README document for datasets

The following are the files used for the manuscript "Health impacts of smoke exposure in South America: Increased risk for populations in the Amazonian Indigenous territories." The types of data include modeling estimates, observations from satellites, observations from AERONET sites, and model codes. Units for variables in the spreadsheets are included in the documents. Please contact the senior author of this paper, Loretta J. Mickley (mickley@fas.harvard.edu), if you plan to use these data.

Important: All papers making use of these data should reference Bonilla et al. (2023):

Bonilla, E.X., L. J. Mickley, G. Raheja, S.D. Eastham, J.J. Buonocore, A. Alencar, L. Verchot. D.M. Westervelt, M.C. Castro (2023), Health impacts of smoke exposure in South America: Increased risk for populations in the Amazonian Indigenous territories, *Environmental Research:Health*, in press.

Modeling data

GEOSChem.Aerosols_Col.2014.nc4 to
GEOSChem.Aerosols_Col.2019.nc4
Aerosol optical depth estimates from GEOS-Chem for each column for 2014 to 2019 with biomass burning emissions from GFED4s (unitless).

GEOSChem.PM25.2014.nc4 to
GEOSChem.PM25.2019.nc4
GEOS-Chem daily estimates of $PM_{2.5}$ in units of $\mu g\ m^{-3}$ between 2014 to 2019 with GFED4s.

GEOSChem.PM25.2014_noGFED.nc4 to
GEOSChem.PM25.2019_noGFED.nc4
GEOS-Chem daily estimates of $PM_{2.5}$ in units of $\mu g\ m^{-3}$ between 2014 to 2019 without GFED4s.

GEOSChem.PM25.2014mean.nc4 to
GEOSChem.PM25.2019mean.nc4
GEOS-Chem annual average of $PM_{2.5}$ in units of $\mu g\ m^{-3}$ between 2014 to 2019 with GFED4s.

GEOSChem.PM25.2014mean_noGFED.nc4 to
GEOSChem.PM25.2019mean_noGFED.nc4
GEOS-Chem annual average of $PM_{2.5}$ in units of $\mu g\ m^{-3}$ between 2014 to 2019 with GFED4s.

GEOSChem.PM25.2014_2019means.nc4
GEOS-Chem annual means of $PM_{2.5}$ in units of $\mu g\ m^{-3}$ between 2014 to 2019 with GFED4s.

GEOSChem.PM25.2014_2019means_noGFED.nc4
GEOS-Chem annual means of $PM_{2.5}$ in units of $\mu g\ m^{-3}$ between 2014 to 2019 without GFED4s.

GEOSChem.PM25.2014_2019mean.nc4
GEOS-Chem estimates of $PM_{2.5}$ in units of $\mu g\ m^{-3}$ for the 2014 to 2019 average with GFED4s.

GEOSChem.PM25.2014_2019mean_noGFED.nc4
GEOS-Chem estimates of $PM_{2.5}$ in units of μg m^{-3} for the 2014 to 2019 average without GFED4s.

mortality_output_dump_2014.pkl to
mortality_output_dump_2019.pkl
Mortality results from multiple concentration-response functions for exposure to $PM_{2.5}$ in units of μg m^{-3} between 2014 to 2019 annual average in South America.

mortality_output_dump_2014_2019.pkl
Mortality results from multiple concentration-response functions for exposure to $PM_{2.5}$ in units of μg m^{-3} for 2014 to 2019 annual average in South America.

mortality_output_dump_2014_ind.pkl to
mortality_output_dump_2019_ind.pkl
Mortality results from multiple concentration-response functions for exposure to $PM_{2.5}$ in units of μg m^{-3} between 2014 to 2019 annual average in Amazonian Indigenous territories.

mortality_output_dump_2014_2019_ind.pkl
Mortality results from multiple concentration-response functions for exposure to $PM_{2.5}$ in units of μg m^{-3} for 2014 to 2019 annual average in Amazonian Indigenous territories.

Vodonos_countrylevel_2014_2019mean.xls
Country level results for excess mortality between 2014 to 2019 from using Vodoos et al. 2018 as the concentration-response function.

Observations
AERONET_South_america.csv
Aerosol optical depths v2, level 3 data from AERONET for South America (unitless)

amazon_fires_2000_2019.csv
Fires locations from INPE online data for 2000 to 2019 as detected by MODIS.

daily_AERONET_means.csv
Daily averages of aerosol optical depth in South American AERONET sites.

GHE2016_Deaths_2016-country.xls
Global Health Estimates summary tables for 2016 from the World Health Organization for each country separated by age groups.

