Have State-level Inequalities including Gender Gaps in Completeness of Death Registration in India Narrowed in Last Two Decades of Civil Registration System Strengthening?

Jayanta Kumar Basu[1*]

[1] Consultant-CRVS, India, jayanta14@yahoo.com
* Corresponding author

Abstract

Background

In India, the number of registered deaths increased substantially in recent years, improving the potential of civil registration system to be the primary source of mortality data. This study aims to critically analyze whether the level and recent trends in state-level inequalities in death registration completeness in India, including by gender, have really reduced in last two decades of CRVS system strengthening.

Methods

Completeness of death registration is calculated using the empirical completeness method. Levels and trends in inequalities in completeness are measured in each state using two socio-economic indicators– the Socio-Demographic Index and Multi-dimensional Poverty Indicator.

Results

Although by large state-level inequalities by state remain, there was a narrowing of inequalities by SDI and to a lesser extent by MPI. However, gender level inequalities in death registration are still a serious concern.

Conclusions

Although narrowing of inequalities in completeness demonstrates that the benefits of higher levels of death registration have spread to relatively poorer states of India in recent years, the continued low completeness in some states and for females are concerning. The Indian CRVS system also needs to increase the number of registered deaths with age at death reported to improve their usability for mortality statistics.

Keywords

Civil Registration, Vital Statistics, Mortality, Completeness, India, Inequalities, Gender, Socio-economic.

Background

A high quality civil registration and vital statistics (CRVS) system should be the primary source of routine mortality data to inform public health policy.[1] In India, the world's 2nd most populous country and where an estimated 17% of the world's deaths occur, regular, timely and accurate mortality data is important not only for the national government but state and territory governments, the largest of which (Uttar Pradesh) has a population of over 200 million.[2, 3] Recent decades in India have seen substantial declines in under-five mortality, however the country faces significant health challenges, including the recent COVID-19 pandemic as well as continuing premature mortality from non-communicable diseases due to risk factors such as unhealthy diet and air pollution.[4]

Like many countries, India does not have a complete death registration system. Instead, the Sample Registration System (SRS) has been used for many years to underpin evidence on Indian mortality. The SRS operates as a death reporting system within a sample of the population within the country. Deaths are actively notified and corrected based on a dual record system and the SRS sample is revised every ten years based on the latest census frame.[5] SRS estimates are generally valid and reliable for the country as a whole and for bigger states with more than 10 million populations, and recently the sample size of SRS has been increased to allow for estimates by natural divisions within the bigger states.[6] In recent years, however, the quality of the SRS has been questioned, with one analysis finding that it produces lower estimates of adult mortality than the death registration system in many states and also suffers from considerable uncertainty due to it being based on a sample of the population.[7] For early age mortality, data are available at the national and subnational level from household surveys such as the India National Family Health Survey (INFHS) based on retrospective detailed birth histories.[2, 8, 9]

Since 2000, there has been a strong increase in not only the absolute numbers of deaths registered by the Indian CRVS system, but also the completeness when measured as a proportion of estimated total deaths. In 2000, 3.8 million deaths were registered in India, which increased to almost 8 million deaths in 2020.[10, 11] This increase in registered deaths is substantial in the context of the 56.5 million annual global deaths.[12] With rising levels of completeness of registration, there is an increased potential for death registration data to be used as a source of routine mortality estimates, with appropriate adjustments for estimates of incompleteness.[7] Death registration also has the advantage of providing the benefits to the population with the issuance of a death certificate, such as relieving the individual from social, legal and official obligations, to enable settlement of property inheritance, and to authorize the family to collect insurance and other benefits.

The CRVS system is based upon the Registration of Births and Deaths Act, 1969, which provides for uniform law across the country on the registration of births and deaths as well as compulsory reporting and registration of all births and deaths. Initially death registration was a paper-based system, but as a process of further strengthening the registration of vital events the online process of birth and death registration was initiated in 2015 by the Office of the Registrar General of India. The online system of birth and death registration has provided

impetus to increasing access to registration and has also introduced greater transparency and accountability to the entire process. The implementation of the births and deaths registration Act has been the responsibility of the State Governments, and this has led to inconsistencies in the functioning and reporting of the online system, which may affect inequalities in death registration. Another issue is that the data produced by the death registration system are limited because some states and territories that do not report age or sex at death and so age- and sex-specific data are not available at the national level. Some of these states are yet to use online system completely. As a result, the death registration system is not used in any international mortality estimates in India by the Global Burden of Disease (GBD) or United Nations Population Division because of non-availability of age data at the national level.[2, 13]

The increase in death registration completeness in India since 2000 raises the question about whether inequalities in completeness between states have narrowed over the period. The relative level of completeness of death registration between states is important because it demonstrates the utility of the death registration system to be a source of routine subnational mortality data, particularly given the population size of some states, and also shows the extent to which the benefits of death registration are available to the population, particularly marginalized populations. In the only more populous country, China, death registration completeness in its 31 provinces in 2018 ranged from 16% to 94%, compared with the national level of 74%.[14] In India, the percentage of children under five with birth registration increased from 80% in 2015-16 to about 89% in 2019-21. At the state/UT level in 2019–21, birth registration ranged from 100% in Goa and Lakshadweep to approximately 73% in Nagaland, with several northeastern states, Uttar Pradesh, Bihar, and Jharkhand notably below the national average. Among wealth quintiles, the gap has narrowed: registration now covers 81.1% of children in the poorest quintile versus 95.5% in the richest, reducing the wealth disparity from a 29-point gap in 2015-16 to 14.4 percentage points in 2019–21 Nonetheless, significant inequities persist in birth certificate possession and registration by household wealth in low- and middle-income groups.[15] Hence, the extent to which inequalities in death registration between states reflect socio-economic inequalities can be assessed by using a measure of socio-economic status available for each state.

This paper aims to measure whether inequalities in death registration completeness including gender gaps between states in India have narrowed since 2000. It does this by using the empirical completeness method to measure annual completeness for each state from 2000-20, and then assessing trends in inequalities according to the correlation of completeness with the socio-economic indicator of the Socio-Demographic Index (SDI). I also assessed these trends in inequalities by sex-specific completeness, and examined the availability of age and sex data by state. These results are expected to highlight how investments in the CRVS system have been distributed across states, and where further investment is needed.

Methods

Death registration data used in this study are registered deaths presented in the Reports on Civil Registration System in India published by the Office of Registrar General of India. The

data is obtained from the 2009-2020 CRS Reports, which show numbers of deaths registered in each year from 2000-2020 by state/territory and, where available, age group and sex (sex is only reported for 2009-18).[10, 11, 16-23] The reported deaths in the Civil Registration System reports are based on year of registration. The state of Telangana, which was officially formed out of Andhra Pradesh in 2014, is included with Andhra Pradesh in the analysis to ensure consistency of state boundaries in the analysis over times.[11]

Completeness of death registration (i.e. the percentage of actual deaths that are registered) is calculated using the empirical completeness (Adair-Lopez) method.[24] This method is a statistical model that estimates completeness based on data inputs that reflect the determinants of the crude death rate; mortality level (represented by the under-five mortality rate) and population age structure (reflected by the percentage population of the aged 65 years and above). The other variables are the registered crude death rate (registered deaths divided by population multiplied by 1000) and calendar year (one version of the method also includes completeness of under-five registration, but this cannot be calculated for all states/territories due to no age data). The method has previously been used to estimate completeness of death reporting for 2,844 Chinese counties.[14] The method overcomes the limitations of other completeness estimation methods such as death distribution methods, which rely on death data by five-year age group (which are not reported for Indian death registration), are subject to inaccuracies due to implausible assumptions of population dynamics (especially at the subnational level), and the most reliable of which can only be calculated for the most recent intercensal period (which for India was 2001-11).[24] Population data are obtained from the Population Projections for India and States 2011-36 published by the National Commission on Population (for 2011-18) and the Technical Group for Population Projection constituted by National Commission on Population who produced population projections for Indian states from 2001 onwards (for 2001-2010).[25, 26] The under-five mortality rate data by year, sex and state/territory were obtained from a GBD analysis of national and subnational data from surveys and censuses.[27]

I assessed inequalities in completeness of death registration between states according to the SDI. The SDI is a composite indicator of development that is the geometric mean of average income per person, educational attainment, and total fertility rate; it ranges from 0 to 1.[28] The SDI has previously been used for analyses of subnational Indian epidemiological transition and under-five mortality.[4, 27] It is available for Indian states and territories from 2000-2016 and I projected for 2017 to 2020 based on the annual rate of change from 2015-16. I also considered using the Multi-dimensional Poverty Indicator (MPI) to measure inequalities; it is a measure of the proportion of a state's population in poverty and is based on different variables of Standard of Living, Health and Education.[29, 30] However, the standard deviation of MPIs in Indian states fell sharply from 0.12 to 0.06 because there was a universal decline in poverty over the period; the smaller variation in MPI in recent years could result in a larger negative coefficient when predicting completeness and hence incorrectly show widening inequalities. The standard deviation of the SDI, in contrast, only changed from 0.064 to 0.066 between 2000 and 2020. Other indicators such as literacy and

malnutrition among children were also investigated as indicators of inequalities but did not show as strong an association as SDI.

Inequalities were measured using a linear regression of completeness for each state with a covariate of SDI. For each year, the regression coefficient of SDI was used as the indicator of the extent of inequalities in completeness between states. SDI is expected to have a positive relationship with completeness, so a narrowing of inequalities would be demonstrated by the coefficient falling over time; in other words, if SDI is less important in predicting completeness, then inequalities in completeness according to states' socio-economic development have fallen. Given the large variation in the size of the populations of Indian states, I also conducted the regressions for SDI and completeness for both sexes weighted by population, to assess if it had any impact on trends.

Results

Estimated completeness of death registration in India for both sexes increased from 58% in 2000 to 88% in 2020. There was a sharp increase from 2000 to 2007, followed by a decline and then another increase in recent years (Table A1: Annexure). Male completeness was much higher than female completeness in most years; male completeness rose from 60% in 2009 to 91% in 2020, while female completeness increased from 54% to 81% in the same period (Tables A2-A3: Annexure).

