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Supplementary appendix

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Supplement to: Million Death Study Collaborators. Changes in cause-specific neonatal and 1–59-month child mortality in India from 2000 to 2015: a nationally representative survey. *Lancet* 2017; published online Sept 19. [http://dx.doi.org/10.1016/S0140-6736\(17\)32162-1](http://dx.doi.org/10.1016/S0140-6736(17)32162-1).

Supplementary webappendix: Changes in cause-specific neonatal and 1-59 month child mortality in India from 2000 to 2015: nationally-representative mortality study of 1.3 million homes

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A. Sub-national estimates of live births and child (under-five) mortality in India, 2000-2015

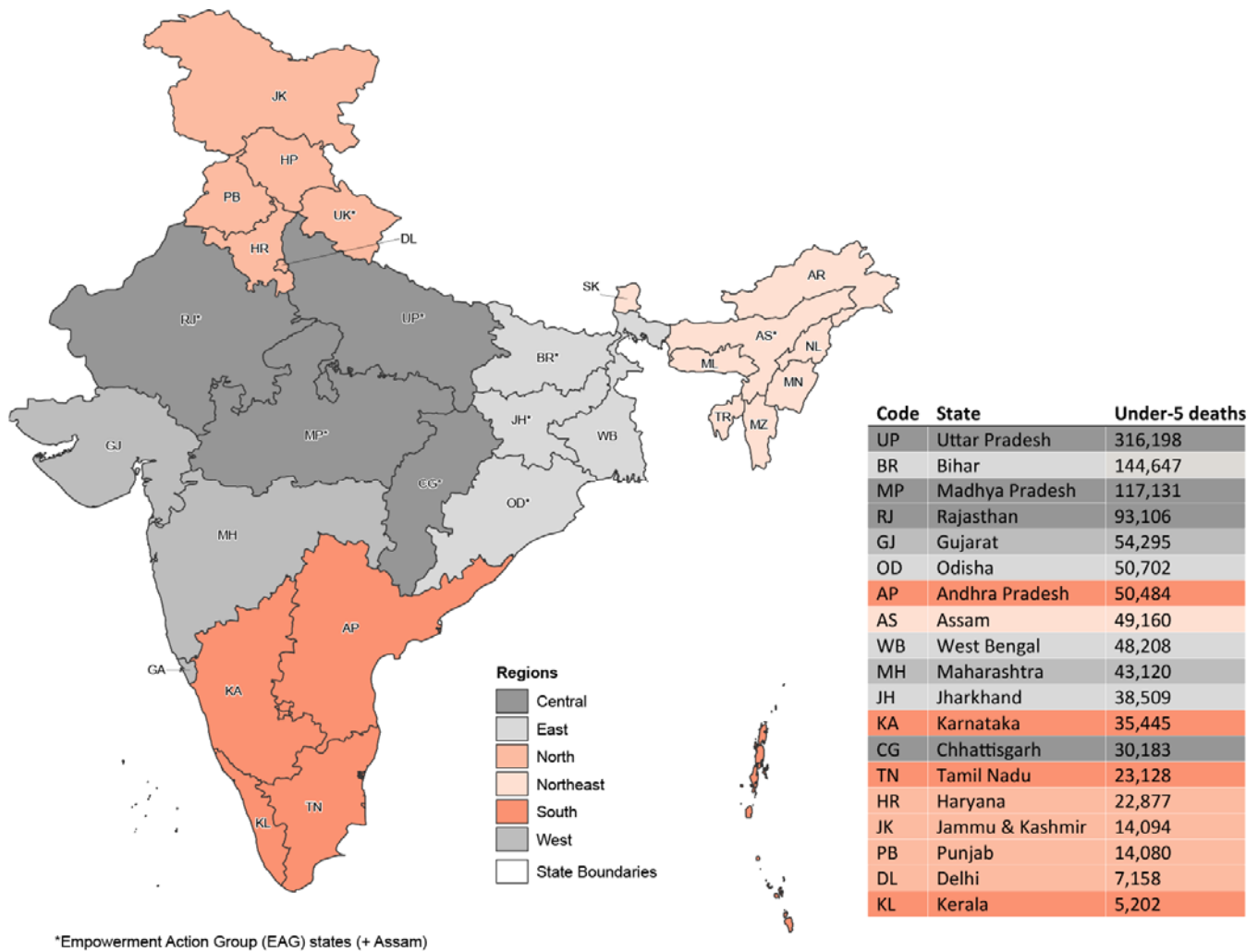
The MDS intends to provide temporal trends of cause-specific mortality for 16 years (from 2000 to 2015) based on 2001-2013 verbal autopsy data. We undertook specific procedures to manage the input data quality and smooth the expected noise in annual data. The demographic framework previously published along with causes of neonatal and child mortality estimates for 2005 were based on aggregated 2001-2003 MDS data.¹

India's SRS has continuously monitored births and deaths vital statistics since 1971 from its nationally representative samples, and the MDS has monitored the causes of death since 2001 within the Sample Registration System (SRS).² The United Nations Population Division (UNPD) and the United Nations Inter-agency Group for Child Mortality Estimation's (IGME) national estimates were partitioned for each of India's 35 states and union territories (UT) by using the population data from 1991-2011 Censuses of India and vital statistics from the SRS.²⁻⁴ (appendix figure 1) To obtain a consistent smooth periodic trend, we used SRS data from 1998 onwards to calculate three-year backward moving averages for live births and under-five mortality for 2000 onwards to 2014. For 2014 and 2015 years we used backward moving averages of 2013 to 2014.

SRS vital statistics, sex ratio at birth, proportion of infant deaths that occur in the neonatal period, infant mortality rates, and under-five mortality rates are available for bigger states, which have more than ten million residents. (There are no official SRS estimates for Telangana, a new state established in 2014 as a partition of Andhra Pradesh. SRS vital statistics are not published for smaller states. For these states we used the estimates from an adjacent big state as follows:

- Haryana for Chandigarh
- Uttar Pradesh for Uttaranchal
- Assam for each of Sikkim, Arunachal Pradesh, Nagaland, Manipur, Tripura and Mizoram
- Gujarat for each of Daman-Diu and Dadra & Nagar Haveli
- Maharashtra for Goa
- Kerala for Lakshadweep
- Tamil Nadu for Pondicherry
- Karnataka for A&N Islands

We use SRS rates for our sub-national mortality envelopes (adjusted to the UN estimated national totals) because SRS has been independently judged to have better ascertainment rates than the National Family Health Surveys (NFHS) and District Level Household Surveys (DLHS) in India.⁵⁻⁷ In contrast to these surveys, the SRS uses a continuous registration method with dual ascertainment of events in contrast to single retrospective review of child births and deaths and provides corresponding death rates for adults. Exceptions were made for states for which SRS data were not available or inconsistent. Specifically, we used estimated values from a fitted regression on pooled data from SRS vital rates, NFHS-3 and DLHS-2 rates for Jharkhand and Chhattisgarh, which became new states in 2001. For Jammu & Kashmir and Delhi, the 2004 SRS rate were used for prior years because SRS did not report reliable rates prior to 2004. Slight differences between current estimates for 2001-2003 in this publication and those from our previously published are due to updates in records.¹



Appendix Figure 1. States and major regions of India and estimated child (under-five) deaths for big states in 2015.

State-level, gender and urban/rural estimates of live births, neonatal deaths and deaths at ages 1-59 months were calculated for each year from 2000 to 2015. The calculations were adjusted to reflect the UNPD estimates for live births and IGME’s estimates for neonatal, infant, and under-five deaths in India for the period 2000-2015 as follows:

1. Live births

We used census projections of India’s population for 1991, 2001, and 2011 to interpolate annual population by five-year age groups and by gender for rural and urban areas of each state yielding 140 strata for 35 states and UT. The annual national population was multiplied by annual SRS crude birth rates multiplied by the SRS sex ratios. The resulting total numbers of live births by gender were then adjusted to reflect the UNPD gender-specific totals for India and then proportionately redistributed for each stratum.

2. Under-five child deaths

2.1 Infant deaths

We estimated total infant deaths by multiplying annual live birth estimates by the corresponding SRS infant mortality rates.

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No SRS infant mortality rate estimates were available for the following small states: Arunachal Pradesh, Chandigarh, Dadra and Nagar Haveli, Daman and Diu, Goa, Lakshadweep, Manipur, Meghalaya, Mizoram, Nagaland, Pondicherry, Sikkim, Tripura, Uttarakhand and A & N Islands. Thus, the relevant reference big state's infant mortality rate was applied to the small states as described above in Section A. Urban and rural deaths were determined in proportion to SRS urban and rural deaths. These estimates were finally adjusted to reflect the UN IGME infant mortality estimates for India.

2.2 Neonatal deaths

We calculated total neonatal deaths by multiplying the total infant deaths from step (2.1) by the proportion of neonatal to infant mortality rates (at the state level and by urban/rural area) reported by the SRS. We adjusted these estimates to reflect the IGME neonatal mortality estimates for India. To stratify by gender, weighted male to female death proportions from the MDS were calculated using three yearly backward moving averages. Gender specific death totals in each state were then multiplied by the corresponding urban to rural ratio of SRS neonatal mortality rates.

2.3 Child -under 5 deaths (0-4 years)

SRS mortality estimates for total child deaths do not use live births as a denominator. Therefore, under-five deaths were estimated for each year from 2000 to 2015 using the following steps:

- (a) From the annual census projections of the population of India^{2,3} the under-five age population, by gender for each urban and rural area of each state, was extracted and was adjusted to reflect the gender-specific under-five UNPD population estimates for India.⁴
- (b) To calculate the under-five deaths, we multiplied the population of each urban and rural area of each state by the corresponding gender specific SRS crude death rates and then adjusted these to IGME under-five death totals for corresponding years.

