Release statement

High-resolution prediction and uncertainty gridded datasets of reproductive, maternal, newborn, child and adolescent health and development indicators for 2015-16 India, version 1.1

09/08/2022

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File descriptions

IND_ANC_timing_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of women who had a live birth in the five (or three) years preceding the survey whose first antenatal care visit was at less than 4 months. The data were collected from the India 2015-16 National Family Health Survey (NFHS-4). Within the DHS surveys, all women aged between 15 and 49 years old were asked about their number and timing of antenatal visits during the five years preceding the survey.

IND_ANC_timing_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of women who had a live birth in the five (or three) years preceding the survey whose first antenatal care visit was at less than 4 months. The data were collected from the India 2015-16 National Family Health Survey (NFHS-4). Within the NFHS surveys, all women aged between 15 and 49 years old were asked about their number and timing of antenatal visits during the five years preceding the survey.

IND_ANC4plus_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of women who have had at least 4 antenatal care (ANC) visits during pregnancy.

IND_ANC4plus_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of women who have had at least 4 antenatal care (ANC) visits during pregnancy.

IND_ANC_blood_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of women with a live birth in the five (or three) years preceding the 2015-16 National Family Health Survey (NFHS-4) who received antenatal care for the most recent birth with blood sample taken. The denominator for this indicator is women who had a live birth in the five (or three) years preceding the survey and received ANC. Women surveyed were aged 15-49.

IND_ANC_blood_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of women with a live birth in the five (or three) years preceding the 2015-16 National Family Health Survey (NFHS-4) who received antenatal care for the most recent birth with blood sample taken. The denominator for this indicator is women who had a live birth in the five (or three) years preceding the survey and received ANC. Women surveyed were aged 15-49.

IND_ANC_urine_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of women with a live birth in the five (or three) years preceding the 2015-16 National Family Health Survey who received antenatal care (ANC) for the most recent birth with urine sample. The denominator for this indicator is women who had a live birth in the five (or three) years preceding the survey and received ANC. Women surveyed were aged 15-49.

IND_ANC_urine_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of women with a live birth in the five (or three) years preceding the 2015-16 National Family Health Survey who received antenatal care (ANC) for the most recent birth with urine sample. The denominator for this indicator is women who had a live birth in the five (or three) years preceding the survey and received ANC. Women surveyed were aged 15-49.

IND_child_marriage_f15_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of child marriage for females under the age of 15. Female child marriage has been calculated as the % of women whose first marriage or consensual union occurred before the age of 15 over the full sample of women aged 15-49.

IND_child_marriage_f15_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of child marriage for females under the age of 15. Female child marriage has been calculated as the % of women whose first marriage or consensual union occurred before the age of 15 over the full sample of women aged 15-49.

IND_child_marriage_f18_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of child marriage for females under the age of 18. Female child marriage has been calculated as the % of women whose first marriage or consensual union occurred before the age of 18 over the full sample of women aged 15-49.

IND_child_marriage_f18_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of child marriage for females under the age of 18. Female child marriage has been calculated as the % of women

whose first marriage or consensual union occurred before the age of 18 over the full sample of women aged 15-49.

IND_decision_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of women who decide on their own health care either alone or jointly with partner.

IND_decision_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of women who decide on their own health care either alone or jointly with partner.

IND_contraception_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of currently married or in union women currently using any modern method of contraception.

IND_contraception_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of currently married or in union women currently using any modern method of contraception.

IND_HIVknow_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of women who have comprehensive knowledge of HIV. Comprehensive knowledge is defined as: knowing that consistent use of condoms during sexual intercourse and having just one uninfected faithful partner can reduce the chances of getting HIV/AIDS, knowing that a healthy-looking person can have HIV/AIDS, and rejecting two common misconceptions about transmission or prevention of HIV/AIDS.

IND_HIVknow_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of women who have comprehensive knowledge of HIV. Comprehensive knowledge is defined as: knowing that consistent use of condoms during sexual intercourse and having just one uninfected faithful partner can reduce the chances of getting HIV/AIDS, knowing that a healthy-looking person can have HIV/AIDS, and rejecting two common misconceptions about transmission or prevention of HIV/AIDS.

IND_NARsec_f_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of female net attendance rate for secondary school. The net attendance rate for secondary school is defined as the percentage of secondary school age girls attending secondary school. Explicitly, the denominator of the proportion is the total count of secondary school aged girls, and the numerator is the count of secondary school aged girls attending secondary school. Data on the % of female net attendance rate for secondary school is collected in the 2015-16 DHS India survey (NFHS-4).

