

Methodology Report for the Pandemic Recovery Survey (PRS)

The Pandemic Recovery Survey (PRS) was designed to help researchers understand the health system, financial, economic, and educational impacts of the COVID-19 pandemic. This project is a collaboration between the Institute for Health Metrics and Evaluation (IHME), LMU Munich (LMU), University of Maryland (UMD), and Meta. The project was funded by Meta, UMD was the survey host and IHME led the design of the surveys, with input and collaboration from the broader public health community. Meta did not host the surveys nor collect survey participant responses, and only had access to public, aggregated survey data provided by the universities. This survey (project ID 1967404-2) has been reviewed and approved by the Institutional Review Board at UMD.

1 Principal investigators and collaborators

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2 Citation

2.1 Report Citation

Haensch, A., Kreuter, F., La Motte-Kerr, W., Li, Y., Stewart, K., Weber, W., Zins, S., Castro, E., Deen, A., Ewald, L. M., Gakidou, E., Gillespie, C. W., Huntely, B. M., Tracy, A., Mokdad, A. H., Bellettiere, J., Farag, T. H., Lee, K., & Palani, S. (2023). Methodology Report for Pandemic Recovery Survey (PRS). The University of Maryland. Retrieved from <https://healthsurveys.umd.edu>

2.2 Data Citation

Haensch, A., Kreuter, F., La Motte-Kerr, W., Li, Y., Stewart, K., Weber, W., Zins, S., Castro, E., Deen, A., Ewald, L. M., Gakidou, E., Gillespie, C. W., Huntely, B. M., Tracy, A., Mokdad, A. H., Bellettiere, J., Farag, T. H., Lee, K., & Palani, S. (2023). Pandemic Response Survey. The University of Maryland. Retrieved from <https://healthsurveys.umd.edu>

3 Survey development and implementation

3.1 Questionnaire design and characteristics

Questionnaire development was led by IHME with input and collaboration from the broader public health community. Some questions for the survey were based on past questionnaires including COVID-19 Trends and Impact Survey (CTIS; <https://covidmap.umd.edu/>), the Vaccine Confidence Project (<https://www.vaccineconfidence.org/>), and the 2020-2021 Goalkeepers Reports (<https://www.gatesfoundation.org/goalkeepers/>). The conceptual framework of this questionnaire was to identify factors associated with socioeconomic and health outcomes related to the COVID-19 pandemic.

Questionnaire modules and sequence

The final questionnaire includes 94 questions within nine survey modules. The modules include demographics, health conditions, routine healthcare, economic security, education, trust in governmental institutions, vaccine confidence, routine childhood immunizations, and COVID-19 vaccines. All survey respondents are asked the same first three modules (including demographics, health conditions, and routine healthcare). After answering these questions, the remaining modules were randomly rotated. Questions were designed to be clear, concise, and at an accessible reading level. The questionnaire has an average completion time of 13.6 minutes.

3.2 Questionnaire translation

Once the final survey was completed in American English, a team of translators translated the English source questionnaire to the following 15 languages: Arabic, German, English (Great Britain), English (United States), Spanish (Latin America), Spanish (Spain), Filipino (Tagalog), Hindi, Indonesian, Italian, Japanese, Polish, Portuguese (Brazil), Turkish, Vietnamese. After the initial translation, localization checks were conducted to ensure accuracy and cultural appropriateness.

3.3 Questionnaire implementation

4 The questionnaire was designed in Qualtrics to be taken on an internet browser either on a desktop or on a phone screen. Question formatting and layout was designed to be easy to scroll on phone screens to prevent the inability to see certain questions or response options.

Participants were allowed to skip any question or go back to previous questions to edit their responses. There was no progress indicator included, and participants could pause the survey and return back within 4 hours. After this time, the survey would be finalized despite missing responses.

5 Sampling methodology

5.1 Sampling frame

The sample for the Pandemic Recovery Survey was designed to provide estimates of key economic, educational, and health indicators among subpopulations globally. The sampling frame was the Facebook Active User Base (FAUB) ages 18+ in 21 selected countries.

Countries include: Argentina, Brazil, Chile, Colombia, Egypt, Germany, India, Indonesia, Italy, Japan, Mexico, Nigeria, Peru, Philippines, Poland, South Africa, Spain, Türkiye, United Kingdom, United States, Viet Nam.

Figure 1: Countries included in the Pandemic Recovery Survey



5.2 Sampling method

We had two main goals for sampling for this cross-sectional study, 1) to have an equivalent number of responses from females and non-females, and 2) to ensure that the sample was representative of the FAUB in each country. Statistical weighting, discussed in section 5, was then used to address coverage and non-response bias.

