Data and Code for: Why Did the Best Prepared Country in the World Fare So Poorly During COVID?

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Overview

The data and code in this replication package constructs five figures using data from seven publicly available sources (Bell et al., 2021; Arias et al., 2022; The World Bank, 2022; United Nations (UN) Department of Economic and Social Affairs Population Division, 2022; Dong et al., 2020; Wang et al., 2022; Ledesma et al., 2023) using R version 4.1.2 (R foundation for statistical computing) for the journal article "Why Did the Best Prepared Country in the World Fare So Poorly During COVID?". The figures are generated with three short programs.

Data Availability and Provenance Statements

- ☐ This paper does not involve analysis of external data (i.e., no data are used or the only data are generated by the authors via simulation in their code).

  If box above is checked and if no simulated/synthetic data files are provided by the authors, please skip directly to the section on Computational Requirements. Otherwise, continue.

Statement about Rights

- **X** I certify that the author(s) of the manuscript have legitimate access to and permission to use the data used in this manuscript.

Summary of Availability

- **X** All data **are** publicly available.
- ☐ Some data **cannot be made** publicly available.
- ☐ **No data can be made** publicly available.

Details on each Data Source

Data.Name	Data.Files	Location	Provided	Citation
"GHS Index"	GHS_index.xlsx	data/	TRUE	Bell et al., 2021
"Life Expectancy by Race	life_table.csv	data/	TRUE	Arias et al., 2022

“All-cause Death Rates, 2013-2021”	all_cause_dth_rates.csv	data/	TRUE	The World Bank, 2022
“Population Counts”	“UN_pops.csv”	data/	TRUE	United Nations (UN) Department of Economic and Social Affairs Population Division, 2022
“IHME Excess Deaths”	“IHME_excess_deaths.csv”	data/	TRUE	Wang et al., 2022
“Age Standardized Excess Deaths	“smr.csv”	data/	TRUE	Ledesma et al., 2023

All datasets used in this analysis are publicly available. Copies of the data are provided as part of this archive. The below are additional information of the exact steps taken to download the datasets of interests.

Bell et al., 2021: To download the dataset, go to the provided URL in the reference section and click on Data Model.

Datafile: GHS_index.csv

Arias et al., 2022: Data were extracted manually from the report for the year 2021. The extracted data were from the Table in the report. Since the data of interest were life expectancy at birth, the data were extracted for age 0 and for each race column in the table. The 2020 data were extracted in a similar manner from Table A in the 2020 report (Arias and Xu, 2022). The remaining years were extracted from archived life tables from the National Center for Health Statistics (National Center for Health Statistics, 2022). The data for the remaining years are found at the following URL: https://www.cdc.gov/nchs/nvss/life-expectancy.htm. After going to the URL, the remaining life tables were at the Find Our Data section. Data were extracted by clicking on each year in the section and extracting data from every table included. In each table, life expectancy at age 0 was manually extracted and the race was recorded as well.

Datafile: life_table.csv

The World Bank, 2022: The provided URL in the reference links directly to a preview of the dataset. To download the full dataset, click on download options on the top left.

Datafile: all_cause_dth_rates.csv

United Nations (UN) Department of Economic and Social Affairs Population Division, 2022: The provided URL in the reference links to many available datasets. The dataset used in this paper is the first that is available to download (Compact (most used: estimates and medium projections) (XLSX, 24.07 MB)).

Datafile: “UN_pops.csv”

Dong et al., 2020: COVID-19 death data (Center for Systems Science and Engineering, 2023) directly download in R using the following link: https://raw.githubusercontent.com/CSSEGISandData/COVID-19/master/csse_covid_19_data/csse_covid_19_time_series/time_series_covid19_deaths_global.csv (see code file 03_FIGURE_4_5.R)

Wang et al., 2022: The reference paper links to the following link to download excess death data (IHME 2022): https://ghdx.healthdata.org/record/ihme-data/covid_19_excess_mortality

Datafile: “IHME_excess_deaths.csv”

Ledesma et al., 2023: We coauthored the Ledesma et al., 2023 paper. The dataset used in Ledesma et al., 2023 was constructed with the publicly available IHME excess death dataset (IHME 2022). With the IHME excess death dataset we utilized age-standardization methods in the Ledesma et al., 2023 paper to derive indirectly age-standardized excess death rates. For this JEP publication, we pulled the input dataset from Ledesma et al., 2023 to provide an illustration of how accounting for biases in COVID-19 mortality data changes relationships. We provide the age-adjusted data that was used in Ledesma et al., 2023 in this folder for reproducibility of the figures.

Computational requirements

This analysis was carried out utilizing R version 4.1.2 (R foundation for statistical computing). Required packages are loaded at the top of each code file and listed below. Each code file can be run locally on a desktop. The code files are not computationally intensive and will take seconds to run locally on a desktop without a cluster.

Software Requirements

- R 4.1.2
  - `data.table`
  - `ggplot2`
  - `sf`
  - `RColorBrewer`
  - `ggpubr`
  - readxl
  - lubridate

Description of programs/code

- Program in `code/01_FIGURE_1` will construct a map of GHS Index scores (Figure 1, output file `results/FIGURE_1.pdf`)

- Program in `code/02_FIGURE_2_3` will generate a figure on life expectancy by race (Figure 2, output file `results/FIGURE_2.pdf`) and a figure on excess mortality (Figure 3, output file `results/FIGURE_3.pdf`)
- Program in `code/02_FIGURE_4_5` will produce a figure describing the GHS Index-COVID mortality relationship as biases in surveillance are gradually addressed (Figure 4, output file `results/FIGURE_4.pdf`) and a figure of the same relationship for the most prepared countries (Figure 5, output file `results/FIGURE_5.pdf`)

Instructions to Replicators

- Edit each code file to adjust the default path.
- Download the data files referenced above. Each should be stored in the prepared subdirectories of `data/`, in the format that you download them in. No further action is needed on the replicator's part.
- Run each program of interest.

Details

- The programs do not need to be ran in any order. Each program produces a figure of interest with the data provided in the folder.

List of tables and programs

The provided code reproduces:

- **X** All numbers provided in text in the paper
- **X** All tables and figures in the paper
- ☐ Selected tables and figures in the paper, as explained and justified below.

Figure/Table #	Program	Output file
Figure 1	code/FIGURE_1.R	results/FIGURE_1
Figure 2	code/FIGURE_2_3.R	results/FIGURE_2
Figure 3	code/FIGURE_2_3.R	results/FIGURE_3
Figure 4	code/FIGURE_4_5.R	results/FIGURE_4
Figure 5	code/FIGURE_4_5.R	results/FIGURE_5

References

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Dong, E., Du, H. and Gardner, L., An Interactive Web-Based Dashboard to Track COVID-19 in Real Time, *The Lancet Infectious Diseases*, vol. **20**, no. 5, pp. 533–34, from https://linkinghub.elsevier.com/retrieve/pii/S1473309920301201, May 2020. DOI: 10.1016/S1473-3099(20)30120-1

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