

Documentation for the Global Subnational Infant Mortality Rates, Version 2

December 2018

Center for International Earth Science Information Network (CIESIN),
Columbia University

Abstract

This document outlines the basic methodology and data sets used to construct the Global Subnational Infant Mortality Rates (IMR), Version 2, along with use cases, limitations, and use constraints. The second version of SEDAC's Global Subnational Infant Mortality Rates data set compiles IMR data for 234 countries and territories, 143 of which include subnational units. The data are benchmarked to the year 2015 (Version 1 was benchmarked to the year 2000), and are drawn from national offices, Demographic and Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS), and other sources from 2006 to 2014. Boundary inputs are derived primarily from the Gridded Population of the World, Version 4 (GPWv4). National and subnational data are mapped to grid cells at a spatial resolution of 30 arc-seconds (~1 km) allowing for easy integration with demographic, environmental, and other spatial data.

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We appreciate feedback regarding this data set, such as suggestions, discovery of errors, difficulties in using the data, and format preferences. Please contact:

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I. Introduction

The Global Subnational Infant Mortality Rates, Version 2 data set includes infant mortality rate data for the lowest administrative units available for each country as of June 2017. The infant mortality rate (IMR) for a region or country (defined as the number of children who die before their first birthday for every 1,000 live births) is of interest to a wide user community in interdisciplinary studies of health, development, sustainability, and the environment. Subnational IMR estimates derived from vital statistics and other sources are frequently used as a proxy for indicators such as poverty and wellbeing since alternative measures, such as Gross Domestic Product (GDP) or population living on less than one U.S. dollar per day, can be difficult to obtain at sub-national levels for many countries (Dasgupta, 1993). IMR also has a number of advantages over other metrics. First, its measurement, unlike small area estimates of poverty or income, is highly standardized. Second, when compared with average income metrics, IMRs are less likely to be influenced by the kind of skewed wealth distribution that might make otherwise poor areas appear well-off because a few high income people live there. Third, the data are available for 90% or more of the population in medium and low income countries (Balk et al., 2006).

This second version of SEDAC’s Global Subnational Infant Mortality Rates data set compiles IMR data for 234 countries and territories, 143 of which include subnational units. The data are benchmarked to the year 2015, whereas version 1 of the data set was benchmarked to the year 2000 (CIESIN, 2005). Metadata are included describing uncertainties related to temporal and spatial scale adjustment, small island state (SIS) status, and conflict regions. Data are drawn from national offices, Demographic and Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS), and other sources from 2006 to 2014. Boundary inputs are derived primarily from the Gridded Population of the World, Version 4 (GPWv4). Assigning both national and

subnational data to grid cells at a spatial resolution of 30 arc-seconds (~1 km) allows for easy integration with demographic, environmental, and other spatial data.

II. Data and Methodology

Input data

IMR data has been collected for 234 countries and territories, 91 include only national units, while 143 include subnational units, representing an improvement of 78 additional countries with subnational data compared to the first version. Distribution of countries by level of administrative unit used and total number of units for each level is displayed in Table 1.

Table 1

| Administrative Level | Count of Highest Resolution SNU** | Sum of Total Number of SNUs** |
|----------------------|-----------------------------------|-------------------------------|
| 0 | 91 | 91 |
| 1 | 113 | 1863 |
| 2 | 22 | 3513 |
| 3 | 7 | 1439 |
| 4 | 1 | 163 |
| Grand Total | 234 | 7069 |

** SNU = Sub-National Unit

Source information by country, including the number of reporting units for each country, is shown in Table 2. Subnational data were drawn from national offices (82 countries), DHS (41 countries), MICS (17 countries), and other sources (3 countries). For the national office source, data were drawn from a national Human Development Report, National Statistical Office (NSO), or ministry of health. Subnational data dates from 2008 to 2014.

Spatial boundaries were obtained from the same IMR data source when possible, otherwise GPWv4 input boundaries were used (CIESIN, 2016a), shown in Table 3. Boundaries for countries and territories where no IMR data has been collected (7 countries) are represented with a “NoData” or no population code (-9999) where applicable. Water features were also obtained from GPWv4 (CIESIN, 2016b) and are represented using the code for no population or uninhabited areas (-7777).

Using the GPWv4 boundaries improves interoperability between IMR and the various GPW data such as population count, age, and sex variables (CIESIN, 2017).

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Table 2: Countries with IMR Data