2.3 Other age groups

- (a) Total deaths between 29 days and one year were calculated by subtracting the neonatal deaths from step (2.2) from the infant deaths from step (2.1).
- (b) Total deaths at ages 1-59 months were calculated by subtracting the neonatal deaths in step (2.2) from the under-five deaths of step (2.3).

3. Mortality rates

Mortality rates for neonates, for children at ages 1-59 months and for children under-five years were calculated for both genders and for urban and rural areas of each state using the adjusted estimates of total deaths and live births described above. We used simple annual rates of change to compare three six-year periods corresponding to the years prior to the NHM (2000-2005), roll out phase of the NHM programs (2005-2010) and post-NHM implementation (2010-2015):

$$\text{Average annual percent change} = \text{Average}((Y_2 - Y_1)/Y_1, (Y_3 - Y_2)/Y_2, (Y_4 - Y_3)/Y_3, (Y_5 - Y_4)/Y_4, (Y_6 - Y_5)/Y_5) * 100$$

Uncertainty in the underlying demographic estimates

The major source of uncertainty in the regional and gender variation in cause-specific mortality rates in this study is the cause of death proportion. The UN annual estimates of total number of live births and deaths by country are widely accepted and the corresponding uncertainty bounds are also made available by the UNPD and IGME. The SRS does not publish uncertainty bounds for each state by residence type, and without those, sub-national uncertainty estimates cannot be generated.

B. ICD-10 Classification of neonatal deaths and deaths at ages 1-59 months

Three-character International Classification of Diseases (ICD-10)⁸ codes were assigned to each child death; inconsistencies in coding (after adjudication) were revised and, if necessary, re-classified with input from the Child Health and Epidemiology Reference Group (CHERG).⁹ Two classification systems were developed for the causes of neonatal deaths (appendix box 1) and deaths among children aged 1-59 months (appendix box 2).

Infections during the neonatal period are difficult to classify using verbal autopsy, given the large overlap in symptoms and signs during the neonatal period, and especially during the first 1-2 weeks of life, when most of these deaths occurred. For this reason, neonatal pneumonias, sepsis and CNS infections are combined under a common category 'Neonatal infections'. Similarly, given the difficulty in separating prematurity from low birthweight outside hospital settings, these two conditions are kept together as the category 'Prematurity/ low birthweight'.

Specific rules were used when assigning final cause of death to neonatal tetanus. Deaths coded as tetanus (A33) before the

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third day of life were re-classified according to the alternative ICD-10 codes assigned either by the physicians during the coding process or available keywords to either bacterial sepsis of the newborn (P36), central nervous system infections (A80-A89) or birth asphyxia/trauma (P21, P10-P15).

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Box 1: Cause of death classification for neonates

Disease	ICD-10 range
Communicable, perinatal and nutritional conditions	
Prematurity/low birthweight Birth asphyxia/trauma	P01, P05, P07, P22, P25-P28, P52, P61, P77, R04 P00, P02, P03, P10-P15, P20, P21, P24, P29, P50, P90, P91
Neonatal infections	
Neonatal pneumonia	A37, H65-H68, H70, H71, J00-J22, J32, J36, J85, J86, P23, U04
Meningitis/encephalitis	A39, A81-A89, G00-G09
Sepsis	A20-A28, A32, A38, A40-A44, A46, A48, A49, A68-A70, A74, A75, A77-A79, B95, B96, H10, H60, I30, I32-I33, I39-I41, K65, K67, K81, L00-L04, L08, M00-M01, M60, M86, N10, N30, N34, N41, N49, N61, P35-P39
Tetanus	A33-A35
Other conditions	
Diarrhoea	A00-A09
Poliomyelitis	A80, B91
Measles	B01, B05
Malaria	B50-B54
Other infectious and parasitic diseases	A15-A19, A30-A31, A36, A50-A67, A71, A90-A99, B00, B02-B04, B06-B09, B15-B27, B30, B33-B49, B55-B60, B64-B83, B85-B90, B92, B94, B97, B99, J65, K04, K05, K61, N70-N74, R50, R75, U00, Y95
Nutritional	D50-D53, E00-E02, E40-E46, E50-E56, E59-E61, E63, E64, X53-X54
Other perinatal conditions	P96
Non-communicable diseases	
Congenital	G10-G99, Q00-Q99
Non-communicable	C00-C97, D01-D48, D55-D89, E03-E35, E65-E90, F00-F99, H00-H06, H11-H59, H61-H62, H69, H72-H95, I00-I28, I31, I34-I38, I42-I99, J30, J31, J33-J35, J37-J47, J60, J64, J66-J70, J80-J82, J84, J90-J99, K00-K03, K06-K60, K62-K63, K70-K80, K82-K93, L05, L10-L99, M02-M54, M61-M85, M87-M99, N00-N08, N11-N29, N31-N33, N35-N40, N42-N48, N50-N51, N60, N62-N64, N75-N99, P04, P08, P51, P53-P60, P70-P72, P74-P76, P78, P80-P83, P92-P94, R00, R01, R03, R05, R06, R11-R23, R26, R27, R29-R36, R39-R49, R55, R56, R59, R63, R70-R74, R76-R77, R80-R82, R84-R87, R90, R91
Injuries	S00-S99, T00-T98, V01-V99, W00-W99, X00-X52, X57-X99, Y00-Y91, Y97-Y98
Ill-defined or cause unknown	R02, R07, R09, R10, R25, R51-R54, R57-R58, R60-R62, R64, R68, R69, R78, R79, R83, R89, R92-R99

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Box 2: Cause of death classification for deaths at 1-59 months

Disease	ICD-10 range
Communicable, perinatal and nutritional conditions	
Pneumonia	A37, H65-H68, H70, H71, J00-J22, J32, J36, J85, J86, P23, U04
Diarrhoea	A00-A09
Acute bacterial sepsis and severe infections	A20-A28, A32, A38, A40-A44, A46, A48, A49, A68-A70, A74, A75, A77-A79, B95, B96, H10, H60, I30, I32, I33, I39-I41, K65, K67, K81, L00-L04, L08, M00-M01, M60, M86, N10, N30, N34, N41, N49, N61, P36, P38
Measles	B01, B05
Malaria	B50-B54
Meningitis/encephalitis	A39, A81-A89, G00-G09
Other infections	
Tuberculosis	A15-A19, B90, J65
Tetanus	A33-A35
Poliomyelitis	A80, B91
HIV/AIDS	B20-B24, R75
Other infectious and parasitic diseases	A30, A31, A36, A50-A67, A71, A90-A99, B00, B02-B04, B06-B09, B15-B19, B25-B27, B30, B33-B49, B55-B60, B64-B83, B85-B89, B92, B94, B97, B99, K02, K04, K05, K61, N70-N74, P35, P37, P39, U00, Y95
Fever of unknown origin	R50
Nutritional	D50-D53, E00-E02, E40-E46, E50-E56, E59-E61, E63, E64, X53-X54
Perinatal conditions*	P00-P04, P05-P07, P10-P15, P20-P22, P24-P29, P50, P52, P61, P77, P90-P91, P96
Non-communicable diseases	
Congenital	Q00-Q07, Q10-18, Q20-Q28, Q30-Q45, Q50-56, Q60-Q87, Q89-Q93, Q95, Q96-Q99
Non-communicable	C00-C97, D01-D48, D55-D89, E03-E35, E65-E90, F00-F99, G10-G99, H00-H06, H11-H59, H61-H62, H69, H72-H95, I00-I28, I31, I34-I38, I42-I99, J30, J31, J33-J35, J37-J47, J60, J64, J66-J70, J80-J82, J84, J90-J99, K00-K01, K03, K06-K60, K62-K63, K70-K80, K82-K93, L05, L10-L99, M02-M54, M61-M85, M87-M99, N00-N08, N11-N29, N31-N33, N35-N40, N42-N48, N50-N51, N60, N62-N64, N75-N99, P04, P08, P51, P53-P60, P70-P72, P74-P76, P78, P80-P83, P92-P94, R00, R01, R03-R05, R06, R11-R23, R26, R27, R29-R49, R55-R56, R59, R63, R70-R74, R76-R77, R80-R82, R84-R87, R90-R91
Injuries	S00-S99, T00-T98, V01-V99, W00-W99, X00-X52, X57-X99, Y00-Y91, Y97-Y98
Ill-defined or cause unknown	R02, R07, R09, R10, R25, R51-R54, R57-R58, R60-R62, R64, R68, R69, R78, R79, R83, R89, R92-R99

Note: *Deaths from perinatal conditions are reported with ill-defined causes in table of main text. Disaggregated values are available in appendix p 8, 11, 13, 15, and 17

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C. Additional results

Appendix Table 1: Annual study deaths by cause from the Million Death Study, India 2001-2013. A total of 94,309 under-five child deaths with verbal autopsies were coded by physicians.