Table 1 shows completeness of registration for both sexes in each state as well as availability of registered death data by age group and sex for selected years. Though estimates indicate an increase in death registration completeness at the national level over the years during 2000 to 2020, the trend and level of the rise at the sub-national level was unevenly distributed [Table 1, Figures A1-A6 (Annexure), Tables A1-A3 (Annexure)]. The level of increase in completeness was very low in some of the states, particularly from eastern (Bihar, Jharkhand) and north-eastern (Manipur, Nagaland) regions of the country. States from the southern region (Kerala, Karnataka, Tamil Nadu) had consistently higher completeness throughout the period. In the western part of the country, Goa and Maharashtra maintained a higher-than-average level of completeness, whereas for Gujarat it increased from 67.4 percent in 2000 to 96.3 percent in 2020. In some states from the northern region (Uttar Pradesh, Uttarakhand) the level of completeness increased significantly from a low level in the earlier years, whereas in Jammu & Kashmir it declined from 2000 to 2020. Differences in male and female completeness are particularly large in some states [Figures A1-A6 (Annexures), Tables A1-A3 (Annexure)]. For example, in the northern states of Rajasthan completeness in 2020 was 88% for males and 62% for females and in Arunachal Pradesh for males it was 84% and 51% for females [Tables A1-A3 (Annexure)].

As shown in Table 1, the death registration data are limited – no sex data were available before 2009 and no age at death data for some states/union territories were available throughout the entire period; hence, no age/sex at death data at national level is available. Seven states with a combined population of 528 million (or 41% of India's population) didn't report deaths by age. However, some improvement in reporting of age-sex data of the

deceased by the states was observed over the years. The states in the southern region of the country have made significant improvement in reporting of age-sex death registration data. Though some improvement in availability of age-sex data was observed in the states from central, northern and north-eastern region of India, the states in the eastern part of the country are still lagging others.

Table 1: India: States having age and sex data for Death Registration for Both Sexes in 2000, 2005, 2010, 2015 and 2020

Region	States	Population (2020) - Both Sexes ('000s)	2000	2005	2010	2015	2020
Northern	NCT of Delhi	22,523	88.9	91.7	96.6	95.8	99.8
	Haryana	28,253	75.8	70.2	81.8	85.7	92.8
	Himachal Pradesh	7,206	80.2	84.1	85.6	82.2	87.8
	Jammu & Kashmir	12,665	54.4	50.3	50.6	49.7	53.1
	Punjab	29,625	84.8	84.3	89.2	90.1	92.8
	Rajasthan	74,884	52.6	63.9	74.0	77.5	80.0
	Uttar Pradesh	224,829	DNA	16.1	47.3	35.4	45.5
	Uttarakhand	10,887	DNA	49.5	48.4	69.3	88.6
Southern	Andhra Pradesh	89,691	64.6	61.1	69.0	80.6	81.0
	Karnataka	63,435	89.1	88.0	86.5	86.4	93.9
	Kerala	36,062	93.9	95.9	97.8	97.5	97.9
	Tamil Nadu	70,047	84.1	89.6	92.8	96.0	95.2
Western	Goa	2,068	95.0	96.2	97.4	97.2	99.5
	Gujarat	67,222	67.4	69.4	80.1	88.0	96.3
	Maharashtra	122,926	81.1	80.3	86.6	85.8	89.4
Eastern	Bihar	106,192	12.2	22.4	15.3	26.2	49.7
	Jharkhand	34,483	27.8	48.8	48.9	59.9	55.1
	Odisha	43,132	77.6	79.0	81.2	86.0	85.6
	West Bengal	95,109	60.4	53.5	59.6	72.6	82.4
Central	Chhattishgarh	26,488	81.6	80.2	60.5	81.8	87.4
	Madhya Pradesh	80,042	61.2	58.3	56.0	53.0	76.8
North Eastern	Arunachal Pradesh	1,341	23.3	24.0	46.4	62.8	61.4
	Assam	33,166	24.7	40.8	43.4	47.3	64.3
	Manipur	2,646	32.5	43.6	40.3	33.4	42.3
	Meghalaya	2,832	78.2	60.1	80.2	82.5	78.5
	Mizoram	1,085	77.6	83.5	81.7	86.2	78.8
	Nagaland	2430	47.1	55.8	68.7	25.0	32.2
	Sikkim	660	42.8	79.4	87.0	90.7	92.8
	Tripura	3,906	65.9	DNA	35.7	44.5	66.7

Both Age-Sex data available	Either age or sex data available	Neither age nor sex data available

Source: Civil Registration System (CRS) Report, ORGI, Govt. of India; Population Projection by ORGI, Govt. of India
Figures in the cells are Estimated Completeness of Death Registration (both sexes)
DNA- Data Not Available

Across Indian states, there has been an increase in the SDI, and a slight decline in the standard deviation of the SDI across states relative to average SDI (Table A4: Annexure). Figure A7: Annexure shows that there is a strong positive correlation between death registration completeness for both sexes and SDI across the Indian states. That is, states with lower SDI overall had a lower completeness than the states with a higher SDI. However, the strength of this association weakened over the period. As the completeness in many states increased above 50%, compared with states with a higher level in 2000, inequalities narrowed. The SDI coefficient (SDI vis-à-vis Predicted Completeness) for both sexes declined from 257 in 2000 to 175 in 2020 (Figure A7: Annexure). There was a sharp decline in the coefficient to 180 in 2007 before increasing and then declining again. Again, when the coefficients were determined from a population-weighted regression they declined, from 333 in 2000 to 245 in 2020; there was a sharp decline to 2007, followed by a rise and then another fall (Figure A10: Annexure). Interestingly, the trend in male and female inequalities differed from 2009 to 2020. Inequalities for males declined from 216 to 162, but for females increased from 169 to 187 (although with some year-to-year variation) (Figures A8-A9: Annexure).

Discussion

The additional 4.2 million annual registered deaths between 2000 and 2020, an increase in estimated completeness from 58% to 88%, is a substantial achievement and dramatically increases the potential of the death registration system to be used as a routine source of mortality data. These changes have occurred with a narrowing of inequalities in completeness between states measure by the SDI, whether it was measured weighted by population size or not. Both male and female completeness increased from 2009-20, but with SDI for females remaining steady, for males narrowing. The largest increases in completeness were found in Rajasthan, Gujarat, Madhya Pradesh, Arunachal Pradesh and Sikkim, and the largest state, Uttar Pradesh, where completeness increased from 16% in 2005 to 45% in 2020. The trend in completeness is characterized by an initial increase to 2007, followed by a dip and then increase in recent years.

The narrowing of inequalities in completeness demonstrates that the benefits of higher levels of death registration, including for mortality statistics and individuals and families, have spread to relatively poorer states of India in recent years. However, the continued low completeness in some states, such as the poorest state Bihar, as well as in Nagaland where there was a substantial decline in completeness over the period, are concerning. Low female

compared with male registration in many states is also an area where much improvement in the system is needed, including in Rajasthan and Arunachal Pradesh. The Indian death registration system also needs to increase the number of deaths with age reported to improve their usability for mortality statistics. In 2020, seven states with comprising 41% of India's population didn't report deaths by age. Even where deaths are reported they are in 10-year age groups, whereas calculation of life expectancy and many mortality indicators require deaths reported in five-year age groups. Although not a focus of this study, child death registration is very low in India, with another study estimating that less than one-third of deaths under five years are registered.[7]

During the COVID-19 pandemic, the lack of complete and timely death registration data in India have prevented timely measurement of excess mortality and potentially masks the true extent of its impact in some states more than others. The extent of variation in the death registration in India across the states, and importantly the varied progress made by the individual states over the decade, reinforces that the steps to improve death registration will have to be addressed at the state level, as generic recommendations to improve completeness may not be applicable across all states. Lessons could be learnt from the states which have made progress in completeness for the states which are lagging behind. In general, some facilitators for death registration, such as access to insurance funds and succession of property owned by the deceased, and barriers to death registration, such as discontinuation of the government pension post death of a retired public sector employee or poor inclination to register death of a child, are acknowledged in India.[31] Other issues with death registration in poorer states include them having a poor system of initial notification of deaths, not having an institutionalized mechanism for death registration (especially at the village level), having insufficient monitoring mechanisms, lacking a computerized death registration system, there being limited training and sensitization workshops at the community level, lacking human resources in vital statistics at the state and district level, and registration units in rural areas often not functioning properly.[32] To increase completeness, these states can improve awareness in the community of the benefits of death registration, strengthen the system of initial notification of deaths, implement better monitoring of death registration data, strengthen training of registration staff, and make registration offices more readily accessible.[32] Death registration was also shown to be higher for males than females; this relative under-registration of female deaths is likely because India is a patriarchal society with the succession rights linked to males.[33]

There are some limitations with this study. Deaths are published according to year of registration, so are subject to annual fluctuations caused by both delayed registrations and also collation of registered deaths. Hence, annual levels of completeness may be affected by reporting efficiencies completeness by year of registration may differ from that reported by year of occurrence. However, the longer-term trend in increased completeness is clear, irrespective of how whether year of registration of occurrence is used. Also, even though this study found that many states do not report detailed age data for registered deaths, does not mean they are not available in the data for policymakers. However, good practice is for these to be published, to enable external analysts to use the data. The measures of completeness

used in the study are estimates; however the estimate of completeness in 2020 of 88% was only slightly higher than that calculated according the GBD estimated deaths of 75%.[2] Finally, the summary socio-economic measures only show state-level and not individual socio-economic differences in death registration; it is likely that differences by individual socio-economic and also by smaller area of enumeration, as shown in Chinese counties, would be larger than according to state.[14]

Concentrated effort is needed in the assessment of strengths and weaknesses at the subnational level of not only CRVS processes in India but the data it produces is essential to ensure that improvements in completeness are continued. Given that India accounts for one-in-six of the world's deaths, increased routine reporting of these deaths will help with understanding of global health trends. Furthermore, improved cause of death data through both Medical Certification of Causes of Death for facility deaths and routine verbal autopsy for community deaths will help improve understanding of national and subnational cause of death patterns and enable more reliable computation of health indicators such as the Sustainable Development Goals by local analysts.[34, 35]

Conclusions

The narrowing of inequalities in completeness according to the SDI demonstrates that the benefits of higher levels of death registration have spread to relatively poorer states of India in recent years. However, the continued low completeness in some states, such as the poorest state Bihar, as well as in Nagaland where there was a substantial decline in completeness over the period, are concerning. Low female compared with male registration in many states is also an area where much improvement in the system is needed, including in Rajasthan and Arunachal Pradesh. The Indian death registration system also needs to increase the number of deaths with age reported to improve their usability for mortality statistics.

