers.
Healthcare access	Clinics	Locations of health clinics.
Healthcare access	EMS stations	Locations of EMS stations.
Healthcare access	Hospitals	Locations of hospitals.
Healthcare access	Pharmacies	Locations of pharmacies.
Healthcare access	WIC clinics	Locations of WIC clinics.
Healthcare access	Cancer programs	Locations of Commission on Cancer (CoC)-accredited cancer programs.
Healthcare access	WIC retailers	Locations of WIC retailers.
Healthcare access	Federally qualified health centers (FQHCs)	Locations of FQHCs.

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