To achieve sampling goals, the FAUB of each country was divided into strata based on gender. Simple random samples were selected in each gender (female vs. not female). To achieve gender balance, we first computed the male-to-female ratio of survey invitations needed to achieve an equal number of survey consents. This was computed as the male survey consent rate ($\# \text{ survey consents} / \# \text{ invitations sent}$) over the female consent rate, where the invitations and consent were determined during a 1-day soft launch of the survey in each of the 21 countries. We then scaled our sample by this ratio to increase the chances of gender parity.

To prevent survey fatigue, Facebook users are only invited to take a survey every few months, and so users that had taken a survey recently were not eligible to receive an invite.

5.3 Sample size calculation

General sample size guidelines to quantify population attributes calculate a sample size as

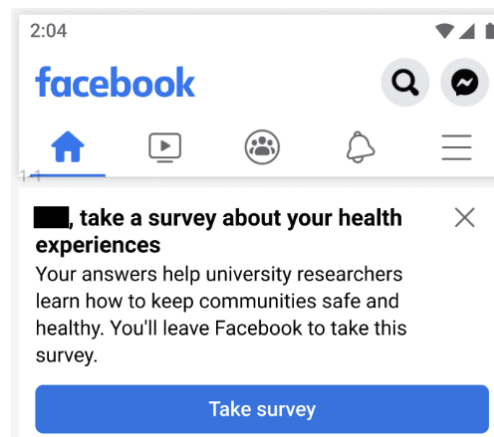
$$n = (z^2 * p(1-p))/\epsilon^2$$

where z is the z score, p is the population proportion of interest, and ϵ is the margin of error. To quantify an attribute that affects 50% of the population with 95% confidence and a margin of error of 5%, a minimum of 385 complete responses are needed for each subgroup-specific signal or desired prevalence estimate. 50% is approximately equivalent to the proportion of a population that may experience a delay in routine screening, such as mammograms which are recommended for most women 40 and older depending on the country. We then inflate this value by 15% to account for item non-response yields 443 completed surveys per age-, sex-, and location-specific subgroup of interest.

5.4 Data collection

The Facebook app invited users to take the survey by sending an invitation at the top of their Facebook Feed to an optional, off-Facebook website. The rate of invitations sent, viewed, and clicked were monitored daily for quality control. Once a FB user viewed an invitation and exited the application, they were not eligible for another invitation for at least 6 months, and survey reminders were not sent.

Figure 2: Survey invitation



Data were collected by UMD using Qualtrics. The invitation and survey text were translated into 15 languages. Data collection time ranged from 16 March 2023 to 16 May 2023, with survey invitations sent to each country until our needed sample size was achieved. Dates of the last survey response recorded by country are presented in Table 1. All respondents provide informed consent.

Table 1: Last survey response and demographics, by country

Country	Last survey response collected	Total number of responses collected	Age mean (sd)	Gender n (%)
Argentina	5 May 2023	12,716	41.8 (14.9)	Female (46.8%) Male (51.7%)
Brazil	2 May 2023	22,115	41.6 (13.5)	Female (47.9%) Male (51.5%)
Chile	4 May 2023	12,001	44.9 (14.4)	Female (50.4%) Male (48.2%)
Colombia	15 May 2023	17,942	36 (13.1)	Female (48.5%) Male (50.3%)
Egypt	3 May 2023	30,778	33.8 (11.6)	Female (40.3%) Male (58.3%)
Germany	9 May 2023	9,354	47.7 (13.8)	Female (54%) Male (44.8%)
India	13 May 2023	40,613	34.2 (10.9)	Female (45.7%) Male (53.7%)
Indonesia	13 May 2023	29,571	34.4 (10.9)	Female (45.8%) Male (52.9%)
Italy	18 April 2023	17,487	48.5 (13.9)	Female (56.2%) Male (42.4%)
Japan	5 May 2023	9,978	55.3 (12.3)	Female (42.8%) Male (55.9%)
Mexico	13 May 2023	22,965	37.1 (13.1)	Female (48.8%) Male (49.5%)
Nigeria	12 May 2023	27,358	33.1 (10.3)	Female (34.8%) Male (64.7%)
Peru	8 May 2023	16,360	37.8 (14.1)	Female (48.3%) Male (50.8%)
Philippines	2 May 2023	38,977	34.7 (12.0)	Female (51.1%) Male (46.1%)
Poland	19 April 2023	16,249	42.5 (16.8)	Female (54.9%) Male (43.8%)