Acknowledgements

References

1. Lopez AD, McLaughlin D, Richards N: **Reducing ignorance about who dies of what: research and innovation to strengthen CRVS systems.** *BMC Med* 2020, **18:**58.
2. G.B.D. Demographics Collaborators: **Global age-sex-specific fertility, mortality, healthy life expectancy (HALE), and population estimates in 204 countries and territories, 1950-2019: a comprehensive demographic analysis for the Global Burden of Disease Study 2019.** *Lancet* 2020, **396:**1160-1203.
3. Census of India 2011: **Population projections for India and states: 2011-2036: Report of the Technical Group on Population Projections.** (National Commission on Population MoHaFW ed. New Delhi; 2019.
4. India State-Level Disease Burden Initiative Collaborators: **Nations within a nation: variations in epidemiological transition across the states of India, 1990-2016 in the Global Burden of Disease Study.** *Lancet* 2017, **390:**2437-2460.

5.   Office of the Registrar General India: **Sample Registration System, Statistical Report, 2020.** (Office of the Registrar General India ed. New Delhi: Office of the Registrar General India, Ministry of Home Affairs; 2022

6.   Mahapatra P: **An overview of sample registration system in India.** Hyderabad: The Institute of Health Systems; 2010.

7.   Rao C, Gupta M: **The civil registration system is a potentially viable data source for reliable subnational mortality measurement in India.** *BMJ Global Health* 2020, **5**.

8.   UN Inter-agency Group for Child Mortality Estimation (IGME): **Child Mortality Estimates.** New York; 2019.

9.   International Institute for Population Sciences - IIPS/India and ICF: **National Family Health Survey NFHS-9, 2019-21: India.** Mumbai: IIPS; 2017.

10.   Office of the Registrar General India: **Vital Statistics of India based on the Civil Registration System, 2009.** (Office of the Registrar General India ed. New Delhi: Office of the Registrar General India, Ministry of Home Affairs, Vital Statistics Division,; 2013.

11.   Office of the Registrar General India: **Vital Statistics of India based on the Civil Registration System, 2018.** (Office of the Registrar General India ed. New Delhi: Office of the Registrar General India, Ministry of Home Affairs, Vital Statistics Division,; 2020.

12.   Global Burden of Disease Collaborative Network: **Global Burden of Disease Study 2019 (GBD 2019) Results.** Seattle; 2020.

13.   United Nations Population Division: **World Population Prospects: The 2019 Revision.** In *World Population Prospects*. New York: United Nations; 2019.

14.   Zeng X, Adair T, Wang L, Yin P, Qi J, Liu Y, Liu J, Lopez AD, Zhou M: **Measuring the completeness of death registration in 2844 Chinese counties in 2018.** *BMC Med* 2020, **18:**176.

15.   Bhatia A, Ferreira LZ, Barros AJD, Victora CG: **Who and where are the uncounted children? Inequalities in birth certificate coverage among children under five years in 94 countries using nationally representative household surveys.** *Int J Equity Health* 2017, **16:**148.

16.   Office of the Registrar General India: **Vital Statistics of India based on the Civil Registration System, 2010.** (Office of the Registrar General India ed. New Delhi: Office of the Registrar General India, Ministry of Home Affairs, Vital Statistics Division,; 2013.

17.   Office of the Registrar General India: **Vital Statistics of India based on the Civil Registration System, 2011.** (Office of the Registrar General India ed. New Delhi: Office of the Registrar General India, Ministry of Home Affairs, Vital Statistics Division,; 2014.

18.   Office of the Registrar General India: **Vital Statistics of India based on the Civil Registration System, 2012.** (Office of the Registrar General India ed. New Delhi: Office of the Registrar General India, Ministry of Home Affairs, Vital Statistics Division,; 2015.

19.   Office of the Registrar General India: **Vital Statistics of India based on the Civil Registration System, 2013.** (Office of the Registrar General India ed. New Delhi: Office of the Registrar General India, Ministry of Home Affairs, Vital Statistics Division,; 2015.

20.   Office of the Registrar General India: **Vital Statistics of India based on the Civil Registration System, 2014.** (Office of the Registrar General India ed. New Delhi:

Office of the Registrar General India, Ministry of Home Affairs, Vital Statistics Division,; 2016.

21. Office of the Registrar General India: **Vital Statistics of India based on the Civil Registration System, 2015.** (Office of the Registrar General India ed. New Delhi: Office of the Registrar General India, Ministry of Home Affairs, Vital Statistics Division,; 2017.

22. Office of the Registrar General India: **Vital Statistics of India based on the Civil Registration System, 2016.** (Office of the Registrar General India ed. New Delhi: Office of the Registrar General India, Ministry of Home Affairs, Vital Statistics Division,; 2018.

23. Office of the Registrar General India: **Vital Statistics of India based on the Civil Registration System, 2017.** (Office of the Registrar General India ed. New Delhi: Office of the Registrar General India, Ministry of Home Affairs, Vital Statistics Division,; 2019.

24. Adair T, Lopez AD: **Estimating the completeness of death registration: An empirical method.** *PLoS One* 2018, **13:**e0197047.

25. National Commission on Population: **Population Projections for India and States, 2011-36.** New Delhi: National Commission on Population, Ministry of Health and Family Welfare; 2019.

26. Census of India 2001: **Population projections for India and states: 2001-2026: Report of the Technical Group on Population Projections.** (National Commission on Population GoI ed. New Delhi; 2006.

27. India State-Level Disease Burden Initiative Child Mortality C: **Subnational mapping of under-5 and neonatal mortality trends in India: the Global Burden of Disease Study 2000-17.** *Lancet* 2020, **395:**1640-1658.

28. Global Burden of Disease Collaborative Network: **Global Burden of Disease Study 2016 (GBD 2016) Socio-Demographic Index (SDI) 1970–2016.** In *Global Burden of Disease* (Insitute of Health Metrics and Evaluation (IHME) ed. Seattle; 2017.

29. Alkire S, Foster J: **Counting and multidimensional poverty measurement.** *Journal of Public Economics* 2011, **95:**476-487.

30. Banerjee A, Chaudhuri B, Montier B, Roy A: **Multi-Dimensional Poverty Index (MPI) - A state level analysis for India.** In *Enhancing Knowledge for Renewed Policies against Poverty, India*, vol. Working Paper No. 5.

31. Kumar GA, Dandona L, Dandona R: **Completeness of death registration in the Civil Registration System, India (2005 to 2015).** *Indian Journal of Medical Research* 2019, **149:**740-747.

32. UNICEF India: **Strengths and Challenges in Civil Registration in India.** In. UNICEF India; 2019

33. Gupta M, Rao C, Lakshmi PVM, Prinja S, Kumar R: **Estimating mortality using data from civil registration: a cross-sectional study in India.** *Bulletin of the World Health Organization* 2016, **94:**10-21.

34. Hazard RH, Buddhika MPK, Hart JD, Chowdhury HR, Firth S, Joshi R, Avelino F, Segarra A, Sarmiento DC, Azad AK, et al: **Automated verbal autopsy: from research to routine use in civil registration and vital statistics systems.** *BMC Med* 2020, **18:**60.

35. Hart JD, Sorchik R, Bo KS, Chowdhury HR, Gamage S, Joshi R, Kwa V, Li H, Mahesh BPK, McLaughlin D, et al: **Improving medical certification of cause of death: effective strategies and approaches based on experiences from the Data for Health Initiative.** *BMC Med* 2020, **18:**74.

ANNEXURE

Figure A1: Predicted Completeness in Death Registration in Indian States (Both Sexes) in 2000

Predicted completeness of death registration (both sexes) in Indian states in 2000

- Below 50%
- 50-79.99%
- 80% and above
- Newly formed state/UT
- Data not available
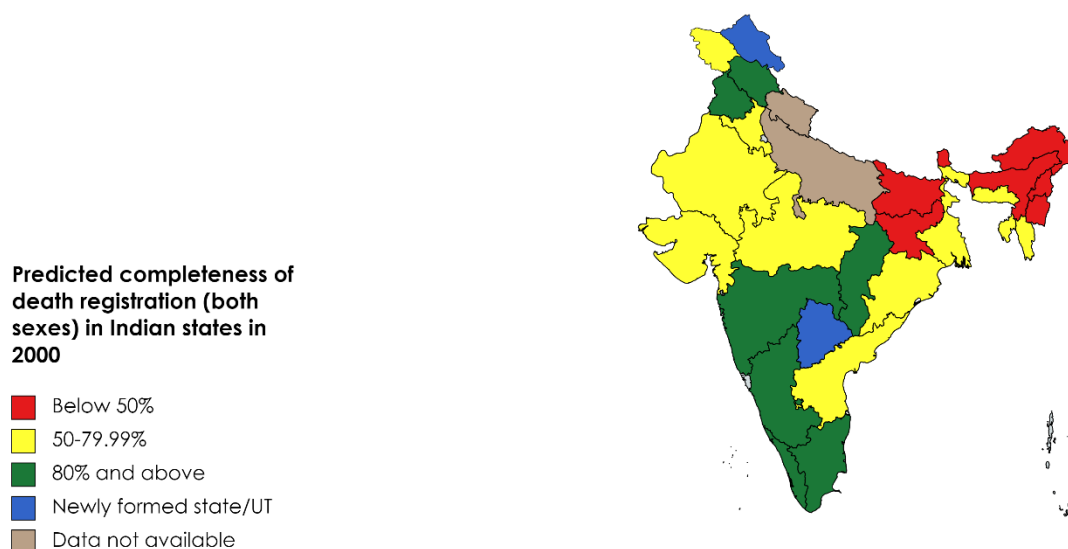
Figure A2: Predicted Completeness in Death Registration in Indian States (Both Sexes) in 2020

Predicted completeness of death registration (both sexes) in Indian states in 2020