| Continent | ISO3 | Country | Highest Resolu-tion SNU** | Total Number of SNUs** | National IMR (Year) | National IMR* | Sub-national IMR (Year) | Sub-national IMR* | Method of Calculation | Source of Adjustment |
|------------|------|-------------------------------|---------------------------|------------------------|---------------------|---------------|-------------------------|-------------------|---|--|
| Europe | ANR | Andorra | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | AFG | Afghanistan | 1 | 34 | 2011-2015 | DHS | 2006-2015 | DHS | Acquired | UN IGME 2017 |
| Africa | AGO | Angola | 1 | 18 | 2011-2015 | DHS | 2006-2015/16 | DHS | Acquired | UN IGME 2017 |
| Europe | ALB | Albania | 1 | 3 | 2014 | DHS | 1999-2008 | DHS | Acquired | UN IGME 2017 |
| Asia | ARE | United Arab Emirates | 0 | 1 | 2011 | National | n/a | n/a | Acquired | UN IGME 2017 |
| S. America | ARG | Argentina | 2 | 525 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | ARM | Armenia | 1 | 11 | 2014 | National | 2013 | National | Acquired | UN IGME 2017 |
| Oceania | ASM | American Samoa | 0 | 1 | 2014 | CIA | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| N. America | ATG | Antigua and Barbuda | 0 | 1 | 2007 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Australia | AUS | Australia | 1 | 9 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Europe | AUT | Austria | 1 | 9 | 2014 | National | 2013 | National | Calculated by CIESIN | UN IGME 2017 |
| Asia | AZE | Azerbaijan | 2 | 74 | 2014 | National | 2013 | National | Acquired | UN IGME 2017 |
| Africa | BDI | Burundi | 1 | 5 | 2006-2011 | DHS | 2001-2011 | DHS | Acquired | UN IGME 2017 |
| Europe | BEL | Belgium | 2 | 11 | 2013 | National | 2013 | National | Acquired (admin0 and admin1); Calculated by CIESIN (admin2) | UN IGME 2017 |
| Africa | BEN | Benin | 1 | 12 | 2010-2014 | MICS | 2010-2014 | MICS | Acquired | UN IGME 2017 |
| N. America | BES | Bonaire, Sint Eustatius, Saba | 0 | 1 | 2009 | PAHO | n/a | n/a | Acquired | n/a |

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| | | | | | | | | | | |
|------------|-----|--------------------------|---|-----|-----------|----------|-------------------------------------|----------|----------------------|--|
| Africa | BFA | Burkina Faso | 1 | 13 | 2006-2010 | DHS | 2001-2010 | DHS | Acquired | UN IGME 2017 |
| Asia | BGD | Bangladesh | 2 | 64 | 2014 | National | admin1: 2014, admin2: 2012 | National | Acquired | UN IGME 2017 |
| Europe | BGR | Bulgaria | 3 | 28 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | BHR | Bahrain | 0 | 1 | 2013 | National | n/a | n/a | Acquired | UN IGME 2017 |
| N. America | BHS | Bahamas | 0 | 1 | 2013 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | BIH | Bosnia and Herzegovina. | 3 | 142 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| N. America | BLM | Saint-Barthelemy | 0 | 1 | 2014 | Other | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Europe | BLR | Belarus | 3 | 155 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| N. America | BLZ | Belize | 1 | 6 | 2011-2015 | MICS | 2009 | National | Acquired | UN IGME 2017 |
| N. America | BMU | Bermuda | 0 | 1 | 2014 | National | n/a | n/a | Calculated by CIESIN | U.S. Census Bureau International Data Base |
| S. America | BOL | Bolivia | 1 | 9 | 2008 | National | 2008 | National | Acquired | UN IGME 2017 |
| S. America | BRA | Brazil | 3 | 557 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| N. America | BRB | Barbados | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | BRN | Brunei Darussalam | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | BTN | Bhutan | 1 | 20 | 2012 | National | 2012 and 2005 | National | Acquired | UN IGME 2017 |
| Africa | BWA | Botswana | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | CAF | Central African Republic | 1 | 16 | 2010 | MICS | 2010 | MICS | Acquired | UN IGME 2017 |
| N. America | CAN | Canada | 1 | 13 | 2012 | National | 2012 | National | Acquired | UN IGME 2017 |
| Europe | CHE | Switzerland | 1 | 26 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| S. America | CHL | Chile | 2 | 347 | 2013 | National | 2013 | National | Acquired | UN IGME 2017 |
| Asia | CHN | China | 1 | 31 | 2012 | National | 11/2009-10/2010 | National | Calculated by CIESIN | UN IGME 2017 |
| Africa | CIV | Côte d'Ivoire | 1 | 11 | 2007-2012 | DHS | 2002-2012 | DHS | Acquired | UN IGME 2017 |
| Africa | CMR | Cameroon | 1 | 12 | 2009-2014 | MICS | 2005-2014 | MICS | Acquired | UN IGME 2017 |

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| | | | | | | | | | | |
|------------|-----|----------------------------------|---|----|----------------|----------|-----------|----------|--|--|
| Africa | COD | Democratic Republic of the Congo | 1 | 11 | 2009-2013 | DHS | 2003-2013 | DHS | Acquired | UN IGME 2017 |
| Africa | COG | Congo (Brazzaville) | 1 | 12 | 2010-2014/2015 | MICS | 2002-2011 | DHS | Acquired | UN IGME 2017 |
| Oceania | COK | Cook Islands | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| S. America | COL | Colombia | 1 | 33 | 2005-2010 | DHS | 2000-2010 | DHS | Acquired | UN IGME 2017 |
| Africa | COM | Comoros | 1 | 3 | 2008-2012 | DHS | 2003-2012 | DHS | Acquired | UN IGME 2017 |
| Africa | CPV | Cape Verde | 1 | 22 | 2013 | National | 2011 | National | Acquired (admin0); Calculated by CIESIN (admin1) | UN IGME 2017 |
| N. America | CRI | Costa Rica | 2 | 81 | 2014 | National | 2013 | National | Acquired | UN IGME 2017 |
| N. America | CUB | Cuba | 1 | 16 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| N. America | CUW | Curacao | 0 | 1 | 2014 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| N. America | CYM | Cayman Islands | 0 | 1 | 2014 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Asia | CYP | Cyprus | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | CZE | Czech Republic | 2 | 77 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Europe | DEU | Germany | 1 | 16 | 2013 | National | 2013 | National | Acquired | UN IGME 2017 |
| Africa | DJI | Djibouti | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| N. America | DMA | Dominica | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | DNK | Denmark | 1 | 5 | 2014 | National | 2014 | National | Calculated by CIESIN | UN IGME 2017 |
| N. America | DOM | Dominican Republic | 1 | 10 | 2009-2014 | MICS | 2009-2014 | MICS | Acquired | UN IGME 2017 |
| Africa | DZA | Algeria | 1 | 48 | 2014 | National | 2013 | National | Acquired | UN IGME 2017 |
| S. America | ECU | Ecuador | 2 | 24 | 2013 | National | 2012 | National | Acquired | UN IGME 2017 |
| Africa | EGY | Egypt | 1 | 27 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Africa | ERI | Eritrea | 1 | 6 | 2010 | National | 2010 | National | Acquired | UN IGME 2017 |
| Africa | ESH | Western Sahara | 0 | 1 | 2014 | CIA | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |

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| | | | | | | | | | | |
|------------|-----|--|---|-----|-----------|----------|-----------|----------|----------|--|
| Africa | ESP | Spain | 2 | 52 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Europe | EST | Estonia | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | ETH | Ethiopia | 1 | 11 | 2006-2011 | DHS | 2001-2011 | DHS | Acquired | UN IGME 2017 |
| Europe | FIN | Finland | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Oceania | FJI | Fiji | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | FRA | France | 2 | 96 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Europe | FRO | Faroe Islands | 0 | 1 | 2014 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Oceania | FSM | Micronesia (Fed. States of) | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | GAB | Gabon | 1 | 10 | 2007-2012 | DHS | 2002-2012 | DHS | Acquired | UN IGME 2017 |
| Europe | GBR | United Kingdom of Great Britain and Northern Ireland | 3 | 405 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | GEO | Georgia | 1 | 12 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Europe | GGY | Guernsey | 0 | 1 | 2010-2012 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Africa | GHA | Ghana | 1 | 10 | 2010-2014 | DHS | 2005-2014 | DHS | Acquired | UN IGME 2017 |
| Europe | GIB | Gibraltar | 0 | 1 | 2014 | CIA | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Africa | GIN | Guinea | 1 | 8 | 2007-2012 | DHS | 2002-2012 | DHS | Acquired | UN IGME 2017 |
| N. America | GLP | Guadeloupe | 0 | 1 | 2014 | National | n/a | n/a | Acquired | n/a |
| Africa | GMB | Gambia | 1 | 8 | 2009-2013 | DHS | 2003-2013 | DHS | Acquired | UN IGME 2017 |
| Africa | GNB | Guinea-Bissau | 1 | 9 | 2010-2014 | MICS | 2010-2014 | MICS | Acquired | UN IGME 2017 |
| Africa | GNQ | Equatorial Guinea | 1 | 2 | 2007-2011 | DHS | 2001-2011 | DHS | Acquired | UN IGME 2017 |
| Asia | GRC | Greece | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| N. America | GRD | Grenada | 0 | 1 | 2010 | National | n/a | n/a | Acquired | UN IGME 2017 |
| N. America | GRL | Greenland | 0 | 1 | 2013 | National | n/a | n/a | Acquired | U.S. Census Bureau |

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|------------|-----|---|---|-----|-----------|----------|-----------|----------|----------|---|
| | | | | | | | | | | International Data Base |
| N. America | GTM | Guatemala | 1 | 22 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| S. America | GUF | French Guiana | 0 | 1 | 2014 | National | n/a | n/a | Acquired | n/a |
| Oceania | GUM | Guam | 0 | 1 | 2014 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| S. America | GUY | Guyana | 0 | 1 | 2010-2014 | MICS | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | HKG | China Hong Kong Special Administrative Region (SAR) | 0 | 1 | 2014 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| N. America | HND | Honduras | 1 | 18 | 2014 | National | 2002-2012 | DHS | Acquired | UN IGME 2017 |
| Europe | HRV | Republic of Croatia | 1 | 21 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| N. America | HTI | Haiti | 1 | 11 | 2007-2012 | DHS | 2002-2012 | DHS | Acquired | UN IGME 2017 |
| Europe | HUN | Hungary | 2 | 20 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | IDN | Indonesia | 1 | 33 | 2008-2012 | DHS | 2003-2012 | DHS | Acquired | UN IGME 2017 |
| Europe | IMN | Isle of Man | 0 | 1 | 2014 | CIA | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Asia | IND | India | 1 | 37 | 2013 | National | 2013 | National | Acquired | UN IGME 2017 |
| Europe | IRL | Ireland | 2 | 34 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | IRN | Iran | 1 | 26 | 2014 | UN | 1996 | UN | Acquired | UN IGME 2017 |
| Asia | IRQ | Iraq | 1 | 18 | 2014 | National | 2006-2011 | MICS | Acquired | UN IGME 2017 |
| Europe | ISL | Iceland | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | ISR | Israel | 2 | 16 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Europe | ITA | Italy | 3 | 110 | 2013 | National | 2013 | National | Acquired | UN IGME 2017 |
| N. America | JAM | Jamaica | 0 | 1 | 2001-2011 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | JEY | Jersey | 0 | 1 | 2010-2012 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Asia | JOR | Jordan | 1 | 12 | 2008-2012 | DHS | 2003-2012 | DHS | Acquired | UN IGME 2017 |