Causes of death	Year													Total
	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	
Neonatal (age 0-28 days)														
Prematurity/low birthweight	1100	1432	1099	1404	1852	1947	1941	1947	1979	1840	1714	1639	1575	21469
Neonatal infections*	1093	1039	751	891	986	869	780	747	725	723	590	586	572	10352
Birth asphyxia/trauma	681	800	592	764	811	774	697	670	517	503	414	469	400	8092
Non-communicable	190	208	161	288	336	356	347	304	316	267	207	266	241	3487
Congenital	116	139	104	167	227	221	235	220	198	139	123	164	141	2194
Diarrhoea	114	122	101	131	164	160	120	125	143	139	91	107	101	1618
Injuries	14	19	14	22	30	29	27	26	19	35	26	45	24	330
Tetanus	98	98	68	75	106	98	100	60	42	33	15	14	8	815
Other conditions†	16	13	5	32	30	47	37	49	50	26	25	33	24	387
Other perinatal conditions	175	207	179	269	360	344	373	252	200	180	150	167	125	2981
Ill-defined‡	31	67	46	63	38	46	56	52	36	28	23	18	23	527
All causes	3628	4144	3120	4106	4940	4891	4713	4452	4225	3913	3378	3508	3234	52252
1-59 months														
Pneumonia	1383	1164	885	867	1076	988	946	809	780	660	600	480	410	11048
Diarrhoea	1048	893	775	783	833	730	761	611	608	481	376	331	294	8524
Non-communicable	350	323	275	274	364	339	341	305	314	238	249	189	188	3749
Injuries	304	245	208	228	316	283	272	245	235	266	242	204	174	3222
Other infections§	391	290	249	315	460	448	351	341	320	301	248	221	158	4093
Congenital	94	116	95	130	144	149	169	152	124	105	110	109	107	1604
Nutritional	94	129	119	129	209	220	181	170	158	146	123	88	78	1844
Malaria	263	176	148	146	217	222	183	140	171	153	129	94	58	2100
Meningitis/encephalitis	168	125	148	184	185	154	148	130	126	93	71	60	58	1650
Acute bacterial sepsis and severe infections	109	173	78	82	56	60	51	33	37	35	25	26	19	784
Measles	319	225	214	110	123	130	88	93	73	39	34	25	13	1486
Perinatal conditions¶	89	96	78	131	30	4	8	9	7	2	4	-	-	458
Ill-defined‡	139	149	133	86	127	160	167	117	90	95	99	88	55	1495
All causes	4751	4104	3405	3465	4140	3877	3666	3155	3043	2614	2310	1915	1612	42057
Under-five all causes	8379	8248	6525	7571	9080	8768	8379	7607	7268	6527	5688	5423	4846	94309

Notes: *Neonatal infections are predominantly pneumonia, followed by sepsis and meningitis/encephalitis. †Other conditions for neonatal deaths include polio, measles, malaria, other infectious and parasitic diseases, and nutritional diseases. ‡Ill-defined conditions include all ICD-10 'R' codes that have not been assigned to defined cause groups. Ill-defined causes averaged 1% in neonatal death and 4% in child death, and decreased in proportion over time. §Other infections for 1-59 months deaths include TB, tetanus, polio, HIV/AIDS, and other infectious and parasitic diseases. ¶Improvement in physician cause assignment reduced the number of deaths at ages 1-59 months misclassified as perinatal.

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Appendix Table 2: Annualized mortality rate per 1000 live births in India, 2000-2015.

Study deaths	Year																
	2001-13	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Live births (M)*		27.9	27.9	27.9	27.8	27.7	27.6	27.5	27.3	27.1	26.8	26.6	26.3	26.1	26.0	25.9	25.8
Neonatal (90% CI)	52252	45.0 (42, 49)	43.6 (41, 47)	42.2 (39, 46)	40.8 (38, 44)	39.3 (37, 43)	38.1 (35, 41)	37.0 (34, 40)	36.0 (33, 39)	35.0 (32, 38)	33.9 (31, 37)	32.8 (30, 36)	31.6 (29, 35)	30.3 (28, 34)	29.0 (27, 33)	27.9 (25, 32)	27.0 (24, 32)
Girls	23208	41.1	39.8	39.6	38.3	37.4	36.8	35.1	34.1	32.5	31.9	31.1	29.5	27.9	26.8	26.2	26.8
Boys	29044	48.5	47.0	44.6	43.0	41.1	39.3	38.7	37.7	37.1	35.8	34.3	33.4	32.5	31.0	29.4	27.1
Rural	29044	49.7	48.1	46.7	45.1	43.7	42.4	41.2	40.3	39.4	38.4	37.2	36.0	34.8	33.4	32.1	31.1
Urban	23208	28.8	28.1	27.1	26.2	24.9	24.2	23.3	22.4	21.2	20.4	19.6	18.6	17.3	16.1	15.5	15.0
Poorer states†	29353	51.9	50.1	48.2	46.6	45.3	44.2	42.8	41.6	40.6	39.5	38.4	37.2	35.9	34.3	32.9	31.8
Richer states	22899	36.0	35.2	34.4	33.1	31.4	30.0	29.0	28.2	27.2	26.1	25.0	23.6	22.5	21.5	20.8	20.1
1-59 months (90% CI)	42057	45.2 (43, 50)	43.3 (41, 47)	41.4 (39, 45)	39.5 (37, 43)	37.7 (35, 42)	35.8 (33, 40)	34.1 (31, 38)	32.3 (30, 36)	30.6 (28, 34)	28.9 (26, 32)	27.2 (24, 31)	25.6 (22, 29)	23.8 (20, 28)	22.4 (18, 27)	20.8 (16, 26)	19.6 (15, 26)
Girls	21841	54.2	52.1	49.0	46.8	43.7	41.2	39.7	38.0	36.6	34.3	32.1	30.5	28.7	26.7	24.3	21.2
Boys	20216	37.0	35.3	34.5	33.0	32.2	31.0	29.0	27.2	25.3	24.1	22.8	21.2	19.4	18.5	17.7	18.1
Rural	20216	49.6	47.6	45.2	42.9	41.0	39.5	38.0	36.0	33.9	31.6	29.6	27.5	25.3	23.6	22.0	20.9
Urban	21841	30.0	28.5	28.5	28.3	26.6	23.8	21.3	20.6	20.5	20.7	20.2	20.2	19.3	18.7	17.3	15.8
Poorer states	25565	56.2	53.9	51.2	48.6	46.0	44.2	42.4	40.1	37.8	35.6	33.8	31.7	29.4	27.6	25.8	24.4
Richer states	16492	31.0	29.6	28.6	27.7	26.6	24.5	22.7	21.6	20.8	19.6	18.1	17.2	16.0	14.9	13.8	12.6
Under-five (90% CI)	94309	90.1 (88, 95)	86.9 (85, 91)	83.6 (81, 88)	80.3 (78, 84)	77.0 (75, 81)	74.0 (72, 78)	71.1 (69, 75)	68.3 (66, 72)	65.6 (62, 69)	62.8 (60, 66)	60.0 (57, 63)	57.2 (54, 61)	54.2 (51, 59)	51.4 (48, 57)	48.8 (45, 55)	46.6 (42, 53)
Girls	45049	95.3	91.9	88.6	85.1	81.1	78.0	74.9	72.0	69.1	66.1	63.2	60.0	56.6	53.5	50.5	48.0
Boys	49260	85.5	82.3	79.0	76.0	73.3	70.4	67.6	64.9	62.4	59.8	57.2	54.6	51.9	49.4	47.2	45.2
Rural	49260	99.3	95.7	91.8	88.0	84.7	81.9	79.2	76.3	73.3	70.0	66.8	63.5	60.1	57.0	54.2	51.9
Urban	45049	58.8	56.7	55.6	54.5	51.6	48.1	44.6	43.0	41.8	41.1	39.8	38.8	36.6	34.8	32.8	30.8
Poorer states	54918	108.1	104.0	99.4	95.2	91.3	88.4	85.2	81.7	78.3	75.2	72.2	68.9	65.2	61.9	58.7	56.2
Richer states	39391	67.1	64.8	63.0	60.8	58.0	54.6	51.8	49.8	47.9	45.7	43.1	40.8	38.5	36.4	34.6	32.7

Notes: *Sub-nationally estimated live births were adjusted to reflect total live births from UNPD estimates. Sub-nationally estimated neonatal, infant and under-five deaths were adjusted to reflect the total death from IGME estimates. The 90% uncertainty bounds for all-cause mortality are as per IGME estimates. †The poorer states are lower income states - Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttarakhand and Uttar Pradesh - where approximately half of India's population lives.

webappendix: Changes in cause-specific in neonatal and 1-59 month child mortality in India from 2000 to 2015

Appendix Table 3: Estimated annualized child deaths (thousands) in India, 2000-2015.