- Below 50%
- 50-79.99%
- Newly formed state/UT
- 80% and above
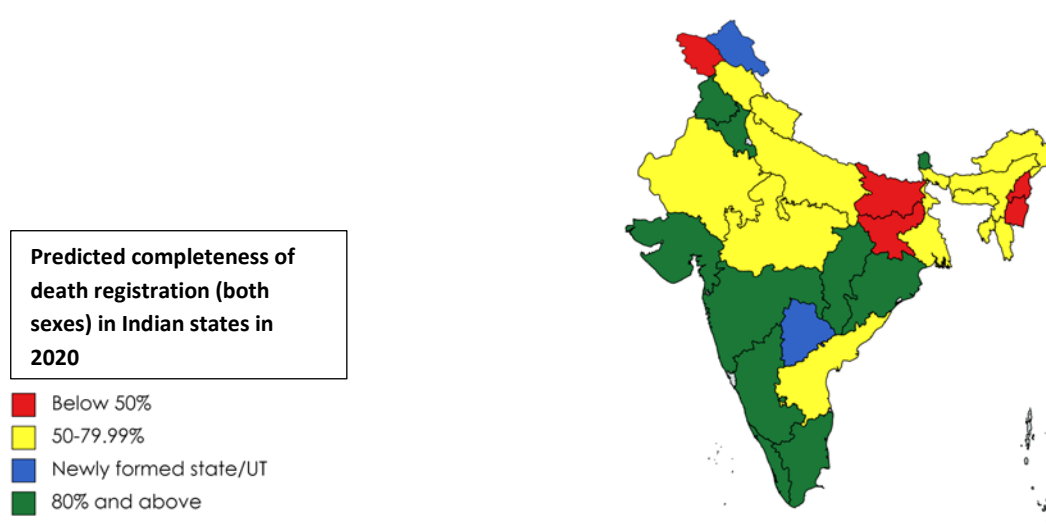
Figure A3: Predicted Completeness in Death Registration in Indian States (Male) in 2009

Predicted completeness of death registration (male) in 2009

- ☐ 50-79.99%
- ■ 80% and above
- ■ Below 50%
- ■ Data not available
- ■ Newly formed state/UT
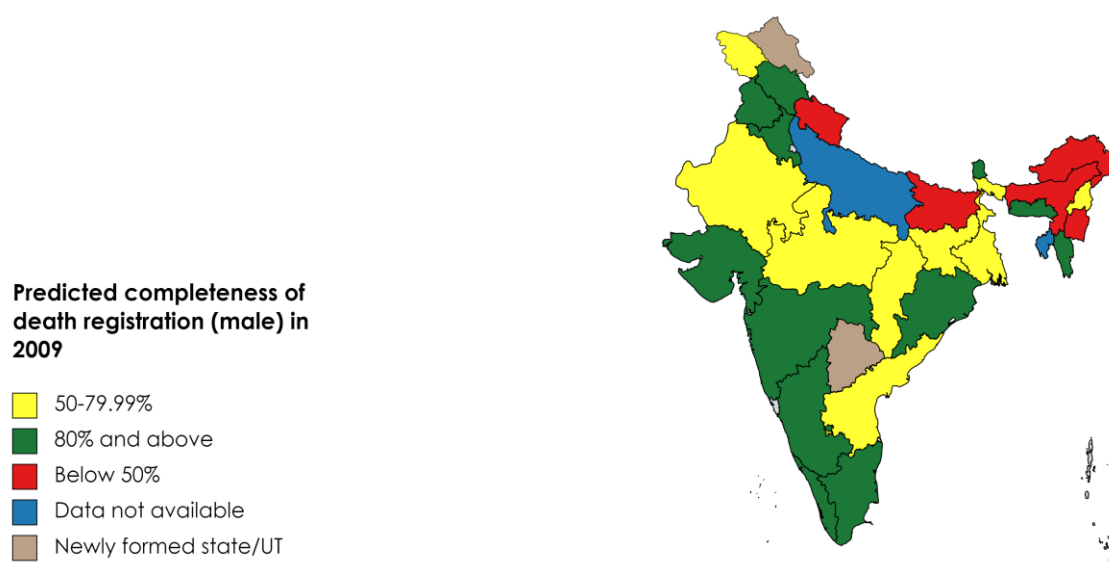
Figure A4: Predicted Completeness in Death Registration in Indian States (Male) in 2020
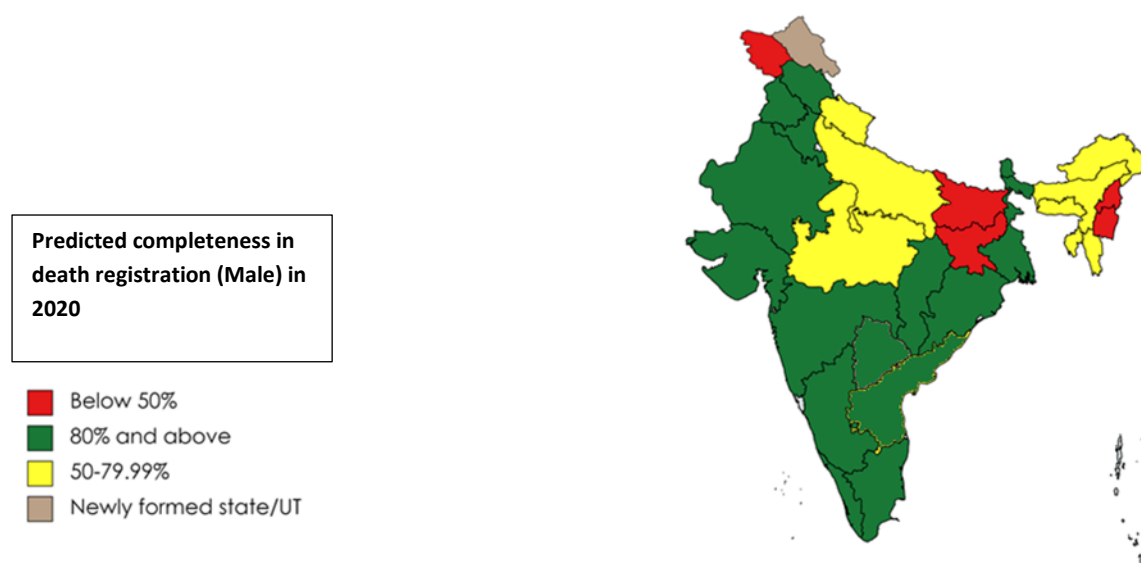
Predicted completeness in death registration (Male) in 2020

- ■ Below 50%
- ■ 80% and above
- ☐ 50-79.99%
- ■ Newly formed state/UT

Figure A5: Predicted ompleteness in Death Registration in Indian States (Female) in 2009

Predicted completeness of
death registration (female)
in 2009

- Below 50%
- 50-79.99%
- 80% and above
- Data not available
- Newly formed state/UT
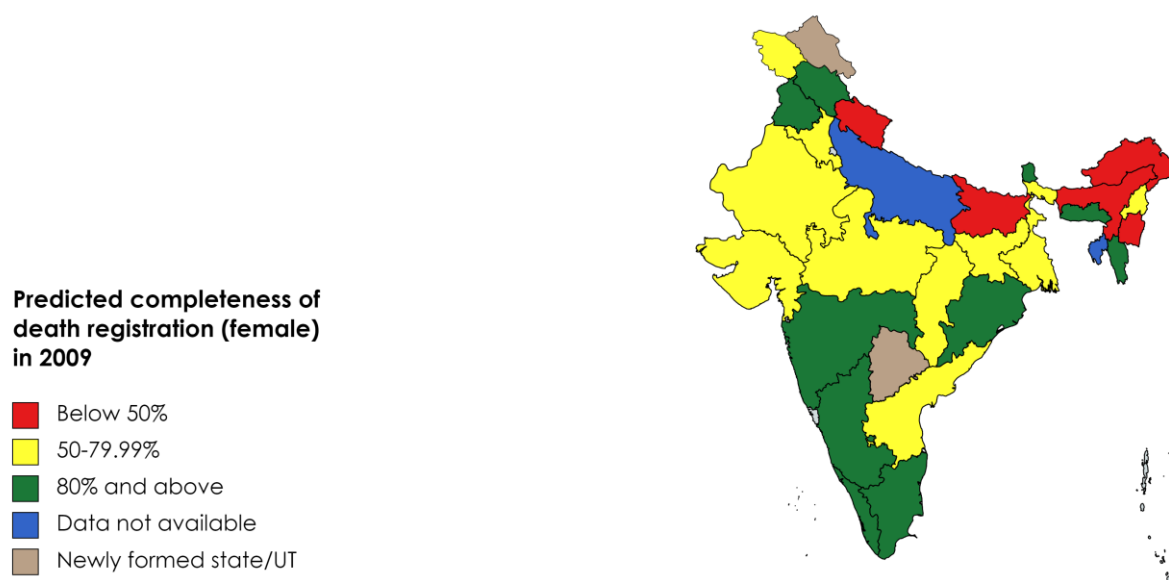
Figure A6: Predicted completeness in Death Registration in Indian States (Female) in 2020