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| | | | | | | | | | | |
|------------|-----|---|---|------|-----------|----------|-----------|----------|----------------------|--|
| Asia | JPN | Japan | 2 | 1714 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | KAZ | Kazakhstan | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | KEN | Kenya | 1 | 8 | 2010-2014 | DHS | 2005-2014 | DHS | Acquired | UN IGME 2017 |
| Asia | KGZ | Kyrgyzstan | 1 | 9 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | KHM | Cambodia | 1 | 19 | 2010-2014 | DHS | 2003-2014 | DHS | Acquired | UN IGME 2017 |
| Oceania | KIR | Kiribati | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| N. America | KNA | Saint Kitts and Nevis | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | KOR | Republic of Korea | 1 | 17 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Europe | KOS | Kosovo | 1 | 37 | 2014 | National | 2014 | National | Calculated by CIESIN | U.S. Census Bureau International Data Base |
| Asia | KWT | Kuwait | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | LAO | Lao People's Democratic Republic | 1 | 17 | 2012 | MICS/DHS | 2007-2011 | MICS/DHS | Acquired | UN IGME 2017 |
| Asia | LBN | Lebanon | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | LBR | Liberia | 1 | 5 | 2008-2012 | DHS | 2003-2012 | DHS | Acquired | UN IGME 2017 |
| Africa | LBY | Libyan Arab Jamahiriya | 1 | 22 | 2010 | National | 2010 | National | Calculated by CIESIN | UN IGME 2017 |
| N. America | LCA | Saint Lucia | 0 | 1 | 2012 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | LIE | Liechtenstein | 0 | 1 | 2014 | CIA | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Asia | LKA | Sri Lanka | 1 | 25 | 2010 | National | 2010 | National | Acquired | UN IGME 2017 |
| Africa | LSO | Lesotho | 1 | 10 | 2009-2014 | DHS | 2004-2014 | DHS | Acquired | UN IGME 2017 |
| Europe | LTU | Lithuania | 1 | 10 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Europe | LUX | Luxemburg | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | LVA | Latvia | 1 | 6 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | MAC | China Macao Special Administrative Region (SAR) | 0 | 1 | 2014 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |

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| | | | | | | | | | | |
|------------|-----|--|---|----|-------------------|----------|--------------------|----------|----------------------|--|
| N. America | MAF | Saint Martin | 0 | 1 | 2014 | Other | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Africa | MAR | Morocco | 0 | 1 | 2011 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | MCO | Monaco | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | MDA | Republic of Moldova | 2 | 35 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Africa | MDG | Madagascar | 1 | 22 | 2012-2013 | National | 1998-99 to 2008-09 | DHS | Acquired | UN IGME 2017 |
| Asia | MDV | Maldives | 1 | 3 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| N. America | MEX | Mexico | 1 | 32 | 2014 | National | 2014 | National | Calculated by CIESIN | UN IGME 2017 |
| Oceania | MHL | Marshall Islands | 0 | 1 | 2011 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | MKD | Republic of Macedonia | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | MLI | Mali | 1 | 9 | 2008-2013 | DHS | 2004-2013 | DHS | Acquired | UN IGME 2017 |
| Europe | MLT | Malta | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | MMR | Myanmar | 1 | 15 | 2010 to 2015-2016 | National | 2005 to 2015-2016 | National | Acquired | UN IGME 2017 |
| Europe | MNE | Montenegro | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | MNG | Mongolia | 2 | 22 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Oceania | MNP | Northern Mariana Islands | 0 | 1 | 2002 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Africa | MOZ | Mozambique | 1 | 11 | 2006-2011 | DHS | 2001-2011 | DHS | Acquired | UN IGME 2017 |
| Africa | MRT | Mauritania | 1 | 12 | 2007-2011 | MICS | 2007-2011 | MICS | Acquired | UN IGME 2017 |
| N. America | MSR | Montserrat | 0 | 1 | 2014 | CIA | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| N. America | MTQ | Martinique | 0 | 1 | 2014 | National | n/a | n/a | Acquired | n/a |
| Africa | MUS | Mauritius (excluding Agalega and St Brandon) | 1 | 10 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Africa | MWI | Malawi | 2 | 30 | 2014 | National | 2009- | MICS | Acquired | UN IGME 2017 |