	Year															
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Live births (M)*	27·9	27·9	27·9	27·8	27·7	27·6	27·5	27·3	27·1	26·8	26·6	26·3	26·1	26·0	25·9	25·8
Neonatal	1,254	1,216	1,176	1,134	1,092	1,054	1,017	982	946	910	871	831	793	753	722	696
Girls	544·2	527·7	519·3	505·5	491·5	482·6	457·8	440·8	417·6	405·2	391·9	368·3	346·1	329·9	321·6	328·2
Boys	709·4	687·8	656·2	628·5	600·0	571·6	558·8	541·0	528·7	504·4	479·4	462·7	446·5	422·8	400·1	367·7
Rural	1,071·2	1,037·7	1,003·1	966·0	931·3	897·5	865·6	835·2	805·9	774·0	740·1	706·9	677·9	646·7	620·4	598·0
Urban	182·5	177·8	172·5	168·1	160·2	156·6	151·1	146·6	140·4	135·6	131·2	124·2	114·7	106·0	101·3	97·8
Poorer states†	813·5	786·5	759·1	734·5	717·3	700·8	679·6	658·2	637·9	616·4	593·9	572·2	548·7	522·4	500·2	483·0
Richer states	440·1	429·0	416·4	399·5	374·2	353·3	337·1	323·6	308·5	293·2	277·4	258·9	243·9	230·3	221·6	212·9
1-59 months	1,259·5	1,206·4	1,152·6	1,099·3	1,044·9	990·3	936·7	882·0	829·2	775·4	723·8	674·8	622·2	580·9	539·0	505·1
Girls	718·4	689·9	652·4	617·2	575·6	539·4	517·9	491·3	469·5	435·9	404·7	381·0	355·6	328·8	298·2	259·9
Boys	541·1	516·5	500·2	482·1	469·3	450·9	418·9	390·7	359·6	339·5	319·1	293·8	266·7	252·1	240·8	245·2
Rural	1,069·6	1,026·0	970·9	917·5	873·5	836·3	798·6	746·6	693·6	637·4	589·1	539·6	494·1	457·9	425·6	401·8
Urban	189·8	180·4	181·7	181·8	171·4	154·0	138·1	135·3	135·5	138·0	134·7	135·2	128·2	123·0	113·4	103·4
Poorer states	880·7	846·6	806·1	765·6	728·4	701·6	673·2	633·3	593·4	555·5	522·5	486·8	449·1	420·9	392·1	371·1
Richer states	378·7	359·8	346·5	333·6	316·5	288·7	263·5	248·6	235·8	219·9	201·3	188·0	173·1	159·9	146·9	134·0
Under-five	2,513·1	2,421·9	2,328·1	2,233·3	2,136·4	2,044·5	1,953·4	1,863·8	1,775·5	1,685·0	1,595·1	1,505·9	1,414·8	1,333·6	1,260·8	1,201·0
Girls	1,262·6	1,217·6	1,171·7	1,122·7	1,067·1	1,022·0	975·7	932·1	887·2	841·1	796·6	749·4	701·7	658·7	619·9	588·1
Boys	1,250·5	1,204·3	1,156·4	1,110·6	1,069·3	1,022·5	977·7	931·7	888·3	843·9	798·5	756·5	713·2	674·9	640·9	612·9
Rural	2,140·8	2,063·7	1,973·9	1,883·4	1,804·9	1,733·8	1,664·2	1,581·8	1,499·5	1,411·4	1,329·2	1,246·5	1,171·9	1,104·6	1,046·0	999·8
Urban	372·3	358·2	354·2	349·9	331·5	310·6	289·2	282·0	276·0	273·7	265·9	259·4	242·9	228·9	214·8	201·2
Poorer states	1,694·3	1,633·1	1,565·2	1,500·1	1,445·8	1,402·5	1,352·8	1,291·5	1,231·2	1,172·0	1,116·4	1,059·0	997·8	943·3	892·3	854·1
Richer states	818·9	788·8	762·9	733·2	690·7	642·0	600·6	572·3	544·3	513·1	478·7	446·9	417·0	390·3	368·5	346·9

Notes: *Sub-nationally estimated live births were adjusted to reflect total live births from UNPD estimates. Sub-nationally estimated neonatal, infant and under-five deaths were adjusted to reflect the total death from IGME estimates. †The poorer states are lower income states - Assam, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Odisha, Rajasthan, Uttarakhand and Uttar Pradesh - where approximately half of India's population lives

webappendix: Changes in cause-specific in neonatal and 1-59 month child mortality in India from 2000 to 2015

Appendix Table 4: Annual cause-specific mortality rate per 1000 live births in India, 2000-2015.

Causes of death	Study deaths	Mortality rate (lower bound, upper bound)									Annualized Percent Change ¹		
		2000	2005		2010		2015		2000-05	2005-10	2010-15		
Neonatal													
Prematurity/low birthweight	21,469	12.3	(8.9, 14.6)	12.5	(9.1, 14.9)	14.3	(10.5, 17.0)	14.3	(10.5, 17.0)	0.4	2.8	0.0	
Neonatal infections*	10,352	11.9	(6.7, 16.1)	8.1	(4.5, 10.9)	5.7	(3.2, 7.7)	4.0	(2.2, 5.4)	-7.5	-6.7	-6.8	
Birth asphyxia/trauma	8,092	9.0	(4.0, 12.4)	6.5	(2.8, 8.8)	3.9	(1.7, 5.4)	2.2	(1.0, 3.0)	-6.5	-9.4	-10.9	
Non-communicable	3,487	2.4	(1.2, 3.6)	2.5	(1.2, 3.7)	2.2	(1.1, 3.3)	2.0	(1.0, 2.9)	0.7	-2.2	-2.1	
Congenital	2,194	1.8	(1.1, 2.3)	1.7	(1.0, 2.1)	1.4	(0.8, 1.8)	1.1	(0.6, 1.4)	-2.0	-3.3	-5.1	
Diarrhoea	1,618	1.6	(1.2, 1.9)	1.4	(1.0, 1.7)	1.3	(0.9, 1.5)	1.1	(0.8, 1.3)	-2.5	-2.0	-3.2	
Injuries	330	0.3	(0.1, 0.4)	0.4	(0.2, 0.5)	0.3	(0.2, 0.4)	0.5	(0.3, 0.7)	6.9	-2.6	10.1	
Tetanus	815	1.6	(1.0, 3.4)	1.3	(0.8, 2.6)	0.7	(0.5, 1.5)	0.0		-4.9	-10.2	-43.5	
Other conditions†	387	0.2	(0.1, 0.7)	0.4	(0.2, 1.2)	0.5	(0.2, 1.4)	0.4	(0.2, 1.3)	13.3	3.4	-0.9	
Other perinatal conditions	2,981	3.0	(1.5, 5.3)	2.8	(1.5, 5.0)	1.9	(1.0, 3.4)	1.1	(0.6, 2.0)	-0.8	-7.0	-10.3	
Ill-defined‡	527	0.8	(0.4, 1.4)	0.7	(0.4, 1.3)	0.5	(0.3, 0.9)	0.2	(0.1, 0.4)	-1.3	-7.5	-14.7	
All causes	52,252	45.0	(42, 49)	38.1	(35, 41)	32.8	(30, 36)	27.0	(24, 32)	-3.2	-3.0	-3.8	
1-59 months													
Pneumonia	11,048	11.2	(8.5, 12.7)	8.3	(6.3, 9.4)	6.2	(4.7, 7.1)	4.2	(3.2, 4.8)	-5.8	-5.6	-7.6	
Diarrhoea	8,524	9.4	(7.8, 10.6)	7.2	(6.0, 8.1)	5.3	(4.4, 6.0)	3.2	(2.6, 3.6)	-5.3	-5.9	-9.7	
Injuries	3,222	2.3	(2.0, 2.4)	2.4	(2.1, 2.5)	2.2	(1.9, 2.3)	2.7	(2.4, 2.8)	1.0	-1.6	4.2	
Non-communicable	3,749	3.5	(2.0, 5.6)	2.8	(1.6, 4.5)	2.6	(1.4, 4.1)	2.1	(1.2, 3.3)	-4.4	-1.8	-4.0	
Other infections§	4,093	3.4	(1.7, 5.8)	3.3	(1.6, 5.6)	2.9	(1.4, 4.8)	2.1	(1.0, 3.4)	-0.5	-3.0	-6.3	
Nutritional	1,844	1.5	(0.8, 2.4)	1.8	(1.0, 2.8)	1.7	(0.9, 2.6)	1.1	(0.6, 1.8)	3.4	-1.2	-7.4	
Malaria	2,100	2.0	(1.1, 2.7)	1.6	(0.9, 2.2)	1.3	(0.7, 1.8)	1.1	(0.6, 1.5)	-4.3	-3.9	-3.1	
Congenital	1,604	1.4	(0.9, 1.6)	1.3	(0.8, 1.5)	1.2	(0.7, 1.4)	1.0	(0.6, 1.2)	-1.0	-1.8	-3.5	
Meningitis/encephalitis	1,650	2.1	(0.9, 2.9)	1.9	(0.8, 2.6)	1.2	(0.5, 1.7)	0.8	(0.3, 1.1)	-2.0	-8.5	-7.3	
Acute bacterial sepsis and severe infections	784	1.6	(0.5, 2.6)	1.1	(0.3, 1.8)	0.5	(0.2, 0.9)	0.3	(0.1, 0.5)	-7.7	-13.3	-9.7	
Measles	1,486	3.3	(2.1, 3.6)	1.7	(1.1, 1.9)	0.9	(0.6, 1.0)	0.3	(0.2, 0.3)	-12.0	-11.0	-21.8	
Perinatal conditions¶	458	1.5	(0.5, 2.4)	1.1	(0.4, 1.7)	0.0		0.0		--	--	--	
Ill-defined‡	1,495	1.9	(1.1, 3.4)	1.4	(0.9, 2.6)	1.2	(0.7, 2.3)	1.1	(0.7, 2.0)	-5.2	-2.9	-2.1	
All causes	42,057	45.2	(43, 50)	35.8	(33, 40)	27.2	(24, 31)	19.6	(15, 26)	-4.5	-5.3	-6.4	