Table 1 (continued): Last survey response and demographics, by country

Country	Last survey response collected	Total number of responses collected	Age mean (sd)	Gender n (%)
South Africa	1 May 2023	24,982	35.9 (12.4)	Female (52.5%) Male (46.4%)
Spain	2 May 2023	9,408	48.0 (14.0)	Female (55.2%) Male (43.7%)
Türkiye	14 April 2023	12,859	44.9 (12.8)	Female (41.1%) Male (58.3%)
United Kingdom	14 May 2023	8,213	48.5 (15.5)	Female (51.1%) Male (47.6%)
United States	16 May 2023	10,629	46.1 (15.4)	Female (56.6%) Male (41.3%)
Viet Nam	8 May 2023	25,400	31.5 (11.6)	Female (45.2%) Male (52.5%)

6 Weighting methodology

The computation of the survey weights consisted of two steps.

1. Response propensities were estimated for all persons that were invited to participate in the survey.
2. The inverse of the estimated response propensities were calibrated to known population totals of age, gender, and education categories and the regional distribution of the population.

6.1 Estimation of Response Propensities by Meta

Survey non-response was adjusted for using inverse propensity score weighting (IPW). We first computed the estimated response propensity using logistic regression with LASSO (Least Absolute Shrinkage and Selection Operator). All users who received an invitation were included in this modeling. The dependent variable was whether or not a user 1) consented to the survey, 2) completed the first 4 survey questions about demographics, and 3) completed at least two survey questions. The covariates included in this model included age, gender, and country of residence reported by users on Facebook app, and also other information about how sampled users interact with the Facebook app. Continuous covariates were categorized to fit the covariate distribution better by bucketing the data into deciles. Missing data were addressed by creating a separate category for missingness for each variable. The inverse of the response propensity was then scaled to the target population (i.e., the total number of users sent a survey invitation). To control for the variation of weights, a bound of 1.5 was set for the factor of Kish's design effect that measures the effect of using unequal weights on the variance of a weighted sample mean.

6.2 Computation of the final Survey Weights

We provided weights to enable inference to the target population (people being at least 18 years old) of each country in the survey. The weights are scaled to the size of the target population.

For the observations of each country, the inverse of the estimated response propensities were calibrated, using a linear calibration method, to the population totals of the following socio-demographic variables:

1. Cross-classification of gender and age
2. Cross-classification of gender and education
3. Cross-classification of age and education
4. Region

with the following categories:

1. Age: 18-24; 25-29; 30-39; 40-49; 50-59; 60-69; 70 +
2. Gender: Female; Non-Female
3. Education - Highest level of completed education: None; Primary; Secondary; Tertiary
4. Region: Location of residence by subnational administrative level 1 regions

The calibration was done for two sets of the sample, for the step-1-complete responses and the partial complete responses.

- Step-1 is achieved when respondents consent to take part in the survey, confirm that they are 18 years or older and state the country and region they live in, their age group, gender, and education level, in addition to answering two other questions.
- Partial complete is achieved when respondents in addition to the step-1 requirements answer any two of the questions 36, 37, and 38.

For all countries, the step-1-complete weights were trimmed to be between 1 and 100,000. For partial complete responses only a lower bound of 1 was set. The trimming of the step-1-complete weights results in a substantially lower coefficient of variation (CV) of the weights for some countries, as shown in Table 2, which displays the relative change between the CV of the trimmed and the CV of the untrimmed weights.

Table 2: Relative Change in Coefficient of variation

Country	Rel. CV Change
Argentina	0.00
Brazil	-0.23
Chile	0.00
Colombia	-0.02
Egypt	-0.25
Germany	-0.31

India	-0.82
Indonesia	-0.47
Italy	-0.07
Japan	-0.88
Mexico	-0.27
Nigeria	-0.66
Peru	-0.09
Philippines	-0.26
Poland	0.00
South Africa	-0.05
Spain	-0.01
Turkey	-0.46
United Kingdom	-0.18
United States	-0.08
Vietnam	-0.21

Using the provided survey weights should increase the chances that the results more accurately reflect the characteristics of the target population in each country, but it is not certain that they ensure an approximately unbiased estimation.

Also the survey weights do not perfectly replicate the population totals used in the calibration, as there is a trade-off between bounding the weights and achieving a better fit to the population totals. It is possible that non-respondents differ from respondents conditional on the variables used in the estimation of the response propensities and calibration and/or that Facebook users differ from the target population even if conditioned on the variables that are used in the calibration.