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| | | | | | | | 2014 (admin1) and 2004- 2014 (admin2) | | | |
|------------|-----|---------------------|---|----|----------------|----------|---|----------|----------|---|
| Asia | MYS | Malaysia | 1 | 16 | 2012 | National | 2012 | National | Acquired | UN IGME 2017 |
| Africa | MYT | Mayotte | 0 | 1 | 2014 | National | n/a | n/a | Acquired | n/a |
| Africa | NAM | Namibia | 1 | 13 | 2008- 2012 | DHS | 2003- 2012 | DHS | Acquired | UN IGME 2017 |
| Oceania | NCL | New Caledonia | 0 | 1 | 2012 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Africa | NER | Niger | 1 | 8 | 2008- 2012 | DHS | 2003- 2012 | DHS | Acquired | UN IGME 2017 |
| Africa | NGA | Nigeria | 1 | 6 | 2009- 2013 | DHS | 2004- 2013 | DHS | Acquired | UN IGME 2017 |
| N. America | NIC | Nicaragua | 1 | 17 | 2011- 2012 | National | 2011- 2012 | National | Acquired | UN IGME 2017 |
| Oceania | NIU | Niue | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | NLD | Netherlands | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | NOR | Norway | 1 | 19 | 2014 | National | 2006- 2010 | National | Acquired | UN IGME 2017 |
| Asia | NPL | Nepal | 1 | 15 | 2009 - 2014 | MICS | 2009 - 2014 | MICS | Acquired | UN IGME 2017 |
| Oceania | NRU | Nauru | 0 | 1 | 2011- 2013 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Oceania | NZL | New Zealand | 1 | 20 | 2014 | National | 2012 | National | Acquired | UN IGME 2017 |
| Asia | OMN | Oman | 1 | 11 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | PAK | Pakistan | 1 | 6 | 2008- 2012 | DHS | 2003- 2012 | DHS | Acquired | UN IGME 2017 |
| N. America | PAN | Panama | 1 | 13 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| S. America | PER | Peru | 1 | 25 | 2013 | National | 2011 | National | Acquired | UN IGME 2017 |
| Asia | PHL | Philippines | 1 | 17 | 2009- 2013 | DHS | 2004- 2013 | DHS | Acquired | UN IGME 2017 |
| Oceania | PLW | Palau | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | PNG | Papua New Guinea | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | POL | Poland | 1 | 16 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| N. America | PRI | Puerto Rico | 1 | 78 | 2014 | National | 2014 | National | Acquired | U.S. Census Bureau |

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| | | | | | | | | | | |
|------------|-----|---------------------------------------|---|----|-----------|----------|-----------|----------|----------|--|
| | | | | | | | | | | International Data Base |
| Asia | PRK | Democratic People's Republic of Korea | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | PRT | Portugal | 1 | 7 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| S. America | PRY | Paraguay | 1 | 18 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | PSE | Occupied Palestinian Territory | 1 | 2 | 2010-2014 | MICS | 2010-2014 | MICS | Acquired | UN IGME 2017 |
| Oceania | PYF | French Polynesia | 0 | 1 | 2014 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Asia | QAT | Qatar | 1 | 7 | 2013 | National | 2013 | National | Acquired | UN IGME 2017 |
| Africa | REU | Réunion | 0 | 1 | 2014 | National | n/a | n/a | Acquired | n/a |
| Europe | ROU | Romania | 3 | 42 | 2012 | National | 2012 | National | Acquired | UN IGME 2017 |
| Europe | RUS | Russian Federation | 1 | 80 | 2014 | National | 2013 | National | Acquired | UN IGME 2017 |
| Africa | RWA | Rwanda | 1 | 5 | 2010-2014 | DHS | 2005-2014 | DHS | Acquired | UN IGME 2017 |
| Asia | SAU | Saudi Arabia | 0 | 1 | 2013 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | SDN | Sudan | 1 | 18 | 2010-2014 | MICS | 2010-2014 | MICS | Acquired | UN IGME 2017 |
| Africa | SEN | Senegal | 1 | 14 | 2013 | National | 2013 | National | Acquired | UN IGME 2017 |
| Asia | SGP | Singapore | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | SHN | Saint Helena | 0 | 1 | 2013 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Oceania | SLB | Solomon Islands | 1 | 10 | 2009 | National | 2009 | National | Acquired | UN IGME 2017 |
| Africa | SLE | Sierra Leone | 2 | 14 | 2009-2013 | DHS | 2004-2013 | DHS | Acquired | UN IGME 2017 |
| N. America | SLV | El Salvador | 1 | 14 | 2010-2014 | MICS | 2010-2014 | MICS | Acquired | UN IGME 2017 |
| Europe | SMR | San Marino | 0 | 1 | 2010-2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | SOM | Somalia | 1 | 18 | 2001-2006 | MICS | 2006-2011 | MICS | Acquired | UN IGME 2017 |
| N. America | SPM | Saint Pierre and Miquelon | 0 | 1 | 2014 | CIA | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |

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| | | | | | | | | | | |
|------------|-----|--------------------------|---|-----|-----------|----------|-----------|----------|----------|--|
| Europe | SRB | Republic of Serbia | 4 | 163 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Africa | SSD | Republic of South Sudan | 1 | 10 | 2006 | National | 2005-2010 | National | Acquired | UN IGME 2017 |
| Africa | STP | Sao Tome and Principe | 1 | 4 | 2011-2014 | MICS | 2005-2014 | MICS | Acquired | UN IGME 2017 |
| S. America | SUR | Suriname | 0 | 1 | 2012 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Europe | SVK | Slovakia | 2 | 85 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Europe | SVN | Slovenia | 1 | 12 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Europe | SWE | Sweden | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | SWZ | Swaziland | 1 | 4 | 2009-2014 | MICS | 2009-2014 | MICS | Acquired | UN IGME 2017 |
| N. America | SXM | Sint Maaarten | 0 | 1 | 2013 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Africa | SYC | Seychelles | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | SYR | Syrian Arab Republic | 1 | 14 | 2014 | UN | 2008 | UN | Acquired | UN IGME 2017 |
| N. America | TCA | Turks and Caicos Islands | 0 | 1 | 2013 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Africa | TCD | Chad | 1 | 21 | 2010-2014 | DHS | 2005-2014 | DHS | Acquired | UN IGME 2017 |
| Africa | TGO | Togo | 1 | 6 | 2009-2013 | DHS | 2004-2013 | DHS | Acquired | UN IGME 2017 |
| Asia | THA | Thailand | 2 | 76 | 2012 | National | 2011 | UN | Acquired | UN IGME 2017 |
| Asia | TJK | Tajikistan | 1 | 5 | 2008-2012 | DHS | 2003-2012 | DHS | Acquired | UN IGME 2017 |
| Asia | TKM | Turkmenistan | 0 | 1 | 2012 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | TLS | Timor-Leste | 1 | 13 | 2005-2009 | DHS | 2000-2009 | DHS | Acquired | UN IGME 2017 |
| Oceania | TON | Tonga | 0 | 1 | 2011 | National | n/a | n/a | Acquired | UN IGME 2017 |
| N. America | TTO | Trinidad and Tobago | 0 | 1 | 2008 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Africa | TUN | Tunisia | 0 | 1 | 2014 | National | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | TUR | Turkey | 1 | 81 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Oceania | TUV | Tuvalu | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| Asia | TWN | Taiwan | 0 | 1 | 2014 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |

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Documentation for the Global Subnational Infant Mortality Rates, v2 (2015)*

| | | | | | | | | | | |
|------------|-----|----------------------------------|---|----|-----------------|----------|-----------------|----------|----------|--|
| Africa | TZA | United Republic of Tanzania | 1 | 9 | 2010/11-2015/16 | DHS | 2005/06-2015/16 | DHS | Acquired | UN IGME 2017 |
| Africa | UGA | Uganda | 1 | 10 | 2012-2016 | DHS | 2002-2011 | DHS | Acquired | UN IGME 2017 |
| Europe | UKR | Ukraine | 1 | 27 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| S. America | URY | Uruguay | 1 | 19 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| N. America | USA | United States of America | 1 | 51 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | UZB | Uzbekistan | 0 | 1 | 2014 | UN | n/a | n/a | Acquired | UN IGME 2017 |
| N. America | VCT | Saint Vincent and the Grenadines | 0 | 1 | 2013 | National | n/a | n/a | Acquired | UN IGME 2017 |
| S. America | VEN | Venezuela | 1 | 25 | 2012 | National | 2012 | National | Acquired | UN IGME 2017 |
| N. America | VGB | British Virgin Islands | 0 | 1 | 2014 | CIA | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| N. America | VIR | United States Virgin Islands | 0 | 1 | 2014 | National | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Asia | VNM | Viet Nam | 2 | 63 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Oceania | VUT | Vanuatu | 0 | 1 | 2013 | DHS | n/a | n/a | Acquired | UN IGME 2017 |
| Oceania | WLF | Wallis and Futuna Islands | 0 | 1 | 2014 | CIA | n/a | n/a | Acquired | U.S. Census Bureau International Data Base |
| Oceania | WSM | Samoa | 1 | 4 | 2014 | National | 2014 | National | Acquired | UN IGME 2017 |
| Asia | YEM | Yemen | 1 | 21 | 2009-2013 | DHS | 2004-2013 | DHS | Acquired | UN IGME 2017 |
| Africa | ZAF | South Africa | 2 | 53 | 2011 | National | 2011 | National | Acquired | UN IGME 2017 |
| Africa | ZMB | Zambia | 1 | 10 | 2009-2013 | DHS | 2004-2013 | DHS | Acquired | UN IGME 2017 |
| Africa | ZWE | Zimbabwe | 1 | 10 | 2010-2014 | MICS | 2010-2014 | MICS | Acquired | UN IGME 2017 |

* DHS = Demographic Health Survey; MICS = Multiple Indicator Cluster Surveys; UN = Various United Nations programs; CIA = Central Intelligence Agency; PAHO = Pan American Health Organization; National = various sources from national Human Development Reports, national statistical offices, or ministries of health

** SNU = Sub-National Unit

Table 3

| Boundary Source | Number of Countries |
|-----------------|---------------------|
| GPWv4 | 192* |
| DHS | 42 |
| GADM | 6 |
| IGBE | 1 |
| Grand Total | 241 |

*Includes 7 countries and territories that do not have IMR data (Åland Islands, British Indian Ocean Territory, Falkland Islands (Malvinas), French Southern Territories, Heard and McDonald Islands, South Georgia and the South Sandwich Islands, Svalbard and Jan Mayen Islands)

Data acquisition included collecting IMR, live births, and infant deaths for the most recent year available. The highest administrative level (subnational unit) available with an IMR as of June 2017 is included in the gridded data product.