GHE2016_Deaths_WHOReg_2000_2016.xls
Global Health Estimates summary tables for 2000-2016 from the World Health Organization (WHO) for each country by cause of death, age and sex, and WHO region.

gpw_v4_data_quality_indicators_rev11_context_lookup.txt

GPWv4 context lookup text file for world population density data.

gpw_v4_data_quality_indicators_rev11_watermask_lookup.txt
GPWv4 watermask lookup text file for world population density data.

gpw_v4_national_identifier_grid_rev11_datacode_lookup.txt
GPWv4 lookup datacode text file for world population density data.

gpw_v4_national_identifier_grid_rev11_lookup.tx
GPWv4 lookup text file for world population density data.

gpw_v4_netcdf_contents_rev11.csv
GPWv4 csv with netcdf files information for word population density estimates used for mortality calculations.

gpw_v4_population_density_adjusted_to_2015_unwpp_country_totals_rev11_totpop_2pt5_min_nc_readme.txt
GPWv4 README document from sedac.ciesin.columbia.edu with word population density estimates.

gpw_v4_population_ncfiles.zip
GPWv4 zipfile with netcdf files with word population density estimates used for mortality calculations.

g4.timeAvgMap.MYD08_D3_6_1_AOD_550_Dark_Target_Deep_Blue_Combined_Mean.20140115-20140515.84W_56S_33W_14N.nc to
g4.timeAvgMap.MYD08_D3_6_1_AOD_550_Dark_Target_Deep_Blue_Combined_Mean.20190715-201911515.84W_56S_33W_14N.nc
Time averaged MODIS aerosol optical depths at 550 nm calculated from the Giovanni website. The dataset is from the 'Dark Target Blue Combined' dataset (MYD08_D3,
34 Collection 6.1, level 3) at 1° X 1°spatial resolution. The files are for 2014 to 2019 Amazonian wet season and dry seasons.

Historico_pais_america_do_sul.csv
Historical fire counts for South American countries.

Historico_pais_brasil.csv
Historical fire counts for Brazil.

monthly_AERONET_means.csv
Monthly averages of aerosol optical depth in South American AERONET sites.

openaq_averages_with_locations_newdrywetdefinitions.csv
OpenAQ reference monitor of $PM_{2.5}$ in units of $\mu g\ m^{-3}$ observations for Amazonian wet and dry seasons.

pa_and_geoschem_newseasons.csv
PurpleAir site estimates of $PM_{2.5}$ in units of $\mu g\ m^{-3}$ for Amazonian wet and dry seasons.

Tis_ComunIndigenas.html
Indigenous communities' information in html format, data is from Amazonian Network of Georeferenced Socio-Environmental Information last updated in 2020.

Tis_ComunIndigenas.lyr
Indigenous communities' information in lyr format, data is from Amazonian Network of Georeferenced Socio-Environmental Information last updated in 2020.

Tis_ComunIndigenas.zip
Zip file for shapefiles for Amazonian Indigenous communities from Amazonian Network of Georeferenced Socio-Environmental Information last updated in 2020.

Tis_TerritoriosIndigenas.lyr
Indigenous territories information in lyr format, data is from Amazonian Network of Georeferenced Socio-Environmental Information last updated in 2020.

Tis_TerritoriosIndigenas.zip
Zip file for shapefiles for Amazonian Indigenous territories from Amazonian Network of Georeferenced Socio-Environmental Information last updated in 2020.

Tis_2020.zip
Zip file containing Indigenous territories and communties shapefiles from Amazonian Network of Georeferenced Socio-Environmental Information last updated in 2020.

Tis_TerritoriosIndigenas.html
Indigenous territories information in html format, data is from Amazonian Network of Georeferenced Socio-Environmental Information last updated in 2020.

Tis_territoriosIndigenas.jpg
Picture of Amazonian Indigenous territories.

vc965bq8111.zip
Zipfile with South American shapefiles.

weekly_AERONET_means.csv
Weekly averages of aerosol optical depth in South American AERONET sites.

World_Countries_Generalized_.zip
Holds the world countries shapefiles used in this project.

wfsrequest.txt
Text file with information about South American shapefiles.

Model codes

1. Health codes.
The following text applies to the three health-related codes listed below.

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mortality_v3.py
An example code that performs mortality calculations. This includes a library of exposure response functions (ERFs) such as the Vodonos et al. 2018.

mcstats.py
The routines which are responsible for handling uncertainty quantification.

simple_mortality_2014.py
This example code calculates the mortality in each grid cell associated with each simulation. The change in mortality is the difference between the two outputs. The script memory intensive because it performs the health calculation in a Monte Carlo fashion at a global resolution of 2.5 arcminutes (for cells containing people).

2. Other codes.
AQ_amazon_2014_2019.ipynb
Jupyter notebook code was used to compare air quality estimated from GEOS-Chem.

AOD_AERONET_GC_Satellites.ipynb
Jupyter notebook code was used to compare AOD from AERONET, MODIS observations, and GEOS-Chem estimates.

pie_mortality.yml
Python environment used for jupyter notebook, "PM25mortality_2014_2019.ipynb" calculations.

Pie_research.yml
Python environment used for jupyter notebook, "AQ_amazon_2014_2019.ipynb" and "AOD_AERONET_GC_Satellites.ipynb" calculations.

PM25mortality_2014_2019.ipynb
Jupyter notebook was used to calculate excess mortality from results from different concentration-response functions.