Notes: ICD-10 codes for each cause are listed in appendix pp 6-7. *Neonatal infections are predominantly pneumonia, followed by sepsis and meningitis/encephalitis. †Other conditions for neonatal deaths include polio, measles, malaria, other infectious and parasitic diseases, and nutritional diseases. ‡Ill-defined conditions include all ICD-10 'R' codes that have not been assigned to defined cause groups. Ill-defined causes averaged 1% in neonatal death and 4% in child death, and decreased in proportion over time. §Other infections for 1-59 months deaths include TB, tetanus, polio, HIV/AIDS, and other infectious and parasitic diseases. ¶Improvement in physician cause assignment reduced the number of deaths at ages 1-59 months misclassified under perinatal conditions. For 2003-2013, causes of deaths are calculated using 3-yearly backward moving averages of death proportions from Million Death Study, then adjusted to IGME death totals. For 2000-02 and 2014-15, we extrapolated predicted values from a cubic spline polynomial fitted on 2003 to 2013 death rates. We calculated rates by dividing estimated deaths by UNPD live birth estimates for India. For cause-specific rates, lower bounds reflect the rates when two independent physicians had immediate agreement, and the upper bounds reflect the rates when either physician assigned the cause of death. We normalized both rates across all years. ¹The average annual percent change is the average of simple annual rates of changes in mortality.

webappendix: Changes in cause-specific in neonatal and 1-59 month child mortality in India from 2000 to 2015

Appendix Table 5a: Cause-specific neonatal mortality rates per 1000 live births by sex

Causes of death		Mortality rate (lower bound, upper bound)				Annualized Percent Change [§]		
		2000	2005	2010	2015	2000-05	2005-10	2010-15
Live births in 000s	Boys	14,631	14,529	13,970	13,554			
	Girls	13,254	13,105	12,596	12,239			
Prematurity/low birthweight	Boys	13.3 (9.7, 15.8)	12.7 (9.2, 15.1)	15.1 (11.0, 18.0)	14.3 (10.4, 17.0)	-1.0	3.7	-1.2
	Girls	11.0 (8.0, 13.1)	12.3 (9.0, 14.7)	13.4 (9.8, 16.0)	14.5 (10.6, 17.3)	2.3	1.7	1.7
Neonatal infections*	Boys	12.4 (6.8, 16.8)	8.2 (4.5, 11.2)	5.7 (3.1, 7.8)	4.0 (2.2, 5.5)	-7.8	-7.0	-6.6
	Girls	11.4 (6.5, 15.4)	7.9 (4.5, 10.7)	5.7 (3.2, 7.6)	4.0 (2.3, 5.4)	-7.0	-6.4	-6.8
Birth asphyxia/trauma	Boys	10.2 (4.6, 14.0)	6.8 (3.1, 9.4)	4.4 (2.0, 6.1)	2.4 (1.1, 3.4)	-7.6	-8.3	-11.1
	Girls	7.8 (3.4, 10.6)	6.1 (2.7, 8.2)	3.4 (1.5, 4.6)	1.9 (0.8, 2.6)	-4.9	-10.9	-11.0
Non-communicable	Boys	2.8 (1.4, 4.0)	2.7 (1.3, 3.9)	2.3 (1.2, 3.4)	1.9 (1.0, 2.8)	-0.5	-2.8	-3.4
	Girls	2.1 (1.0, 3.1)	2.3 (1.1, 3.4)	2.2 (1.1, 3.2)	2.1 (1.0, 3.1)	2.1	-1.4	-0.5
Congenital	Boys	2.0 (1.1, 2.5)	1.7 (1.0, 2.2)	1.6 (0.9, 2.0)	1.1 (0.6, 1.4)	-2.5	-2.0	-7.0
	Girls	1.7 (1.0, 2.1)	1.6 (1.0, 2.0)	1.2 (0.7, 1.5)	1.0 (0.6, 1.3)	-1.5	-4.9	-2.7
Diarrhoea	Boys	1.6 (1.1, 1.9)	1.4 (1.0, 1.7)	1.2 (0.9, 1.4)	1.0 (0.7, 1.2)	-2.6	-3.1	-2.5
	Girls	1.6 (1.2, 2.0)	1.5 (1.1, 1.7)	1.4 (1.0, 1.7)	1.1 (0.8, 1.3)	-2.4	-0.8	-3.7
Injuries	Boys	0.2 (0.1, 0.3)	0.3 (0.2, 0.4)	0.4 (0.2, 0.5)	0.5 (0.3, 0.8)	9.0	5.8	7.2
	Girls	0.4 (0.2, 0.5)	0.5 (0.2, 0.6)	0.3 (0.1, 0.3)	0.4 (0.2, 0.6)	1.9	-10.2	11.3
Tetanus	Boys	1.8 (1.1, 3.7)	1.4 (0.9, 2.9)	0.7 (0.4, 1.4)	0.1 (0.1, 0.3)	-4.8	-12.6	-26.9
	Girls	1.5 (0.9, 3.0)	1.1 (0.7, 2.3)	0.8 (0.5, 1.6)	0.0 (0.0, 0.0)	-5.0	-7.1	-66.9
Other conditions†	Boys	0.2 (0.1, 0.7)	0.4 (0.2, 1.1)	0.5 (0.2, 1.4)	0.4 (0.2, 1.1)	12.2	4.9	-4.0
	Girls	0.2 (0.1, 0.6)	0.4 (0.2, 1.3)	0.4 (0.2, 1.4)	0.5 (0.2, 1.7)	17.8	1.9	4.0
Other perinatal conditions	Boys	3.3 (1.7, 5.7)	3.0 (1.6, 5.3)	2.0 (1.0, 3.5)	1.2 (0.6, 2.0)	-0.9	-7.8	-10.1
	Girls	2.7 (1.4, 4.8)	2.5 (1.3, 4.6)	1.9 (1.0, 3.4)	1.1 (0.6, 1.9)	-0.8	-5.8	-10.5
Ill-defined‡	Boys	0.9 (0.5, 1.6)	0.8 (0.4, 1.3)	0.5 (0.2, 0.8)	0.2 (0.1, 0.3)	-2.4	-8.8	-18.1
	Girls	0.7 (0.4, 1.2)	0.7 (0.3, 1.2)	0.5 (0.3, 0.9)	0.3 (0.1, 0.5)	0.2	-5.9	-10.8
All causes	Boys	48.5	39.3	34.3	27.1	-4.1	-2.7	-4.6
	Girls	41.1	36.8	31.1	26.8	-2.2	-3.3	-2.9
Neonatal (0-28 days) deaths in 000s	Boys	709	572	479	368	-4.2	-3.4	-5.2
	Girls	544	483	392	328	-2.4	-4.1	-3.4

Notes: ICD-10 codes for each cause are listed in appendix pp 6-7. *Neonatal infections are predominantly pneumonia, followed by sepsis and meningitis/encephalitis. †Other conditions for neonatal deaths include polio, measles, malaria, other infectious and parasitic diseases, and nutritional diseases. ‡Ill-defined conditions include all ICD-10 'R' codes that have not been assigned to defined cause groups. Ill-defined causes averaged 1% in neonatal death and 4% in child death, and decreased in proportion over time. For 2003-2013, causes of deaths are calculated using 3-yearly backward moving averages of death proportions from Million Death Study, then adjusted to IGME death totals. For 2000-02 and 2014-15, we extrapolated predicted values from a cubic spline polynomial fitted on 2003 to 2013 death rates. We calculated rates by dividing estimated deaths by UNPD live birth estimates for India. For cause-specific rates, lower bounds reflect the rates when two independent physicians had immediate agreement, and the upper bounds reflect the rates when either physician assigned the cause of death. We normalized both rates across all years. §The average annual percent change is the average of simple annual rates of changes in mortality.

webappendix: Changes in cause-specific in neonatal and 1-59 month child mortality in India from 2000 to 2015

Appendix Table 5b: Cause-specific 1-59 month child mortality rates per 1000 live births by sex