6.3 Population totals for weighting

Population totals for the categories of variables Age, Gender, Education are all based on estimates provided by IHME.

The population totals for the subnational administrative level 1 regions were obtained from different sources. For Brazi, India, Indonesia, Italy, Mexico, Poland, South Africa, United Kingdom, United States, the data was also based on estimates provided by IHME.

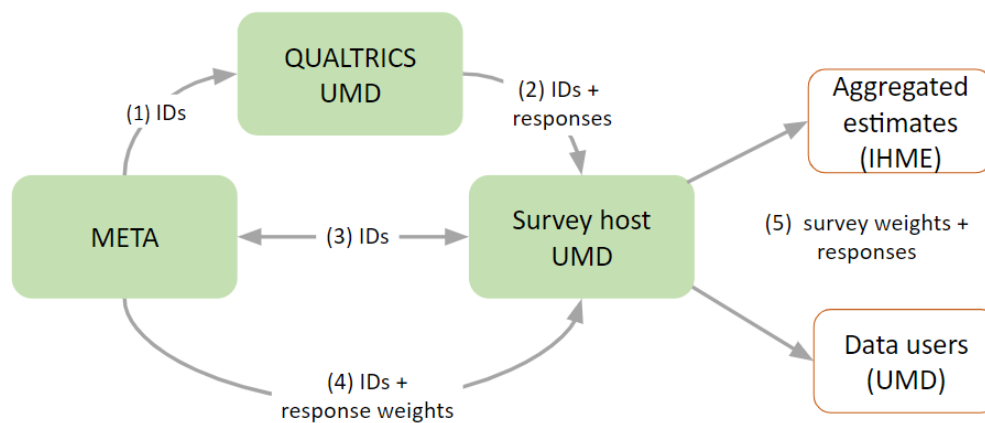
For Argentina, Chile, Colombia, Nigeria, Peru, Philippines, Turkey, Viet Nam the percentages of the total population by subnational administrative level 1 region were obtained from data sets provided by the

Humanitarian Data Exchange. For Egypt, data were obtained from the Central Agency for Public Mobilization And Statistics (CAPMAS), for Germany from the Federal Statistical Offices (DeStatis), for Japan from e-stat, a portal site for Japanese Government Statistics, for Spain from the Spanish Statistical Office. The percentages per subnational administrative level 1 were multiplied by the respective overall population total estimated by IHME.

6.4 Privacy protection in the weighting pipeline

Meta did not gather nor receive the survey responses from UMD for weight calculation. Instead, when a Facebook user clicked on "Take Survey" on the survey invitation, they were directed to a questionnaire hosted by UMD. The survey software used was licensed from Qualtrics, and the URL from Qualtrics included an automatically generated anonymized ID number and the respondent's language on Facebook. After fieldwork was completed, UMD sent Meta a list of anonymized ID numbers for respondents who had provided enough information in the survey to receive a weight. Meta utilized this list of anonymized ID numbers. The weights from Meta were then used by UMD to calculate the final Survey Weights as mentioned in 5.2.

Figure 3: Data Collection Process



7 Data Processing

7.1 Quality checks

The survey data underwent processing to ensure the validity and reliability of the collected data. The checks were carried out to ensure the data was of high quality and errors or inconsistencies were dealt with appropriately. The data were examined for duplicates, illogical codes, and other data quality issues such as straight-lining, skip and 'don't know' rates, illogical time spent on survey as whole.

7.2 Open-ended responses

There are no open-ended responses included in the questionnaire.

7.3 Generated variables

Generated variables were derived from the survey software and provide insight into survey logistics and include a variable 'StartDate' which gives the date and time of survey initiation, 'EndDate' which gives the date and time of survey completion, 'Finished' which is a binary variable indicating whether a respondent completed the entire survey, 'RecordedDate' which is a variable indicating the date of survey completion, and 'cweight' which is the weight variable described in the weighting section.

7.4 Post-hoc output harmonization

The questionnaire was designed with comparability in mind. Topics and questions are closely based on surveys of comparable topic, size, or location. Response categories, location, timing of data collection, and other factors may affect the comparability of estimates.

This is a cross-sectional survey without additional waves of data to assess the quality of harmonization.

7.5 Imputation

There are no imputed values in the data.

8 Data Access

The microdata is available for project participants with a signed data use agreement from GESIS Leibniz Institute for the Social Sciences (www.gesis.org). Third parties outside of GESIS would require a data user agreement to access the data. Aggregated data are available from IHME's project website (<https://vizhub.healthdata.org/pandemic-recovery-survey/>)

9 Acknowledgement

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