Methods

IMR Grid

The infant mortality rates were either “Acquired” or “Calculated by CIESIN”. “Acquired” means that IMRs were collected from vital registration data, surveys, models, or other estimates. “Calculated by CIESIN” indicates that the rates were estimated using reported live births and infant deaths data. IMRs were calculated by taking the number of infant deaths, dividing them by the number of live births, and multiplying the result by 1,000.

$$IMR = (deaths\ of\ infants\ less\ 1\ year\ old / live\ births) * 1000$$

Out of all *national* IMRs in the database, 90 countries use “Acquired” data. Only 1 (Bermuda) uses estimates “Calculated by CIESIN”. Out of all *subnational* IMRs, 135 countries use “Acquired” data, and eight use estimations “Calculated by CIESIN” (Table 2). The highest available subnational resolution of IMR was included in the final gridded product.

The IMR input data comes from different sources and spans from 2006 to 2014 varying by country and subnational unit. Because of this, rates were adjusted for year and source to be consistent with the United Nations (UN) Inter-agency Group for Child Mortality Estimation (UN IGME, 2017) national estimates for the year 2015. As this source does not include all the countries included in the IMR 2015 data set, adjustment values for countries not included in UN IGME 2017 report were imputed using data from the U.S. Census Bureau International Database¹. Five countries were not included in either source, therefore were adjusted only for year. Coded values are included for those data not imputed (0), imputed (1) and year adjustment only (2).

¹ U.S. Census Bureau. International Programs. International Data Base. Revised: December 22, 2017. Version: Data:17.0810 Code:12.0321

The adjustment approach follows the method used in the first version of the infant mortality data set (Storeygard et al., 2008:216), as follows:

The IMR value $r_{c,y,s,x}$ for country c , year y from source s , at scale x (0 = national; 1 = subnational) were scaled to $y = 2015$ national rates from UN IGME (denoted $s = 0$), where UN IGME includes observed and imputed values, while values for 5 countries represent only adjustment for year y

Given the formula above, the adjustment cannot be applied to the Cook Islands, which has a reported IMR value of 0 and an adjustment rate of 6.9. The reported national IMR of 0 is used un-adjusted.

Topology was applied such that there are no gaps or overlaps between country or subnational unit boundaries. The data were then gridded to a spatial resolution of 30 arc-seconds, which is about 1 kilometer at the equator. The final gridded product represents the estimated IMR at the highest subnational resolution available for the year 2015.

Coded values are included for “NoData” (-9999), and for no population or uninhabited areas including bodies of water (-7777).

Births and Deaths Grids

Estimates of births and infant deaths are necessary to scale infant mortality rates to alternative geographies (Storeygard et al. 2008:217). Births were calculated using data from GPWv4 Basic Demographic Characteristics, Revision 10. First, rectangular distribution² was applied to the grid of 0-4 year old population counts to obtain crude estimates of population age 0 in each grid cell, which were converted to proportions of the total population in 2010.

Second, these proportions were applied to the 2015 total population to obtain crude estimates of population age 0 in 2015 (under the assumption that the structure of the population remained the same between 2010 and 2015). Finally, the 2015 infant mortality rates were applied to the age 0 population grid to obtain crude estimates of infant deaths in 2015.

III. Data Set Description(s)

Data set description:

The Global Subnational Infant Mortality Rates, Version 2 consists of estimates of infant mortality rates for the year 2015. The data product is a grid (raster data) of IMR rates at 30-arc

² “Rectangular distribution assumes that all the smaller groups (e.g., 1-year age group) have identical shares of the larger group (e.g., 5-year age group). The numbers in each of the smaller groups can be computed by dividing the population of the larger group by the number of subdivisions desired” (Smith, S., J. Tayman and D. Swanson. 2013. A Practitioner’s Guide to State and Local Population Projections. New York, Springer. Pp. 280)

seconds (~1 km) resolution. The nominal resolution of the vector input layers varies from country to country.

Data set web page:

SEDAC URL:

<http://sedac.ciesin.columbia.edu/data/set/povmap-global-subnational-infant-mortality-rates-v2>

Permanent URL: <https://doi.org/10.7927/H4PN93JJ>

Data set format:

The data are available as global grids in GeoTIFF format, vector feature class in an Esri Geodatabase (.GDB) and Microsoft Excel (XLSX) format as downloadable zip files. The downloadables are compressed zip files:

- Global Sub-national Gridded IMR 2015; 30 arc-second (~1 km) resolution in GeoTIFF (49MB zip file)
- Global Sub-national Gridded Births 2015; 30 arc-second (~1km) resolution in GeoTIFF (195MB zip file)
- Global Sub-national Gridded Infant Deaths 2015; 30 arc-second (~1km) resolution in GeoTIFF (349MB zip file)
- Global Administrative Level of the IMR 2015 Grid; 30 arc-second (~1km) resolution in GeoTIFF (7.3MB zip file)
- Global IMR 2015 Data with Administrative Level 0 and Level 1 Information; Vector data as a features class in Esri Geodatabase (GDB) (941MB zip file)
- Global Sub-national IMR 2015 Data with Sources and Data Dictionary; Tabular data in XLSX format (1.7MB zip file)

packaged with PDF documentation.

Data set downloads:

povmap-global-subnational-infant-mortality-rates-v2-geotiff.zip
povmap-global-subnational-infant-mortality-rates-v2-births-geotiff.zip
povmap-global-subnational-infant-mortality-rates-v2-deaths-geotiff.zip
povmap-global-subnational-infant-mortality-rates-v2-adm-used-geotiff.zip
povmap-global-subnational-infant-mortality-rates-v2-adm1-gdb.zip
povmap-global-subnational-infant-mortality-rates-v2-xlsx.zip

IV. How To Use the Data

The raster data in GeoTIFF format and the vector data in geodatabase format, can be used directly in mapping and geospatial analysis.