Causes of death		Mortality rate (lower bound, upper bound)								Annualized Percent Change [§]		
		2000	2005	2010	2015	2000-05	2005-10	2010-15				
Live births in 000s	Boys	14,631	14,529	13,970	13,554							
	Girls	13,254	13,105	12,596	12,239							
Pneumonia	Boys	8.9 (6.8, 10.2)	7.2 (5.5, 8.2)	5.2 (3.9, 5.9)	4.0 (3.0, 4.6)	-4.2	-6.4	-4.9				
	Girls	13.6 (10.3, 15.5)	9.5 (7.2, 10.8)	7.4 (5.6, 8.4)	4.4 (3.4, 5.0)	-6.9	-4.9	-9.6				
Diarrhoea	Boys	7.1 (5.9, 8.1)	5.9 (4.9, 6.6)	4.2 (3.5, 4.7)	3.0 (2.5, 3.4)	-3.8	-6.6	-6.4				
	Girls	11.9 (9.9, 13.4)	8.6 (7.1, 9.7)	6.5 (5.4, 7.4)	3.4 (2.9, 3.9)	-6.2	-5.3	-12.0				
Injuries	Boys	2.2 (2.0, 2.3)	2.3 (2.1, 2.4)	2.1 (1.9, 2.2)	2.4 (2.1, 2.5)	0.8	-1.8	2.7				
	Girls	2.4 (2.1, 2.5)	2.5 (2.2, 2.6)	2.3 (2.0, 2.4)	2.9 (2.6, 3.1)	0.5	-1.3	5.2				
Non-communicable	Boys	3.0 (1.7, 4.7)	2.6 (1.5, 4.1)	2.2 (1.3, 3.5)	2.2 (1.2, 3.4)	-2.5	-3.1	-0.4				
	Girls	4.1 (2.3, 6.7)	3.0 (1.7, 4.9)	2.9 (1.6, 4.7)	2.0 (1.1, 3.3)	-6.0	-0.5	-6.8				
Other infections*	Boys	3.0 (1.5, 4.8)	3.0 (1.5, 4.9)	2.3 (1.2, 3.8)	1.8 (0.9, 2.9)	0.5	-5.1	-4.6				
	Girls	4.0 (1.8, 6.8)	3.7 (1.7, 6.3)	3.5 (1.6, 5.9)	2.3 (1.1, 4.0)	-1.4	-1.2	-7.7				
Nutritional	Boys	1.2 (0.6, 1.8)	1.4 (0.7, 2.1)	1.3 (0.7, 1.9)	1.0 (0.5, 1.5)	3.1	-1.7	-4.3				
	Girls	1.9 (1.0, 3.1)	2.2 (1.2, 3.6)	2.1 (1.1, 3.4)	1.3 (0.7, 2.0)	3.6	-0.8	-9.6				
Malaria	Boys	1.5 (0.8, 2.0)	1.3 (0.7, 1.7)	1.2 (0.6, 1.6)	1.1 (0.6, 1.5)	-3.1	-1.6	-0.7				
	Girls	2.5 (1.5, 3.5)	1.9 (1.1, 2.6)	1.4 (0.8, 2.0)	1.1 (0.7, 1.5)	-5.1	-5.6	-4.7				
Congenital	Boys	1.5 (0.9, 1.7)	1.3 (0.8, 1.5)	1.0 (0.6, 1.2)	0.9 (0.5, 1.0)	-2.4	-4.4	-2.4				
	Girls	1.4 (0.8, 1.6)	1.4 (0.8, 1.6)	1.4 (0.9, 1.6)	1.1 (0.7, 1.3)	0.8	0.6	-4.6				
Meningitis/encephalitis	Boys	2.0 (0.8, 2.7)	1.7 (0.7, 2.3)	1.0 (0.4, 1.4)	0.8 (0.4, 1.1)	-3.4	-8.9	-4.4				
	Girls	2.3 (0.9, 3.2)	2.2 (0.9, 3.0)	1.4 (0.6, 2.0)	0.8 (0.3, 1.2)	-0.5	-8.2	-9.6				
Acute bacterial sepsis and severe infections	Boys	1.1 (0.4, 1.9)	0.8 (0.3, 1.3)	0.5 (0.2, 0.8)	0.2 (0.1, 0.4)	-6.8	-10.3	-14.5				
	Girls	2.1 (0.6, 3.4)	1.4 (0.4, 2.2)	0.6 (0.2, 0.9)	0.4 (0.1, 0.6)	-8.3	-15.4	-6.6				
Measles	Boys	2.5 (1.6, 2.7)	1.3 (0.9, 1.5)	0.8 (0.5, 0.8)	0.1 (0.0, 0.1)	-11.5	-10.8	-35.1				
	Girls	4.1 (2.6, 4.5)	2.1 (1.3, 2.3)	1.2 (0.7, 1.3)	0.4 (0.3, 0.5)	-12.2	-11.2	-16.8				
Perinatal conditions†	Boys	1.3 (0.5, 2.1)	0.9 (0.3, 1.5)	0.0 (0.0, 0.0)	-	-6.1	-	-				
	Girls	1.8 (0.6, 2.8)	1.2 (0.4, 1.9)	0.0 (0.0, 0.0)	-	-5.9	-	-				
Ill-defined‡	Boys	1.6 (1.0, 3.0)	1.3 (0.8, 2.5)	1.1 (0.7, 2.1)	1.0 (0.6, 1.8)	-4.1	-3.5	-2.3				
	Girls	2.1 (1.3, 3.9)	1.5 (0.9, 2.8)	1.3 (0.8, 2.5)	1.2 (0.7, 2.2)	-6.0	-2.2	-1.8				
All causes	Boys	37.0	31.0	22.8	18.1	-3.4	-5.9	-4.5				
	Girls	54.2	41.2	32.1	21.2	-5.4	-4.8	-7.9				
Age 1-59 month child deaths in 000s	Boys	541	451	319	245	-3.6	-6.7	-5.1				
	Girls	718	539	405	260	-5.6	-5.6	-8.4				

Notes: ICD-10 codes for each cause are listed in appendix pp 6-7. *Other infections for 1-59 months deaths include TB, tetanus, polio, HIV/AIDS, and other infectious and parasitic diseases. †Improvement in physician cause assignment reduced the number of deaths at ages 1-59 months misclassified under perinatal conditions. ‡Ill-defined conditions include all ICD-10 'R' codes that have not been assigned to defined cause groups. Ill-defined causes averaged 1% in neonatal death and 4% in child death, and decreased in proportion over time. For 2003-2013, causes of deaths are calculated using 3-yearly backward moving averages of death proportions from Million Death Study, then adjusted to IGME death totals. For 2000-02 and 2014-15, we extrapolated predicted values from a cubic spline polynomial fitted on 2003 to 2013 death rates. We calculated rates by dividing estimated deaths by UNPD live birth estimates for India. For cause-specific rates, lower bounds reflect the rates when two independent physicians had immediate agreement, and the upper bounds reflect the rates when either physician assigned the cause of death. We normalized both rates across all years. §The average annual percent change is the average of simple annual rates of changes in mortality.

webappendix: Changes in cause-specific in neonatal and 1-59 month child mortality in India from 2000 to 2015

Appendix Table 6a: Cause-specific neonatal mortality rates per 1000 live births by poorer/richer states

Causes of death		Mortality rate (lower bound, upper bound)				Annualized Percent Change [§]		
		2000	2005	2010	2015	2000-05	2005-10	2010-15
Live births in 000s	Poorer	15,676	15,865	15,469	15,190			
	Richer	12,209	11,769	11,097	10,604			
Prematurity/low birthweight	Poorer	11.3 (8.3, 13.5)	13.3 (9.7, 15.8)	16.5 (12.1, 19.7)	17.8 (13.0, 21.1)	3.2	4.5	1.5
	Richer	13.5 (9.7, 15.9)	11.5 (8.2, 13.5)	11.2 (8.1, 13.3)	9.5 (6.8, 11.2)	-3.2	-0.4	-3.3
Neonatal infections*	Poorer	16.5 (9.7, 21.8)	10.9 (6.4, 14.4)	7.6 (4.5, 10.0)	5.1 (3.0, 6.7)	-7.9	-6.9	-7.6
	Richer	6.1 (3.0, 8.7)	4.3 (2.1, 6.1)	3.0 (1.5, 4.3)	2.4 (1.2, 3.4)	-6.7	-6.5	-4.4
Birth asphyxia/trauma	Poorer	10.1 (4.2, 13.9)	7.0 (2.9, 9.6)	4.0 (1.6, 5.4)	1.8 (0.7, 2.5)	-7.1	-10.7	-14.4
	Richer	7.4 (3.6, 10.2)	5.7 (2.7, 7.8)	3.9 (1.9, 5.3)	2.8 (1.4, 3.9)	-5.1	-7.4	-6.1
Non-communicable	Poorer	2.6 (1.2, 3.8)	2.6 (1.2, 3.8)	2.6 (1.2, 3.8)	2.4 (1.1, 3.5)	0.6	-0.3	-1.3
	Richer	2.4 (1.3, 3.4)	2.4 (1.3, 3.5)	1.8 (1.0, 2.6)	1.4 (0.8, 2.1)	0.4	-5.3	-4.4
Congenital	Poorer	1.7 (0.9, 2.3)	1.5 (0.8, 2.0)	1.0 (0.6, 1.4)	0.6 (0.3, 0.8)	-3.1	-6.4	-9.7
	Richer	2.0 (1.2, 2.4)	1.9 (1.2, 2.4)	1.9 (1.2, 2.3)	1.8 (1.1, 2.2)	-0.4	-0.3	-1.3
Diarrhoea	Poorer	2.0 (1.5, 2.4)	1.8 (1.4, 2.2)	1.7 (1.3, 2.0)	1.5 (1.1, 1.8)	-2.2	-1.3	-2.1
	Richer	1.1 (0.8, 1.4)	0.8 (0.6, 1.0)	0.7 (0.5, 0.8)	0.4 (0.3, 0.5)	-5.1	-4.5	-9.8
Injuries	Poorer	0.3 (0.2, 0.5)	0.4 (0.2, 0.5)	0.3 (0.2, 0.5)	0.7 (0.3, 0.9)	3.4	-2.1	16.0
	Richer	0.2 (0.1, 0.3)	0.3 (0.2, 0.5)	0.3 (0.2, 0.4)	0.3 (0.1, 0.4)	15.8	-2.6	-2.7
Tetanus	Poorer	2.8 (1.8, 5.6)	2.0 (1.3, 4.1)	1.2 (0.8, 2.4)	-	-6.0	-10.0	-60.1
	Richer	0.2 (0.1, 0.5)	0.3 (0.1, 0.6)	0.1 (0.0, 0.2)	0.1 (0.0, 0.3)	5.5	-14.6	1.9
Other conditions†	Poorer	0.1 (0.0, 0.3)	0.4 (0.2, 1.4)	0.6 (0.2, 1.9)	0.5 (0.2, 1.7)	37.4	6.1	-1.9
	Richer	0.4 (0.2, 1.1)	0.4 (0.2, 0.9)	0.3 (0.1, 0.8)	0.3 (0.1, 0.9)	-0.8	-2.1	0.9
Other perinatal conditions	Poorer	3.6 (1.8, 6.3)	3.4 (1.7, 6.0)	2.3 (1.2, 4.1)	1.3 (0.7, 2.4)	-0.4	-7.1	-10.3
	Richer	2.2 (1.2, 3.9)	2.0 (1.1, 3.6)	1.4 (0.7, 2.5)	0.8 (0.4, 1.5)	-1.9	-6.9	-10.0
Ill-defined‡	Poorer	0.9 (0.5, 1.6)	0.8 (0.4, 1.5)	0.5 (0.3, 1.0)	0.2 (0.1, 0.3)	-0.1	-8.2	-20.4
	Richer	0.7 (0.4, 1.2)	0.5 (0.3, 1.0)	0.4 (0.2, 0.7)	0.3 (0.2, 0.5)	-3.3	-5.9	-6.4
All causes	Poorer	51.9	44.2	38.4	31.8	-3.2	-2.8	-3.7
	Richer	36.0	30.0	25.0	20.1	-3.6	-3.6	-4.3
Neonatal (0-28 days) deaths in 000s	Poorer	814	701	594	483	-2.9	-3.3	-4.1
	Richer	440	353	277	213	-4.3	-4.7	-5.1