Predicted completeness in
death registration (female) in
2020

- Below 50%
- 50-79.99%
- 80% and above
- Newly formed state/UTs
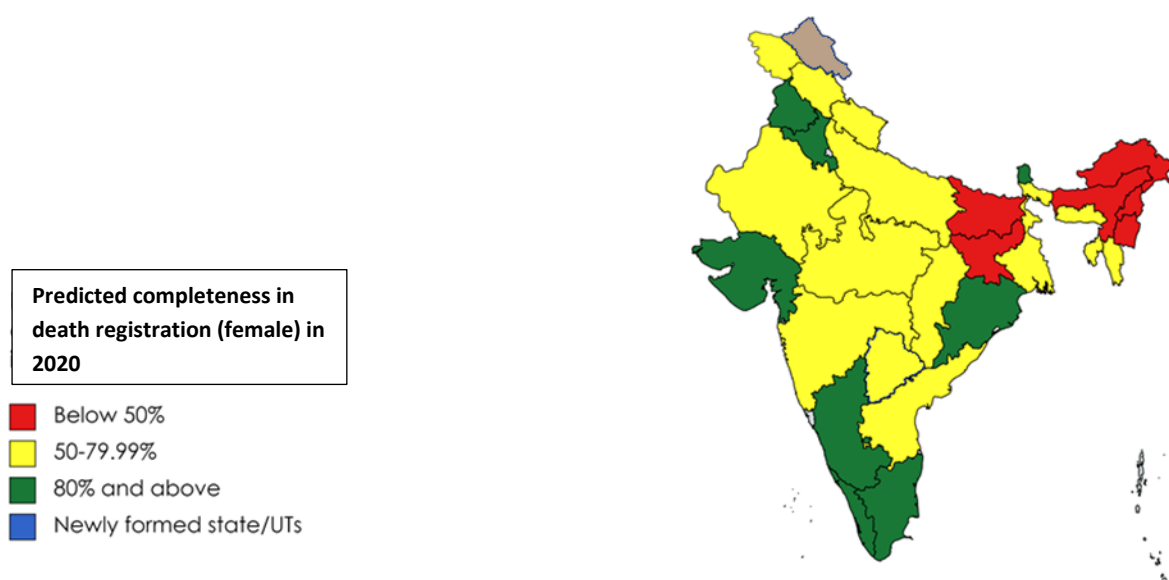
Figure A7: SDI vis-à-vis Predicted Completeness for India, 2000 and 2020
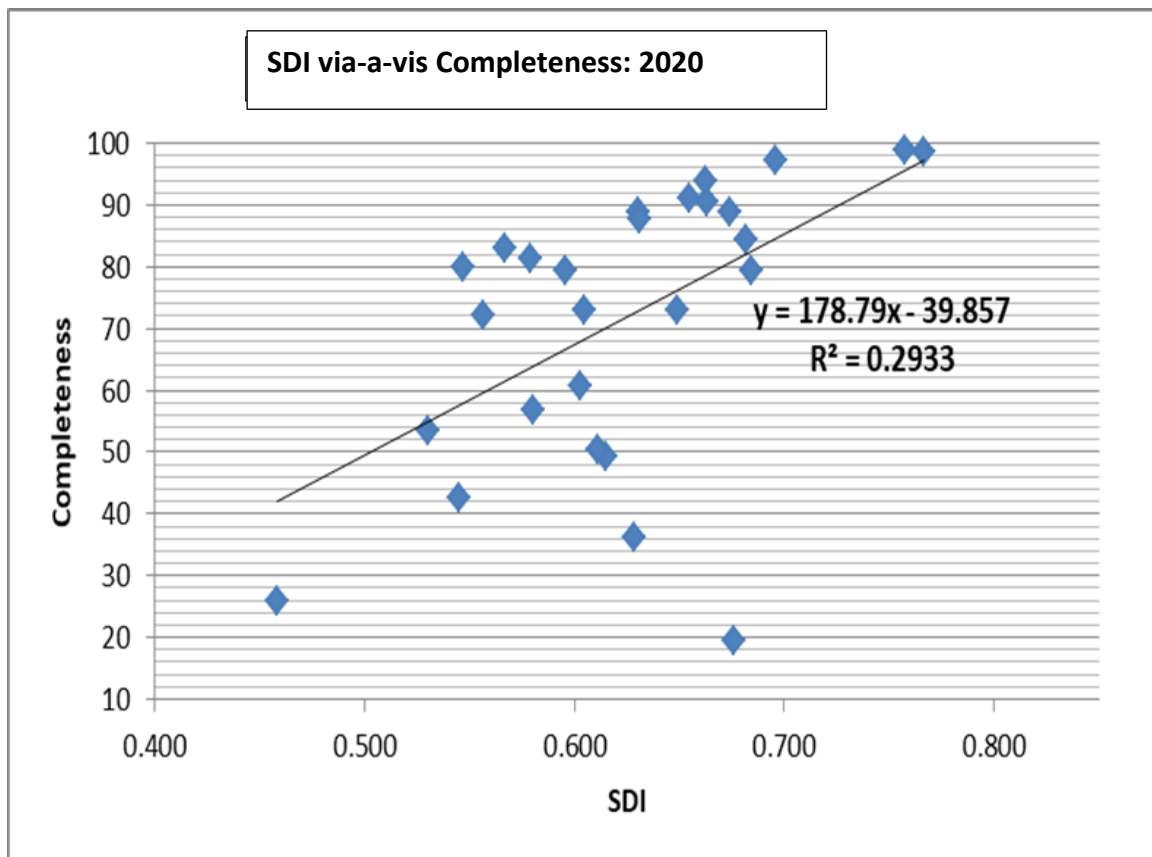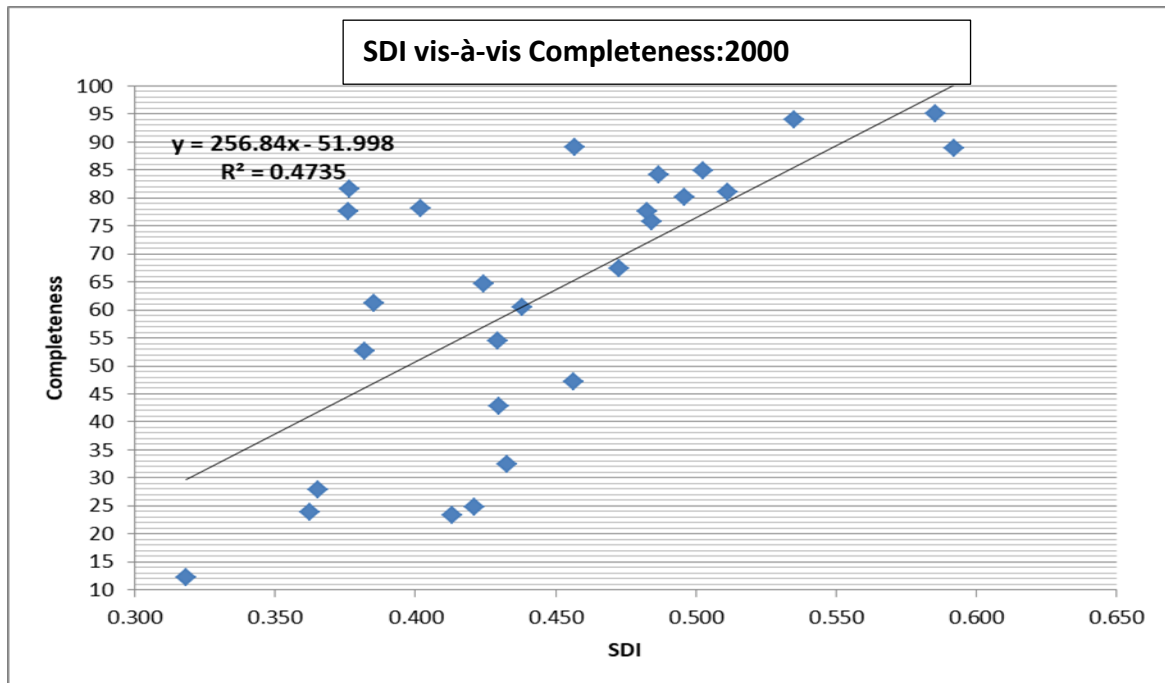
Figure A8: SDI vis-à-vis Predicted Completeness for Males, India, 2009 and 2020

2009

y = 216.44x - 44.572

2020

y = 161.66x - 26.557
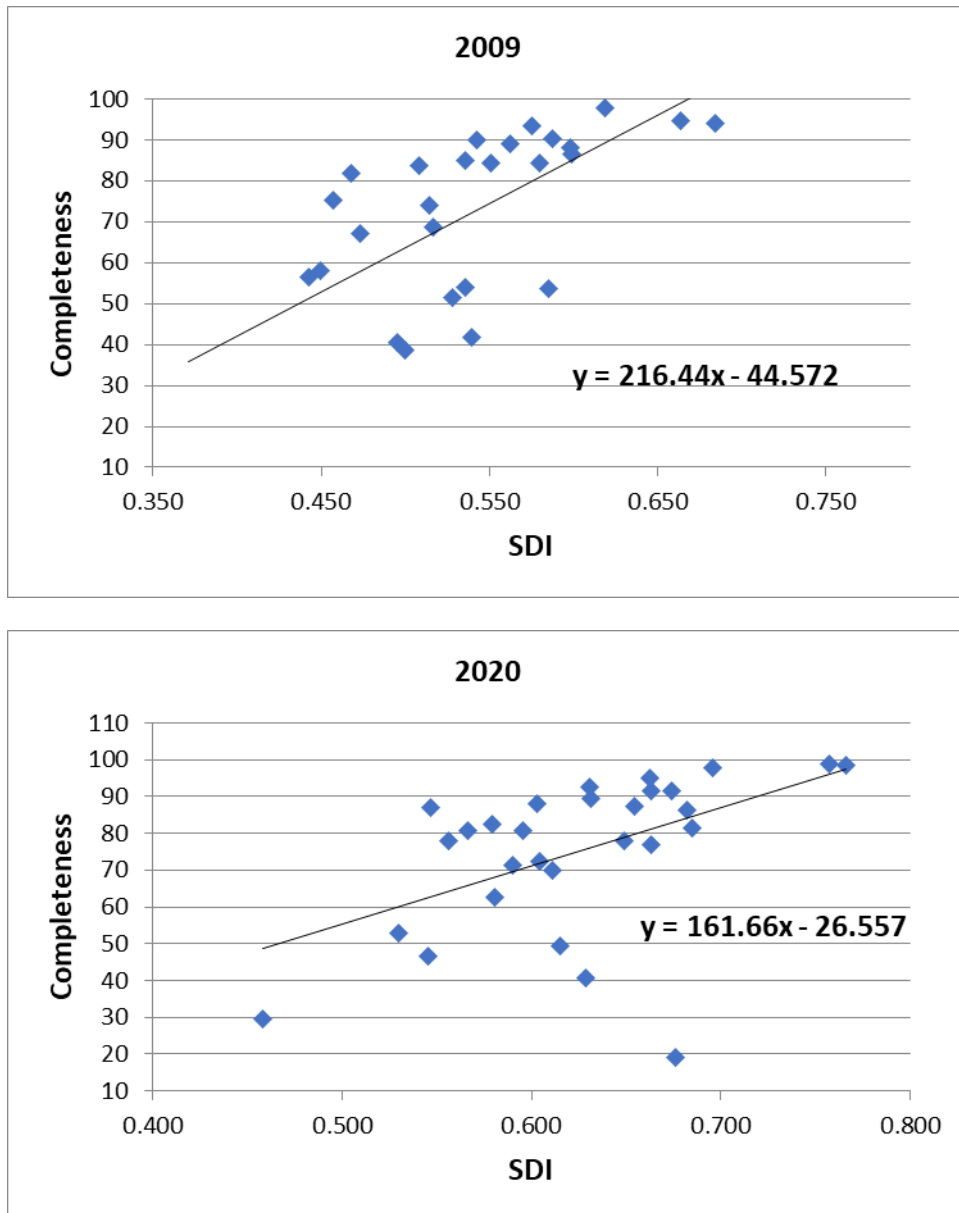
Figure A9: SDI vis-à-vis Predicted Completeness for Females, India, 2009 and 2020

