This document outlines the analysis process for the study:

Ma, Y., Zang, E., Opara, I., Lu, Y., Krumholz, H. M., & Chen, K. (2023). Racial/ethnic disparities in PM2.5-attributable cardiovascular mortality burden in the United States. Nature Human Behaviour, 7(12), 2074-2083.

1. Description of dataset

- The cleaned dataset ("data" in the R scripts) contains the following variables.
- To protect personally identifiable information, the variables related to mortality rates cannot be shared, in accordance with the Data Use Agreement. The mortality data can be requested from the National Center for Health Statistics (https://www.cdc.gov/nchs/index.htm).
- All other variables are shared in the file "Data_2000-2016_county_monthly_combined.7z".

Variable name	Description
GEOID	County FIPS code
year_month	Year-month
year	Year
month	Month
PM25	Monthly mean $PM_{2.5}$ concentrations
NO2	Monthly mean NO2 concentrations
O3	Monthly mean O3 concentrations
Tmean	Monthly mean air temperature
dewT	Dew point temperature
pop.total	Total population
pop.Male	Male population
pop.Female	Female population
pop.White	Population of Non-Hispanic White people
pop.Black	Population of Non-Hispanic Black people
pop.Hispanic	Population of Hispanic people
CVD.adj	Age-adjusted cardiovascular disease mortality rate
HHD.adj	Age-adjusted hypertensive heart disease mortality rate
Hypertensive.adj	Age-adjusted hypertensive disease mortality rate
IHD.adj	Age-adjusted ischemic heart disease mortality rate
MI.adj	Age-adjusted myocardial infarction mortality rate
Stroke.adj	Age-adjusted stroke mortality rate
CVD.adj.Male	Age-adjusted male cardiovascular disease mortality rate
CVD.adj.Female	Age-adjusted female cardiovascular disease mortality rate
CVD.adj.White	Age-adjusted cardiovascular disease mortality rate among Non-Hispanic White people
CVD.adj.Black	Age-adjusted cardiovascular disease mortality rate among Non-Hispanic Black people
CVD.adj.Hispanic	Age-adjusted cardiovascular disease mortality rate among Hispanic people
HHD.adj.White	Age-adjusted hypertensive heart disease mortality rate among Non-Hispanic White people

HHD.adj.Black	Age-adjusted hypertensive heart disease mortality rate among Non-Hispanic Black people
HHD.adj.Hispanic	Age-adjusted hypertensive heart disease mortality rate among Hispanic people
Hypertensive.adj.White	Age-adjusted hypertensive disease mortality rate among Non-Hispanic White people
Hypertensive.adj.Black	Age-adjusted hypertensive disease mortality rate among Non-Hispanic Black people
Hypertensive.adj.Hispanic	Age-adjusted hypertensive disease mortality rate among Hispanic people
IHD.adj.White	Age-adjusted ischemic heart disease mortality rate among Non-Hispanic White people
IHD.adj.Black	Age-adjusted ischemic heart disease mortality rate among Non-Hispanic Black people
IHD.adj.Hispanic	Age-adjusted ischemic heart disease mortality rate among Hispanic people
MI.adj.White	Age-adjusted myocardial infarction mortality rate among Non-Hispanic White people
MI.adj.Black	Age-adjusted myocardial infarction mortality rate among Non-Hispanic Black people
MI.adj.Hispanic	Age-adjusted myocardial infarction mortality rate among Hispanic people
Stroke.adj.White	Age-adjusted stroke mortality rate among Non-Hispanic White people
Stroke.adj.Black	Age-adjusted stroke mortality rate among Non-Hispanic Black people
Stroke.adj.Hispanic	Age-adjusted stroke mortality rate among Hispanic people

2. Descriptive analysis

2.1 Monthly descriptive statistics for all 3,103 contiguous US counties from 2001 to 2016

- The R script “Table 1.R” generates **Table 1**.

2.2 Descriptive maps

- The shapefile “US_continental_counties_3103.shp” was used to make the maps (the “US.county” object in R scripts).
- The R script “Figure 1ab.R” generates the data for **Figure 1a-b**.
- ArcGIS Pro was used to make the final maps.
- The R script “Figure 1c.R” generates **Figure 1c**.

3. Estimation of exposure–response function

- The R script “Table 2.R” generates **Table 2**.

4. Calculation of attributable burden

- The R script “function_AN for each month.R” stores a function to calculate monthly county-level attributable burden.
- The R script “Figure 2a.R” generates the data for **Figure 2a**.
- The R script “Figure 2b.R” generates the data for **Figure 2b**.

- The R script “Figure 2c.R” generates the data for **Figure 2c**.

5. Calculation of attributable burden changes

- The R script “Figure 3a.R” generates the data for **Figure 3a**.
- The R script “Figure 3b.R” generates **Figure 3b**.
- The R script “Figure 4.R” generates **Figure 4**.

6. Sensitivity analysis

- The R script “Sensitivity analysis.R” generates the results of sensitivity analyses.