IND_NARsec_f_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of female net attendance rate for secondary school. The net attendance rate for secondary school is defined as the percentage of secondary school age girls attending secondary school. Explicitly, the denominator of the proportion is the total count of secondary school aged girls, and the numerator is the count of secondary school aged girls attending secondary school. Data on the % of female net attendance rate for secondary school is collected in the 2015-16 DHS India survey (NFHS-4).

IND_NARsec_m_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of male net attendance rate for secondary school. The net attendance rate for secondary school is defined as the percentage of secondary school age boys attending secondary school. Explicitly, the denominator of the proportion is the total count of secondary school aged boys, and the numerator is the count of secondary school aged boys attending secondary school. Data on the % of male net attendance rate for secondary school is collected in the 2015-16 DHS India survey (NFHS-4).

IND_NARsec_m_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of male net attendance rate for secondary school. The net attendance rate for secondary school is defined as the percentage of secondary school age boys attending secondary school. Explicitly, the denominator of the proportion is the total count of secondary school aged boys, and the numerator is the count of secondary school aged boys attending secondary school. Data on the % of male net attendance rate for secondary school is collected in the 2015-16 DHS India survey (NFHS-4).

IND_employment_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of employed women among those currently in a union. Employment status in the last 12 months among those currently in a union. The indicator includes those who worked in the past year, those who are currently working and those who have a job but were on leave over the last 7 days.

IND_employment_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of employed women among those currently in a union. Employment status in the last 12 months among those currently in a union. The indicator includes those who worked in the past year, those who are currently working and those who have a job but were on leave over the last 7 days.

IND_IFA_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of women with a live birth in the five (or three) years preceding the 2015-16 National Family Health Survey who received iron tablets or syrup during antenatal care. The denominator for this indicator is women who had a live birth in the five (or three) years preceding the survey. Women surveyed were aged 15-49.

IND_IFA_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of women with a live birth in the five (or three) years preceding the 2015-16 National Family Health Survey who

received iron tablets or syrup during antenatal care. The denominator for this indicator is women who had a live birth in the five (or three) years preceding the survey. Women surveyed were aged 15-49.

IND_low_birthweight_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of children weighing below 2.5kg at birth. The denominator of the proportion is the total count of live births in the five years preceding the survey that have a written record of the child's weight at the time of birth or the mother was able to recall the child's weight. The numerator of the proportion is the count of instances where the birth weight is less than 2.5kg. Data on low birthweight was collected in the 2015-16 DHS India survey.

IND_low_birthweight_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of children weighing below 2.5kg at birth. The denominator of the proportion is the total count of live births in the five years preceding the survey that have a written record of the child's weight at the time of birth or the mother was able to recall the child's weight. The numerator of the proportion is the count of instances where the birth weight is less than 2.5kg. Data on low birthweight was collected in the 2015-16 DHS India survey.

IND_vitamina_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of children aged 6-59 months who were given vitamin A supplements.

IND_vitamina_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of children aged 6-59 months who were given vitamin A supplements.

IND_stunted_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of children stunted. Stunting is defined as having height-for-age more than two standard deviations below the World Health Organization (WHO) Child Growth Standards median among children under age five years.

IND_stunted_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of children stunted. Stunting is defined as having height-for-age more than two standard deviations below the World Health Organization (WHO) Child Growth Standards median among children under age five years.

IND_wasted_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of children wasted. Wasting is defined as having a weight for height z-score (WHZ) more than 2 standard deviations below the World Health Organization (WHO) Child Growth Standards median among children under age five years.

IND_wasted_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of children wasted. Wasting is defined as having a weight for height z-score (WHZ) more than 2 standard deviations below the World Health Organization (WHO) Child Growth Standards median among children under age five years.

IND_violence_NFHS4_mean_V_1_1.tif

High-resolution (5x5km) prediction (mean) gridded surface of the % of women aged 15-49 who have experienced physical violence since the age of 15 by anyone. The indicator measures the experienced physical violence since age 15 among women aged 15-49, for all women who were selected and interviewed for the physical violence module in the NFHS-4 survey.

IND_violence_NFHS4_sd_V_1_1.tif

High-resolution (5x5km) uncertainty (standard deviation) gridded surface of the % of women aged 15-49 who have experienced physical violence since the age of 15 by anyone. The indicator measures the experienced physical violence since age 15 among women aged 15-49, for all women who were selected and interviewed for the physical violence module in the NFHS-4 survey.

License

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Suggested citation

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Source data

The input data used as response variables (the health and development indicators) to produce gridded datasets were derived from the India National Family Health Survey 4 (NFHS-4) — also called the 2015-16 India Demographic Health Survey (DHS) interchangeably. The 2015-16 India NFHS-4 were conducted by the Ministry of Health and Family Welfare (MoHFW), Government of India and International Institute for Population Sciences (IIPS), Mumbai, with the technical assistance of ICF through the DHS Program (funded by USAID). [3] Microdata and more information can be found here: http://rchiips.org/nfhs/nfhs4.shtml and here: https://dhsprogram.com/.