Notes: ICD-10 codes for each cause are listed in appendix pp 6-7. *Neonatal infections are predominantly pneumonia, followed by sepsis and meningitis/encephalitis. †Other conditions for neonatal deaths include polio, measles, malaria, other infectious and parasitic diseases, and nutritional diseases. ‡Ill-defined conditions include all ICD-10 'R' codes that have not been assigned to defined cause groups. Ill-defined causes averaged 1% in neonatal death and 4% in child death, and decreased in proportion over time. For 2003-2013, causes of deaths are calculated using 3-yearly backward moving averages of death proportions from Million Death Study, then adjusted to IGME death totals. For 2000-02 and 2014-15, we extrapolated predicted values from a cubic spline polynomial fitted on 2003 to 2013 death rates. We calculated rates by dividing estimated deaths by UNPD live birth estimates for India. For cause-specific rates, lower bounds reflect the rates when two independent physicians had immediate agreement, and the upper bounds reflect the rates when either physician assigned the cause of death. We normalized both rates across all years. §The average annual percent change is the average of simple annual rates of changes in mortality.

webappendix: Changes in cause-specific in neonatal and 1-59 month child mortality in India from 2000 to 2015

Appendix Table 6b: Cause-specific 1-59 month child mortality rates per 1000 live births by poorer/richer states

Causes of death		Mortality rate (lower bound, upper bound)				Annualized Percent Change [§]		
		2000	2005	2010	2015	2000-05	2005-10	2010-15
Live births in 000s	Poorer	15,676	15,865	15,469	15,190			
	Other	12,209	11,769	11,097	10,604			
Pneumonia	Poorer	15.4 (12.2, 17.6)	11.0 (8.7, 12.6)	8.1 (6.4, 9.3)	5.4 (4.3, 6.1)	-6.5	-5.9	-7.8
	Other	5.7 (4.1, 6.4)	4.5 (3.3, 5.2)	3.5 (2.5, 4.0)	2.4 (1.7, 2.8)	-4.3	-4.9	-7.3
Diarrhoea	Poorer	12.7 (10.5, 14.1)	9.8 (8.2, 10.9)	7.3 (6.1, 8.1)	4.5 (3.8, 5.0)	-4.9	-5.8	-9.2
	Other	5.2 (4.3, 6.1)	3.6 (2.9, 4.2)	2.5 (2.1, 2.9)	1.3 (1.1, 1.5)	-7.2	-6.7	-12.6
Injuries	Poorer	2.3 (2.0, 2.5)	2.4 (2.1, 2.5)	2.4 (2.1, 2.6)	3.4 (3.0, 3.6)	0.6	0.4	6.8
	Other	2.3 (2.1, 2.4)	2.3 (2.1, 2.4)	1.8 (1.7, 1.9)	1.6 (1.5, 1.7)	0.9	-4.8	-2.4
Non-communicable	Poorer	3.5 (1.9, 5.5)	3.0 (1.6, 4.8)	2.8 (1.5, 4.5)	2.4 (1.3, 3.8)	-2.6	-1.7	-2.9
	Other	3.6 (2.1, 5.7)	2.5 (1.5, 3.9)	2.3 (1.3, 3.5)	1.7 (1.0, 2.6)	-6.7	-2.0	-5.9
Other infections*	Poorer	4.4 (2.1, 7.5)	4.1 (1.9, 7.0)	3.6 (1.7, 6.1)	2.4 (1.1, 4.1)	-1.1	-2.6	-7.5
	Other	2.2 (1.1, 3.6)	2.3 (1.1, 3.7)	1.8 (0.9, 3.0)	1.6 (0.7, 2.5)	0.5	-4.2	-3.2
Nutritional	Poorer	2.2 (1.2, 3.3)	2.5 (1.4, 3.8)	2.1 (1.2, 3.2)	1.4 (0.8, 2.1)	3.7	-3.4	-7.2
	Other	0.6 (0.3, 0.9)	0.8 (0.4, 1.3)	1.1 (0.5, 1.8)	0.8 (0.4, 1.4)	7.2	6.7	-4.4
Malaria	Poorer	2.8 (1.6, 3.9)	1.9 (1.1, 2.7)	1.8 (1.0, 2.4)	1.4 (0.8, 2.0)	-6.9	-2.0	-3.9
	Other	1.0 (0.6, 1.3)	1.1 (0.7, 1.5)	0.7 (0.4, 0.9)	0.6 (0.4, 0.8)	3.7	-9.5	-1.6
Congenital	Poorer	1.1 (0.6, 1.3)	1.0 (0.5, 1.1)	0.9 (0.5, 1.1)	0.7 (0.4, 0.8)	-2.2	-0.8	-5.5
	Other	1.8 (1.2, 2.1)	1.9 (1.2, 2.1)	1.6 (1.0, 1.8)	1.5 (0.9, 1.7)	0.4	-2.5	-2.0
Meningitis/encephalitis	Poorer	2.1 (0.9, 2.9)	2.2 (0.9, 2.9)	1.4 (0.6, 1.9)	1.1 (0.5, 1.5)	1.0	-8.0	-5.0
	Other	2.1 (0.9, 3.0)	1.6 (0.6, 2.2)	0.9 (0.4, 1.3)	0.5 (0.2, 0.6)	-5.9	-9.8	-13.4
Acute bacterial sepsis and severe infections	Poorer	1.9 (0.7, 3.2)	1.3 (0.4, 2.1)	0.5 (0.2, 0.9)	0.3 (0.1, 0.5)	-7.5	-15.4	-9.1
	Other	1.2 (0.3, 1.9)	0.8 (0.2, 1.2)	0.5 (0.1, 0.8)	0.3 (0.1, 0.4)	-8.2	-9.3	-10.7
Measles	Poorer	4.2 (2.8, 4.5)	2.3 (1.5, 2.5)	1.3 (0.8, 1.3)	0.4 (0.3, 0.4)	-11.1	-11.2	-19.5
	Other	2.2 (1.3, 2.4)	0.9 (0.6, 1.0)	0.5 (0.3, 0.6)	0.0 (0.0, 0.0)	-14.7	-10.8	-33.9
Perinatal conditions†	Poorer	1.6 (0.5, 2.6)	1.0 (0.3, 1.7)	0.0 (0.0, 0.0)	-	-7.2	-	-
	Other	1.5 (0.6, 2.2)	1.1 (0.4, 1.6)	0.0 (0.0, 0.0)	-	-4.6	-	-
Ill-defined‡	Poorer	2.0 (1.2, 3.7)	1.6 (1.0, 3.0)	1.5 (0.9, 2.7)	1.3 (0.8, 2.4)	-4.2	-1.5	-1.8
	Other	1.7 (1.0, 3.2)	1.2 (0.7, 2.2)	0.9 (0.5, 1.6)	0.7 (0.5, 1.4)	-7.0	-6.0	-2.7
All causes	Poorer	56.2	44.2	33.8	24.4	-4.7	-5.2	-6.3
	Other	31.0	24.5	18.1	12.6	-4.6	-5.8	-7.0
Age 1-59 month child deaths in 000s	Poorer	881	702	522	371	-4.4	-5.7	-6.6
	Other	379	289	201	134	-5.3	-6.9	-7.8

Notes: ICD-10 codes for each cause are listed in appendix pp 6-7. *Other infections for 1-59 months deaths include TB, tetanus, polio, HIV/AIDS, and other infectious and parasitic diseases. †Improvement in physician cause assignment reduced the number of deaths at ages 1-59 months misclassified under perinatal conditions. ‡Ill-defined conditions include all ICD-10 'R' codes that have not been assigned to defined cause groups. Ill-defined causes averaged 1% in neonatal death and 4% in child death, and decreased in proportion over time. For 2003-2013, causes of deaths are calculated using 3-yearly backward moving averages of death proportions from Million Death Study, then adjusted to IGME death totals. For 2000-02 and 2014-15, we extrapolated predicted values from a cubic spline polynomial fitted on 2003 to 2013 death rates. We calculated rates by dividing estimated deaths by UNPD live birth estimates for India. For cause-specific rates, lower bounds reflect the rates when two independent physicians had immediate agreement, and the upper bounds reflect the rates when either physician assigned the cause of death. We normalized both rates across all years. §The average annual percent change is the average of simple annual rates of changes in mortality.

webappendix: Changes in cause-specific in neonatal and 1-59 month child mortality in India from 2000 to 2015

Appendix Table 7a: Cause-specific neonatal mortality rates per 1000 live births by rural/urban