2009

y = 168.59x - 21.534

2020

y = 186.8x - 47.658

Figure A10: Trends in population-weighted coefficient of SDI (from regression to predict state-level death registration completeness), 2000-2020, India

Table A1: Predicted Completeness (%) in India and the States, 2000 – 2020 (Both Sexes)

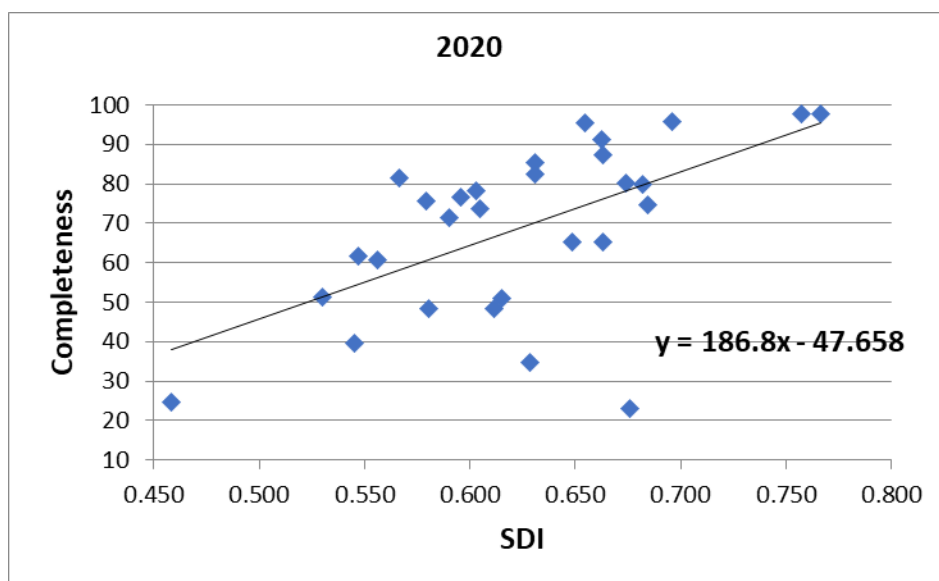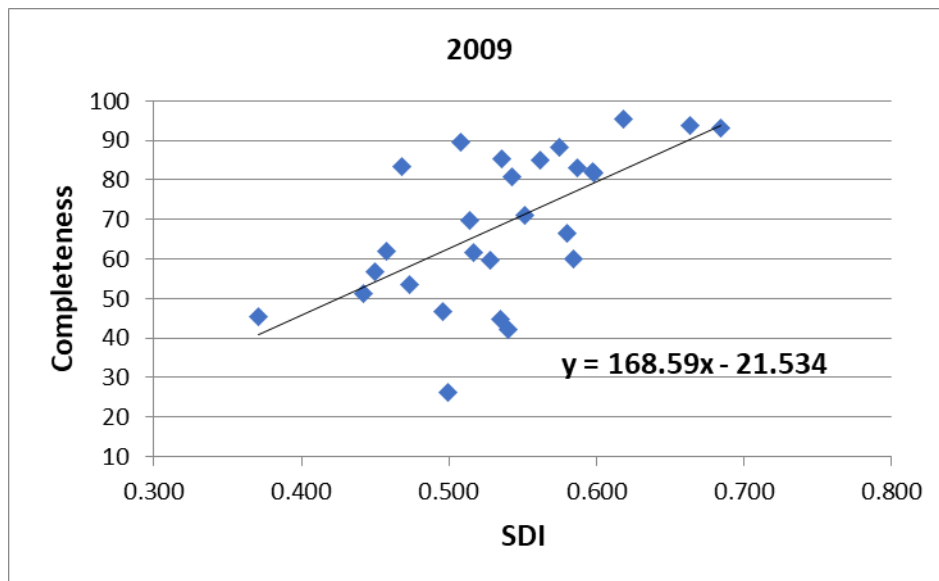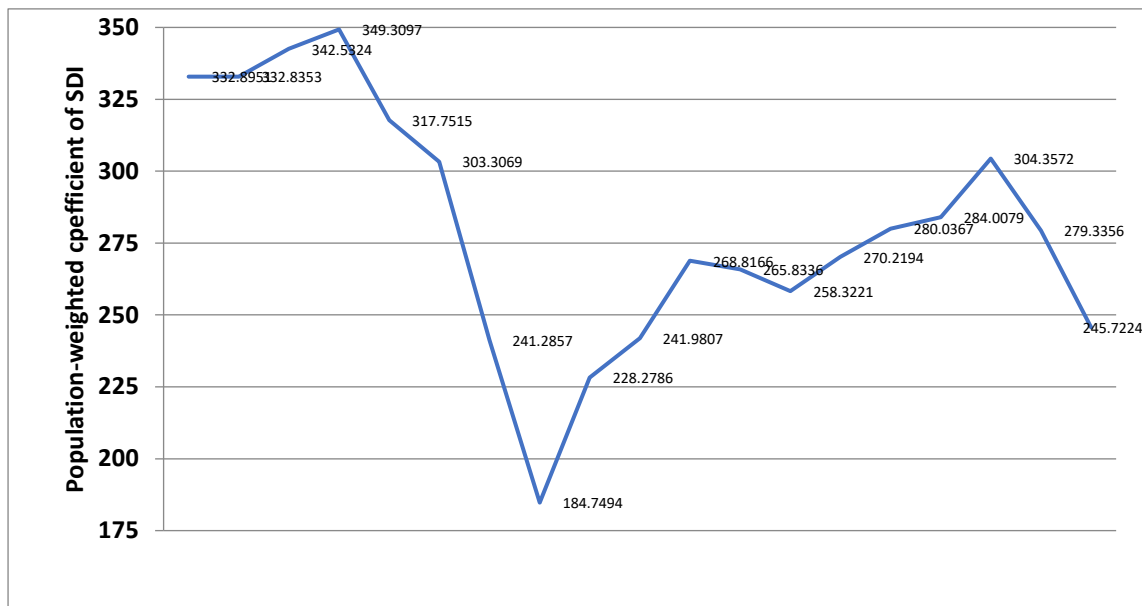| Country/Sub-national (States)	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
India	**57.6**	**59.4**	**65.8**	**66.6**	**64.0**	**64.6**	**72.8**	**76.7**	**74.3**	**67.9**	**66.5**	**66.0**	**66.8**	**68.8**	**69.6**	**72.9**	**73.7**	**77.0**	**80.6**	**84.2**	**87.8**
1. National Capital Territory (NCT) of Delhi	88.9	89.2	90.5	90.6	89.2	91.7	92.7	92.9	93.8	94.2	96.6	95.2	93.3	91.2	95.6	95.8	97.3	96.9	98.6	99.5	99.8
2. Haryana	75.8	75.9	76.1	79.7	76.9	70.2	74.8	79.3	81.8	79.1	81.8	83.0	83.9	83.7	84.6	85.7	88.5	87.2	88.9	90.6	92.8
3. Himachal Pradesh	80.2	83.7	84.0	85.3	83.2	84.1	86.5	85.7	87.5	86.7	85.6	86.3	86.5	80.6	80.5	82.2	74.4	79.1	79.4	84.2	87.8
4. Jammu & Kashmir	54.4	45.4	50.0	50.7	50.4	50.3	50.8	50.0	49.2	54.7	50.6	51.0	DNA	51.5	52.1	49.7	49.4	51.2	49.3	51.3	53.1
5. Punjab	84.8	86.1	85.9	87.6	82.8	84.3	85.0	87.1	88.7	88.8	89.2	90.0	90.1	89.8	90.7	90.1	92.2	91.6	90.6	90.6	92.8
6. Rajasthan	52.6	61.6	67.0	62.5	68.4	63.9	69.7	70.0	70.0	70.9	74.0	72.2	72.3	76.8	76.5	77.5	78.4	79.2	79.8	79.7	80.0
7. Uttar Pradesh	DNA	DNA	17.8	15.7	14.4	16.1	45.2	73.7	59.4	53.7	47.3	42.1	34.3	42.3	38.6	35.4	30.1	28.3	53.6	47.4	45.5
8. Uttarakhand	DNA	DNA	DNA	DNA	43.1	49.5	41.6	48.7	46.5	49.6	48.4	49.0	54.2	53.2	55.2	69.3	74.2	56.2	72.7	89.6	88.6
9. Andhra Pradesh	64.6	65.6	66.5	66.5	65.7	61.1	69.4	72.9	70.1	72.9	69.0	70.0	68.5	69.2	77.4	79.1	87.1	86.3	88.1	80.4	81.0
10. Karnataka	89.1	89.9	88.5	88.4	86.1	88.0	89.8	89.2	87.9	87.7	86.5	87.0	88.4	88.5	88.4	86.4	88.9	88.9	88.9	91.4	93.9
11. Kerala	93.9	94.4	94.5	95.3	95.5	95.9	96.8	97.5	96.7	97.3	97.8	98.0	97.5	98.0	97.6	97.5	97.6	97.8	97.3	97.5	97.9
12. Tamil Nadu	84.1	87.4	88.7	89.9	88.8	89.6	91.5	90.8	90.6	92.1	92.8	93.0	93.8	94.0	95.5	96.0	95.9	96.3	94.0	94.4	95.2
13. Goa	95.0	95.8	96.6	96.3	96.3	96.2	96.5	95.7	94.7	95.0	97.4	97.8	97.1	97.1	97.5	97.2	97.5	97.4	98.8	99.1	99.5
14. Gujarat	67.4	72.0	67.5	72.6	75.3	69.4	78.7	79.7	80.3	80.8	80.1	80.2	76.8	80.5	81.1	88.0	88.6	85.6	87.7	96.8	96.3
15. Maharashtra	81.1	81.9	84.1	86.2	76.5	80.3	82.1	84.7	86.0	85.5	86.6	84.3	85.2	85.8	85.9	85.8	86.6	84.3	84.3	91.7	89.4
16. Bihar	12.2	12.8	13.4	14.6	18.9	22.4	24.6	24.9	23.6	19.4	15.3	20.0	33.0	19.6	20.4	26.2	23.3	35.0	26.0	37.7	49.7
17. Jharkhand	27.8	28.3	32.1	36.9	42.9	48.8	50.7	51.2	48.4	53.6	48.9	52.0	49.6	50.2	58.8	59.9	58.1	52.4	42.6	52.4	55.1
18. Odisha	77.6	77.4	79.0	78.8	75.1	79.0	77.7	79.8	81.7	83.8	81.2	80.2	82.2	80.9	85.3	86.0	88.8	86.1	83.0	84.3	85.6
19. West Bengal	60.4	63.6	64.3	63.3	59.6	53.5	54.0	56.0	67.9	66.0	59.6	68.2	74.0	79.9	70.8	72.6	77.9	77.9	79.4	80.9	82.4
20. Chhattisgarh	81.6	76.6	80.9	79.6	76.2	80.2	79.7	81.9	59.5	61.2	60.5	60.0	72.7	75.7	83.5	81.8	85.9	84.3	81.2	84.3	87.4
21. Madhya Pradesh	61.2	59.8	60.0	64.1	59.1	58.3	63.8	60.2	53.4	57.2	56.0	61.0	61.6	63.9	61.8	53.0	58.5	65.1	72.2	79.9	76.8
22. Arunachal Pradesh	23.3	27.8	23.0	21.8	25.4	24.0	25.4	29.0	29.1	30.1	46.4	34.3	36.9	35.4	47.6	62.8	48.5	44.9	50.4	55.9	61.4