Table 1. Table of geospatial covariates, and their description, assembled for testing when modelling the health and development indicators. All geospatial covariates tested were continuous.

Category	Covariate name	Description	Year	Sources
Geographical	Travel time	Travel time to major cities (mins)	2015	Weiss, D.J. et al. (2018). A global map of travel time to cities to access inequalities in accessibility in 2015. Nature.

	Slope	Shuttle Radar Topography Mission slope (degrees)	2001	de Ferranti, J., 2017. 'Digital Elevation Data'. Viewfinder Panoramas (www.viewfinderPanoramas.org/dem3.html); based on NASA's Shuttle Radar Topography Mission (SRTM) data (http://www2.jpl.nasa.gov/srtm/)
	Elevation	Digital elevation model (m)	2001	de Ferranti, J., 2017. 'Digital Elevation Data'. Viewfinder Panoramas (www.viewfinderPanoramas.org/dem3.html); based on NASA's Shuttle Radar Topography Mission (SRTM) data (http://www2.jpl.nasa.gov/srtm/)
	Distance to major roads	Distance to major OpenStreetMap roads (km)	2016	*[Derived from]* Open Street Map (2019). © OpenStreetMap Contributors www.openstreetmap.org
	Distance to waterways	Distance to OpenStreetMap waterways (km)	2016	[*Derived from*] Open Street Map (2019). © OpenStreetMap Contributors www.openstreetmap.org
	Distance to protected areas	Distance to protected areas as defined by the World Database on protected areas (km)	2016	[*Derived from*] Open Street Map (2019). © OpenStreetMap Contributors www.openstreetmap.org
Socioeconomic	Cattle density	Cattle density (no. / km^2)	2010	Gilbert, M. et al. (2018) Global Distribution Data for Cattle, Buffaloes, Horses, Sheep, Goats, Pigs, Chickens and Ducks in 2010. Nature Scientific data, 5:180227. doi: 10.1038/sdata.2018.227
	Net primary production	MODIS net primary production (kg C/m^2)	2005	Running et al. (2015) MOD17A3H MODIS/Terra Net Primary Production Yearly L4 Global 500 m SIN Grid V006 [Data set]. NASA EOSDIS Land Processes DAAC.
	Nighttime lights	Nighttime lights (nano-watts)	2016	NOAA – Visible Infrared Imaging Radiometer Suite. https://ngdc.noaa.gov/eog/viirs/index.html
Environmental	Temperature	Temperature (degree Celsius x 10)	2005	Wan, Z. *et al*. MOD11C3 MODIS/Terra Land Surface Temperature/Emissivity Monthly L3 Global 0.05Deg CMG V006

			[Data set]. NASA EOSDIS Land Processes DAAC.
Precipitation	Precipitation (mm)	1970-2000	Fick, S. E., & Hijmans, R. J. (2017). WorldClim 2: new 1-km spatial resolution climate surfaces for global land areas. *International journal of climatology*, *37*(12), 4302-4315.
Aridity	Mean aridity index (AI- as developed from CGIAR-CSI data)	1950-2000	CGIAR-CSI Global-Aridity and Global-PET Database. Available at https://cgiarcsi.community/data/global-aridity-and-pet-database/
Evapotranspiration	Average annual potential evapotranspiration (PET - as developed from CGIAR-CSI data)	1950-2000	CGIAR-CSI Global-Aridity and Global-PET Database. Available at https://cgiarcsi.community/data/global-aridity-and-pet-database/

Methods overview

Cluster-level proportions of children's and women's health and wealth and development indicators were calculated and used as input data to construct maps of all indicators here described. Cluster level indicators were used as response variables in the context of geospatial modelling techniques, where the GPS from the surveys and spatial covariates were exploited as independent variables to predict gridded surfaces. These methods are nowadays widely used and applied in different settings. [4-7].

The construction of cluster level indicators from the India NFHS-4 survey followed the definitions and instructions of the DHS programme [8-9] and the DHS GitHub page, where code is available (https://github.com/DHSProgram).

We constructed spatial binomial generalized linear models for each health and development indicator with a corresponding optimal (sub)set of geospatial covariates – selected with the stepwise-backward model selection method. The constructed models are then fitted in the Bayesian framework via the INLA-SPDE approach (Rue et al., 2009); this is implemented using the INLA package (Lindgren and Rue, 2015) in R 4.1.1; the code is readily available on GitHub [10]. Predictions, and calculations of the associated uncertainties, were carried out using the fitted models on a 5x5km resolution gridded surface.

Acknowledgement

Reference

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