V. Potential Use Cases

The Global Subnational Infant Mortality Rates, Version 2 has many potential applications not only for the study of the geographic distribution of infant mortality within countries, but also as a proxy for the analysis of poverty and living conditions in general, in conjunction with environmental or other geographical factors. It could also be a valuable input into other new or existing data sets. As Storeygard et al. (2008:209) notes, “While national data show a similar pattern for infant deaths, with half concentrated in the same six countries, spatially explicit subnational data would permit further quantification of spatial concentration and identify geographical ‘hotspots’ or clusters of mortality, some of which would be expected to cut across national boundaries”.

Version 1 has a large number of citations demonstrating applications of the data; search the SEDAC citations database (<http://sedac.ciesin.columbia.edu/citations-db>) by filtering on SEDAC Data Collections “povmap”.

VI. Limitations

The Global Subnational Infant Mortality Rates, Version 2 data set has a few limitations. The quality of IMR data varies globally in terms of defining, reporting live births and infant deaths, as well as methods of calculating rates. Sampling errors, data omission, and misreporting are common examples of how the input data may be skewed (Storeygard et al., 2008).

Some sources are unclear as to whether births are reporting stillborn and live births or live births alone. Also, methods of calculation of the infant mortality rates differs between sources, and from the approach followed in those “Calculated by CIESIN” where the rates were not available directly from the source.

DHS and MICS survey-based data may have sampling errors and bias related to the survey design, sample size and temporal range, as both report IMRs for five (national) or ten (subnational) year periods.

VII. Acknowledgments

Funding for development and dissemination of this data set was provided under the U.S. National Aeronautics and Space Administration (NASA) contract NNG13HQ04C for the continued operation of the Socioeconomic Data and Applications Center (SEDAC), which is operated by the Center for International Earth Science Information Network (CIESIN) of Columbia University.

VIII. Disclaimer

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X. Recommended Citation(s)

Data set(s):

Center for International Earth Science Information Network (CIESIN), Columbia University. 2018. Global Subnational Infant Mortality Rates, Version 2. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC). <https://doi.org/10.7927/H4PN93JJ>. Accessed DAY MONTH YEAR.

XI. Source Code

No source code is available for this data set.

XII. References

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U.S. Census Bureau. International Programs. International Data Base. Revised: December 22, 2017. Version: Data:17.0810 Code:12.0321.

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Appendix 1. Data Revision History

No revisions have been made to this data set, but an earlier version is available for the year 2000 (CIESIN, 2005).

Appendix 2. Contributing Authors & Documentation Revision History

| Revision Date | Contributors | Revisions |
|-------------------|---|---|
| December 14, 2018 | D. Mendeloff, A. de Sherbinin, S. Adamo | This document is the 1 st instance of documentation. |

Appendix 3. Mali: Data Imputation for Northern Regions 2012-2013

The regions of Timbuktu, Kidal, Gao and part of Mopti were not included in the 2012-13 DHS due to the ongoing conflict. The steps followed to complete subnational IMR for Mali are described below:

1) Two additional Malian DHS reports were used: DHS 2006 and DHS 2001. The reason for including the 2001 report is that IMR for Kidal was not reported in 2006 because of the small numbers. The table below lists the IMR by region in the three DHS reports:

Table 4

| Region | 2001 | 2006 | 2012/2013 | Difference 2001-2006 | % Change 2001-2006 |
|--------------|--------------|-----------|-----------|----------------------|--------------------|
| Bamako | 44.1 | 66 | 42 | | |
| Gao | 141.8 | 68 | 40 | -73.8 | -52.05 |
| Kayes | 124.6 | 105 | 60 | | |
| Kidal | 141.8 | 97 | 57 | | -31.59 |
| Koulikoro | 120.8 | 114 | 61 | | |

| | | | | | |
|----------|-------|-----|----|-------|--------|
| Mopti | 156.3 | 108 | 62 | | |
| Ségou | 118.6 | 131 | 64 | | |
| Sikasso | 126.4 | 132 | 76 | | |
| Timbuktu | 141.8 | 126 | 73 | -15.8 | -11.14 |

2) **Mopti**: three *cercles* (Douentza, Ténenkou and Youwarou) were not included in the 2012/13 DHS. The decision was to apply the IMR for the rest of the region to these three *cercles*.

3) **Timbuktu and Gao**: the 2012/13 IMR was calculated by applying the percent change in national IMR between the 2006 and 2012/13 (as reported in the DHS reports for the country) to the IMR in 2006.

Table 5

| | | |
|---------------|----------------|-----------|
| | | |
| DHS 2006 | IMR 2001-2006 | 96 |
| DHS 2012/2013 | IMR 4-years | 56 |
| | Difference | -40 |
| | Percent change | -41.6667% |

4) **Kidal**: The starting point was to calculate the IMR in 2006. In the 2001 DHS, Kidal, Timbuktu and Gao were reported together. Because of this, Kidal 2006 was calculated applying the average % change of Tombouctou and Gao to Kidal's 2001 IMR (see Table 3). The 2012/13 IMR was calculated using the procedure described above for Gao and Timbuktu.