State																					
23. Assam	24.7	28.3	33.7	33.8	33.3	40.8	42.8	32.6	32.7	42.6	43.4	46.0	45.2	42.0	46.7	47.3	54.1	59.3	56.8	61.8	64.3
24. Manipur	32.5	29.5	41.8	34.6	39.1	43.6	39.1	41.2	30.2	40.3	40.3	40.7	40.7	49.5	54.5	33.4	DNA	38.2	36.2	40.3	42.3
25. Meghalaya	78.2	62.0	55.7	55.4	77.2	60.1	82.2	75.4	72.2	87.1	80.2	82.2	79.7	76.1	79.9	82.5	DNA	77.0	72.9	77.0	78.5
26. Mizoram	77.6	82.4	84.6	85.9	84.5	83.5	82.3	82.3	86.3	88.3	81.7	82.0	87.6	84.7	86.6	86.2	85.6	79.0	72.9	77.1	78.8
27. Nagaland	47.1	51.3	56.1	48.9	53.7	55.8	62.5	53.9	62.4	56.2	68.7	69.3	67.9	67.0	25.3	25.0	25.6	24.7	19.4	34.2	32.2
28. Sikkim	42.8	53.1	67.1	79.1	80.7	79.4	80.0	79.0	81.0	85.0	87.0	87.0	90.8	90.4	90.5	90.7	91.3	90.4	91.2	92.0	92.8
29. Tripura	65.9	65.9	37.0	49.5	66.5	DNA	63.0	DNA	DNA	DNA	35.7	40.1	42.1	53.5	41.3	44.5	45.8	61.3	61.3	65.8	66.7

DNA-Death Registration data Not Available

1-8: States from northern region of India
9-12: States from southern region of India
13-15: States from western region of India
16-19: States from eastern region of India
20-21: States from central region of India
22-29: States from north-eastern region of India

Table A2: Predicted Completeness (%) in India and the States, 2009 – 2020 (Male)

Country/Sub-national (States)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
India	**60.4**	**70.0**	**58.4**	**68.2**	**72.1**	**73.4**	**72.7**	**74.0**	**81.3**	**84.5**	**87.7**	**90.9**
National Capital Territory (NCT) of Delhi	93.9	96.6	95.0	93.3	91.7	95.7	95.7	97.2	96.7	98.5	98.8	99.1
Haryana	84.3	85.6	86.9	87.4	87.6	88.4	89.3	91.4	90.2	91.6	93.0	94.4
Himachal Pradesh	88.1	87.7	87.7	88.2	83.0	83.2	84.6	78.4	82.0	81.5	81.0	80.5
Jammu & Kashmir	51.5	49.6	49.5	DNA	50.9	54.5	54.0	53.5	53.9	49.5	45.1	40.7
Punjab	90.2	91.1	91.1	91.3	90.5	91.2	91.1	93.1	92.0	91.4	90.8	90.2
Rajasthan	75.2	80.5	74.8	76.0	82.1	82.8	84.0	84.5	86.3	87.0	87.7	88.4
Uttar Pradesh	DNA	DNA	DNA	30.7	43.7	40.6	37.6	32.6	30.7	53.0	75.3	97.6
Uttarakhand	54.1	55.1	53.9	59.2	57.5	60.5	74.4	78.0	63.5	77.0	85.5	94.0
Andhra Pradesh	73.9	70.8	71.9	70.4	69.2	77.4	79.1	87.1	86.3	88.1	89.9	91.7
Karnataka	89.8	89.3	89.0	90.5	91.1	90.7	88.8	91.4	93.9	92.5	91.1	89.7
Kerala	97.8	98.0	98.3	97.6	98.5	98.1	97.9	98.0	96.5	97.9	98.4	98.9
Tamil Nadu	93.5	93.8	93.1	94.1	95.0	96.1	96.4	96.4	96.6	94.9	93.2	91.5
Goa	94.8	97.2	96.7	97.3	97.4	97.6	97.3	97.5	97.4	98.8	99.3	99.8
Gujarat	84.3	84.0	83.6	82.0	84.2	84.8	DNA	DNA	87.5	89.4	91.3	93.2
Maharashtra	86.5	87.9	86.1	87.1	87.6	87.7	87.6	87.9	85.9	86.2	86.5	86.8
Bihar	8.7	11.9	DNA	DNA	23.7	24.8	32.8	28.1	40.3	29.5	18.7	7.9
Jharkhand	56.6	51.3	DNA	55.7	54.3	63.9	59.5	62.7	56.3	46.6	36.9	27.2
Odisha	81.9	80.3	79.2	80.8	80.4	84.3	85.6	87.7	84.1	80.6	77.1	73.6
West Bengal	68.6	62.8	70.8	76.3	78.2	73.2	74.2	79.7	79.0	80.7	82.4	84.1
Chhattisgarh	67.1	66.6	65.7	77.8	80.2	84.3	82.1	84.8	84.6	82.6	80.6	78.6
Madhya Pradesh	58.0	57.2	62.4	62.5	64.5	62.5	55.8	63.1	70.4	77.9	85.4	92.9
Arunachal Pradesh	38.5	55.0	37.2	42.5	38.6	57.5	74.4	55.4	62.8	70.0	77.2	84.4
Assam	40.5	42.0	41.7	42.8	40.9	58.9	59.3	62.5	56.3	62.7	69.1	75.5
Manipur	41.7	43.0	42.9	42.6	58.7	65.0	34.5	DNA	36.2	40.6	45.0	49.4
Meghalaya	83.7	79.0	79.6	81.2	73.7	79.8	81.6	DNA	76.7	72.2	67.7	63.2
Mizoram	88.9	83.7	85.0	90.1	88.0	89.0	89.1	88.3	82.9	77.9	72.9	67.9
Nagaland	53.8	64.2	64.2	62.9	61.6	28.3	27.3	27.4	26.0	19.2	12.4	5.6
Sikkim	85.0	86.7	88.0	89.7	89.6	89.4	90.0	90.9	88.0	87.3	86.6	85.9
Tripura	DNA	34.1	38.5	47.6	47.8	46.6	48.2	52.1	71.2	71.4	71.6	71.8

DNA: Data Not Available

Table A3: Predicted Completeness (%) in India and the States, 2009 – 2020 (Female)

Country/Sub-national (States)	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
India	**53.7**	**60.4**	**48.1**	**57.6**	**62.8**	**62.8**	**72.7**	**61.8**	**70.1**	**73.6**	**77.1**	**80.6**
National Capital Territory (NCT) of Delhi	93.1	95.1	93	91.1	88.5	94.1	94.5	96.3	95.9	97.8	98.7	99.6
Haryana	66.5	68.1	71.1	73.3	72.9	73.6	74.9	79.0	78.3	80.3	82.3	84.3
Himachal Pradesh	82.2	80.5	80.7	81.3	74.6	74.5	76.4	67.1	72.9	74.5	76.1	77.7
Jammu & Kashmir	59.6	54.5	54.2	DNA	53.8	50.4	45.6	45.7	49.2	51	52.8	54.6
Punjab	83.0	83.1	83.9	85.3	86.5	87.6	86.3	89.6	88.9	87.2	85.5	83.8
Rajasthan	62.0	61.0	66.2	64.8	65.1	63.0	62.9	64.3	61.9	61.8	61.7	61.6
Uttar Pradesh	DNA	DNA	DNA	22.7	41.7	37.6	34.3	29.2	27.1	51.3	75.5	99.7
Uttarakhand	44.8	40.9	42.4	49.6	48.4	50.1	61.2	67.6	47.3	65.3	77.4	89.5
Andhra Pradesh	69.9	64.7	66.9	65.2	67.2	78.3	80.4	78.2	76.8	78.3	79.8	81.3
Karnataka	80.9	79.8	80.6	81.9	80.9	81.8	80.1	81.6	88.5	85.5	82.5	79.5
Kerala	95.5	95.7	96.5	96.7	96.8	95.8	96.1	96.4	98.4	95.8	93.2	90.6
Tamil Nadu	88.2	89.3	90.9	91.4	90.7	93.1	94.2	93.8	94.7	91.2	87.7	84.2
Goa	93.7	96.5	95.2	95.6	95.3	96.1	95.8	96.5	96.1	97.8	98.5	99.2
Gujarat	71.2	70.9	70.1	66.5	71.6	72.3	DNA	DNA	80.3	82.6	84.9	87.2
Maharashtra	81.8	82.7	78.8	80.2	80.9	81.2	81.1	83	80.3	79.9	79.5	79.1
Bihar	45.4	23.8	DNA	DNA	17.6	18.2	21.3	20.5	31.1	24.7	18.3	11.9
Jharkhand	51.4	47.1	DNA	42.7	45.9	52.2	60.9	52.4	48.6	39.7	30.8	21.9
Odisha	83.5	79.5	79.1	81.3	78.9	84.0	83.7	87.6	84.6	81.5	78.4	75.3
West Bengal	61.8	56.6	64.6	70.7	80.9	66.9	69.7	74.4	75.5	76.6	77.7	78.8
Chhattisgarh	53.6	51.9	51.3	62.5	65.9	75.6	72.8	80.8	80.2	75.5	70.8	66.1
Madhya Pradesh	56.8	53.1	57.3	59.3	61.9	60.0	49.4	51.7	56.1	60.7	65.3	69.9
Arunachal Pradesh	26.3	32.3	33.4	33.0	34.5	36.9	45.0	42.8	47.3	48.5	49.7	50.9
Assam	46.6	46.3	53.0	49.4	44.7	31.6	32.3	42.7	63.1	48.5	33.9	19.3
Manipur	42.2	39.9	40.8	41.1	40.4	42.4	36.2	DNA	44.9	34.6	24.3	14.0
Meghalaya	89.6	81.1	84.8	76.1	78.5	79.2	82.9	DNA	77.0	73.7	70.4	67.1
Mizoram	85.1	77.0	74.9	80.7	76.6	80.2	78.6	78.7	71.4	65.1	58.8	52.5
Nagaland	60.0	74.6	75.0	74.0	73.6	24.6	25.1	26.3	26.2	22.9	19.6	16.3
Sikkim	85.3	84.9	83.2	90.5	89.0	90.4	90.1	90.5	90.9	95.4	96.8	98.2
Tripura	DNA	39.6	44.8	35.8	61.5	36.6	41.4	39.4	70.8	71.3	71.8	72.3

DNA: Data Not Available

Table A4: Socio-Demographic Index (SDI) Values for India and States, 2000-2020

Location	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
India	0.432	0.440	0.447	0.455	0.464	0.473	0.482	0.492	0.502	0.512	0.522	0.533	0.543	0.553	0.564	0.575	0.584	0.594	0.603	0.612	0.621
Andhra Pradesh	0.424	0.434	0.444	0.453	0.463	0.472	0.481	0.493	0.503	0.514	0.525	0.536	0.546	0.556	0.566	0.577	0.585	0.594	0.603	0.612	0.621
Arunachal Pradesh	0.413	0.422	0.430	0.438	0.447	0.457	0.466	0.477	0.487	0.500	0.513	0.526	0.539	0.552	0.565	0.578	0.589	0.600	0.611	0.622	0.633
Assam	0.421	0.429	0.437	0.446	0.454	0.462	0.471	0.479	0.487	0.496	0.504	0.514	0.523	0.532	0.542	0.552	0.562	0.571	0.580	0.589	0.598
Bihar	0.318	0.321	0.325	0.329	0.334	0.338	0.346	0.354	0.363	0.371	0.380	0.390	0.400	0.411	0.421	0.431	0.440	0.449	0.458	0.467	0.476
Chhattisgarh	0.376	0.386	0.395	0.405	0.414	0.425	0.436	0.449	0.461	0.473	0.485	0.497	0.509	0.521	0.534	0.547	0.558	0.568	0.579	0.590	0.601
Delhi	0.592	0.602	0.612	0.623	0.633	0.643	0.653	0.664	0.674	0.684	0.694	0.705	0.715	0.724	0.734	0.744	0.752	0.759	0.766	0.773	0.780
Goa	0.586	0.597	0.608	0.616	0.623	0.631	0.638	0.645	0.654	0.664	0.673	0.686	0.696	0.707	0.718	0.729	0.738	0.748	0.757	0.766	0.775
Gujarat	0.473	0.480	0.487	0.495	0.503	0.512	0.522	0.532	0.542	0.551	0.561	0.571	0.580	0.589	0.598	0.607	0.615	0.623	0.631	0.639	0.647
Haryana	0.484	0.494	0.503	0.513	0.524	0.534	0.545	0.557	0.569	0.580	0.591	0.602	0.613	0.624	0.635	0.646	0.655	0.664	0.674	0.684	0.694
Himachal Pradesh	0.496	0.508	0.520	0.531	0.541	0.553	0.564	0.575	0.587	0.598	0.610	0.622	0.633	0.644	0.654	0.662	0.669	0.677	0.685	0.693	0.701
Jammu and Kashmir	0.429	0.441	0.452	0.464	0.475	0.486	0.497	0.507	0.518	0.528	0.539	0.549	0.559	0.569	0.579	0.589	0.598	0.606	0.615	0.624	0.633
Jharkhand	0.365	0.373	0.381	0.389	0.397	0.406	0.415	0.424	0.433	0.442	0.453	0.464	0.475	0.487	0.499	0.512	0.523	0.534	0.545	0.556	0.567
Karnataka	0.457	0.465	0.474	0.481	0.490	0.499	0.509	0.521	0.532	0.543	0.554	0.565	0.576	0.586	0.596	0.606	0.614	0.622	0.631	0.640	0.649
Kerala	0.535	0.545	0.553	0.562	0.570	0.580	0.589	0.599	0.608	0.619	0.628	0.638	0.648	0.657	0.667	0.676	0.683	0.689	0.696	0.703	0.710
Madhya Pradesh	0.385	0.391	0.397	0.404	0.411	0.418	0.425	0.433	0.441	0.450	0.459	0.470	0.481	0.494	0.507	0.520	0.532	0.544	0.556	0.568	0.580
Maharashtra	0.512	0.519	0.526	0.534	0.543	0.553	0.564	0.576	0.588	0.599	0.610	0.620	0.630	0.639	0.648	0.658	0.666	0.674	0.682	0.690	0.698
Manipur	0.433	0.444	0.455	0.467	0.480	0.494	0.507	0.518	0.529	0.540	0.549	0.560	0.571	0.581	0.591	0.601	0.610	0.619	0.629	0.639	0.649
Meghalaya	0.402	0.417	0.431	0.443	0.455	0.467	0.477	0.488	0.498	0.508	0.519	0.530	0.541	0.552	0.563	0.575	0.585	0.595	0.605	0.615	0.625
Mizoram	0.482	0.492	0.502	0.511	0.520	0.528	0.537	0.545	0.553	0.562	0.572	0.581	0.591	0.601	0.611	0.621	0.630	0.640	0.649	0.658	0.667
Nagaland	0.456	0.473	0.490	0.505	0.519	0.533	0.545	0.559	0.572	0.585	0.597	0.610	0.622	0.634	0.645	0.654	0.661	0.669	0.676	0.683	0.690
Odisha	0.376	0.385	0.393	0.402	0.413	0.422	0.433	0.445	0.457	0.468	0.480	0.491	0.503	0.514	0.526	0.537	0.547	0.557	0.567	0.577	0.587
Punjab	0.503	0.511	0.519	0.527	0.535	0.545	0.555	0.566	0.576	0.587	0.598	0.608	0.618	0.627	0.636	0.643	0.650	0.657	0.663	0.669	0.675
Rajasthan	0.382	0.390	0.397	0.405	0.414	0.422	0.430	0.440	0.449	0.457	0.468	0.479	0.490	0.500	0.511	0.521	0.530	0.538	0.547	0.556	0.565
Sikkim	0.430	0.441	0.453	0.466	0.478	0.490	0.501	0.511	0.520	0.536	0.551	0.565	0.579	0.593	0.607	0.620	0.632	0.643	0.655	0.667	0.679
Tamil Nadu	0.487	0.496	0.505	0.513	0.521	0.531	0.541	0.552	0.563	0.575	0.587	0.599	0.610	0.621	0.632	0.640	0.648	0.655	0.662	0.669	0.676
Telangana	0.417	0.428	0.438	0.449	0.459	0.470	0.482	0.495	0.509	0.521	0.535	0.549	0.562	0.574	0.587	0.599	0.609	0.620	0.630	0.640	0.650
Tripura	0.438	0.451	0.462	0.470	0.478	0.485	0.491	0.497	0.504	0.511	0.518	0.527	0.536	0.545	0.554	0.564	0.573	0.581	0.590	0.599	0.608
Uttar Pradesh	0.362	0.368	0.374	0.382	0.390	0.398	0.407	0.415	0.423	0.432	0.441	0.451	0.462	0.473	0.485	0.498	0.508	0.519	0.530	0.541	0.552
Uttarakhand	0.412	0.424	0.436	0.449	0.463	0.477	0.491	0.505	0.519	0.535	0.551	0.568	0.583	0.598	0.613	0.628	0.639	0.651	0.663	0.675	0.687
West Bengal	0.438	0.446	0.454	0.462	0.470	0.478	0.486	0.496	0.506	0.516	0.526	0.536	0.546	0.555	0.565	0.573	0.580	0.588	0.595	0.602	0.609
Standard deviation	0.064	0.065	0.066	0.066	0.066	0.067	0.067	0.068	0.068	0.069	0.069	0.069	0.069	0.069	0.068	0.068	0.067	0.066	0.066	0.067	0.067
Standard deviation / Average SDI	14.4%	14.3%	14.2%	14.0%	13.8%	13.7%	13.5%	13.3%	13.1%	12.9%	12.7%	12.5%	12.2%	11.9%	11.6%	11.3%	11.0%	10.8%	10.5%	10.7%	10.6%

Global Burden of Disease Collaborative Network: **Global Burden of Disease Study 2016 (GBD 2016) Socio-Demographic Index (SDI) 1970–2016.** In *Global Burden of Disease* (Insitute of Health Metrics and Evaluation (IHME) ed. Seattle; 2017.

The End