Causes of death		Mortality rate (lower bound, upper bound)								Annualized Percent Change [§]		
		2000	2005		2010		2015		2000-05	2005-10	2010-15	
Live births in 000s	Rural	21,550	21,172		19,886		19,253					
	Urban	6,334	6,462		6,680		6,540					
Prematurity/low birthweight	Rural	13.2 (9.5, 15.8)	14.0 (10.1, 16.6)	16.6 (11.9, 19.7)	17.0 (12.3, 20.3)	1.1	3.5	0.6				
	Urban	8.8 (6.6, 10.3)	8.0 (6.0, 9.4)	7.9 (5.9, 9.3)	6.6 (5.0, 7.7)	-1.9	-0.2	-3.4				
Neonatal infections*	Rural	13.9 (7.8, 18.8)	9.5 (5.3, 12.8)	6.8 (3.8, 9.1)	4.6 (2.6, 6.3)	-7.4	-6.5	-7.2				
	Urban	5.2 (2.8, 7.2)	3.6 (2.0, 5.0)	2.6 (1.4, 3.6)	2.2 (1.2, 3.0)	-6.9	-6.4	-3.3				
Birth asphyxia/trauma	Rural	9.9 (4.3, 13.5)	7.2 (3.1, 9.8)	4.4 (1.9, 6.0)	2.4 (1.1, 3.4)	-6.2	-9.4	-10.8				
	Urban	6.0 (2.8, 8.1)	4.1 (1.9, 5.5)	2.6 (1.2, 3.5)	1.5 (0.7, 2.1)	-7.4	-8.5	-10.0				
Non-communicable	Rural	2.5 (1.2, 3.7)	2.6 (1.3, 3.9)	2.4 (1.2, 3.6)	2.3 (1.1, 3.3)	1.0	-1.6	-1.4				
	Urban	2.0 (1.0, 2.9)	2.0 (1.0, 2.8)	1.6 (0.8, 2.3)	1.2 (0.6, 1.7)	0.0	-4.2	-5.6				
Congenital	Rural	1.7 (1.0, 2.2)	1.5 (0.9, 2.0)	1.3 (0.8, 1.7)	0.9 (0.6, 1.2)	-2.3	-2.7	-6.6				
	Urban	2.1 (1.3, 2.5)	1.8 (1.1, 2.2)	1.5 (0.9, 1.8)	1.2 (0.7, 1.5)	-2.4	-4.0	-3.2				
Diarrhoea	Rural	1.8 (1.4, 2.2)	1.6 (1.2, 1.9)	1.5 (1.1, 1.8)	1.3 (1.0, 1.6)	-2.9	-1.2	-1.9				
	Urban	0.8 (0.6, 1.0)	0.8 (0.6, 1.0)	0.6 (0.4, 0.7)	0.2 (0.2, 0.3)	-0.1	-5.5	-15.9				
Injuries	Rural	0.3 (0.1, 0.4)	0.4 (0.2, 0.6)	0.3 (0.2, 0.4)	0.6 (0.3, 0.8)	9.7	-6.7	14.6				
	Urban	0.2 (0.1, 0.2)	0.2 (0.1, 0.2)	0.3 (0.1, 0.4)	0.3 (0.1, 0.4)	1.4	11.9	1.1				
Tetanus	Rural	2.0 (1.3, 4.2)	1.5 (0.9, 3.1)	0.8 (0.5, 1.7)	0.0	-5.6	-11.0	-58.4				
	Urban	0.5 (0.3, 0.7)	0.6 (0.3, 0.9)	0.5 (0.3, 0.7)	0.2 (0.1, 0.3)	5.7	-4.0	-14.6				
Other conditions†	Rural	0.2 (0.1, 0.7)	0.4 (0.2, 1.2)	0.5 (0.2, 1.7)	0.4 (0.2, 1.4)	10.6	6.7	-3.5				
	Urban	0.5 (0.2, 1.2)	0.5 (0.2, 1.2)	0.3 (0.1, 0.7)	0.4 (0.2, 0.9)	0.2	-9.5	5.3				
Other perinatal conditions	Rural	3.2 (1.7, 5.7)	3.0 (1.6, 5.4)	2.1 (1.1, 3.7)	1.1 (0.6, 2.0)	-0.7	-7.0	-11.2				
	Urban	2.1 (1.1, 3.6)	2.0 (1.1, 3.4)	1.4 (0.8, 2.4)	1.0 (0.5, 1.7)	-1.1	-6.2	-7.4				
Ill-defined‡	Rural	0.8 (0.4, 1.5)	0.7 (0.3, 1.2)	0.5 (0.3, 0.9)	0.3 (0.1, 0.4)	-3.6	-5.3	-11.6				
	Urban	0.7 (0.4, 1.1)	0.8 (0.4, 1.3)	0.4 (0.2, 0.7)	0.1 (0.1, 0.2)	5.6	-12.1	-21.7				
All causes	Rural	49.7	42.4		37.2		31.1		-3.1	-2.6	-3.6	
	Urban	28.8	24.2		19.6		15.0		-3.4	-4.1	-5.3	
Neonatal (0-28 days) deaths in 000s	Rural	1,071	898		740		598		-3.5	-3.8	-4.2	
	Urban	182	157		131		98		-3.0	-3.5	-5.7	

Notes: ICD-10 codes for each cause are listed in appendix pp 6-7. *Neonatal infections are predominantly pneumonia, followed by sepsis and meningitis/encephalitis. †Other conditions for neonatal deaths include polio, measles, malaria, other infectious and parasitic diseases, and nutritional diseases. ‡Ill-defined conditions include all ICD-10 'R' codes that have not been assigned to defined cause groups. Ill-defined causes averaged 1% in neonatal death and 4% in child death, and decreased in proportion over time. For 2003-2013, causes of deaths are calculated using 3-yearly backward moving averages of death proportions from Million Death Study, then adjusted to IGME death totals. For 2000-02 and 2014-15, we extrapolated predicted values from a cubic spline polynomial fitted on 2003 to 2013 death rates. We calculated rates by dividing estimated deaths by UNPD live birth estimates for India. For cause-specific rates, lower bounds reflect the rates when two independent physicians had immediate agreement, and the upper bounds reflect the rates when either physician assigned the cause of death. We normalized both rates across all years. §The average annual percent change is the average of simple annual rates of changes in mortality.

webappendix: Changes in cause-specific in neonatal and 1-59 month child mortality in India from 2000 to 2015

Appendix Table 7b: Cause-specific 1-59 month child mortality rates per 1000 live births by rural/urban

Causes of death		Mortality rate (lower bound, upper bound)								Annualized Percent Change [§]		
		2000	2005		2010		2015		2000-05	2005-10	2010-15	
Live births in 000s	Rural	21,550	21,172		19,886		19,253					
	Urban	6,334	6,462		6,680		6,540					
Pneumonia	Rural	13.0 (9.9, 14.9)	9.6 (7.3, 11.0)		7.0 (5.3, 8.0)		4.5 (3.4, 5.2)		-5.9	-6.1	-8.3	
	Urban	5.5 (4.3, 6.2)	4.3 (3.3, 4.8)		4.0 (3.1, 4.5)		3.1 (2.4, 3.5)		-4.9	-1.2	-4.8	
Diarrhoea	Rural	10.7 (8.9, 12.1)	8.3 (6.9, 9.4)		6.0 (5.0, 6.8)		3.5 (2.9, 4.0)		-4.9	-6.2	-10.1	
	Urban	5.2 (4.3, 5.7)	3.9 (3.2, 4.3)		3.1 (2.6, 3.4)		2.3 (1.9, 2.6)		-5.6	-4.1	-5.4	
Injuries	Rural	2.4 (2.2, 2.6)	2.4 (2.2, 2.5)		2.3 (2.1, 2.5)		2.8 (2.5, 3.0)		-0.3	-0.3	3.7	
	Urban	1.6 (1.4, 1.7)	2.1 (1.8, 2.3)		1.7 (1.4, 1.8)		2.3 (2.0, 2.4)		6.4	-4.7	6.8	
Non-communicable	Rural	3.7 (2.1, 5.9)	2.9 (1.6, 4.7)		2.6 (1.5, 4.2)		2.0 (1.1, 3.3)		-4.3	-2.4	-4.8	
	Urban	2.8 (1.6, 4.4)	2.3 (1.3, 3.6)		2.4 (1.4, 3.8)		2.2 (1.3, 3.4)		-3.8	1.0	-2.0	
Other infections*	Rural	3.9 (1.9, 6.5)	3.7 (1.8, 6.3)		3.1 (1.5, 5.2)		2.2 (1.0, 3.7)		-0.7	-3.5	-6.6	
	Urban	2.0 (1.0, 3.1)	2.1 (1.0, 3.4)		2.1 (1.0, 3.4)		1.6 (0.8, 2.6)		1.6	0.1	-5.5	
Nutritional	Rural	1.7 (0.9, 2.6)	2.0 (1.1, 3.1)		1.8 (1.0, 2.8)		1.2 (0.6, 1.8)		4.2	-1.9	-7.8	
	Urban	1.0 (0.5, 1.4)	1.1 (0.6, 1.6)		1.4 (0.7, 1.9)		1.1 (0.6, 1.5)		2.3	3.9	-4.0	
Malaria	Rural	2.3 (1.3, 3.2)	1.9 (1.1, 2.6)		1.5 (0.9, 2.0)		1.2 (0.7, 1.7)		-4.0	-4.4	-3.3	
	Urban	0.8 (0.4, 1.1)	0.7 (0.4, 0.9)		0.8 (0.4, 1.1)		0.7 (0.4, 1.0)		-2.4	3.7	-2.0	
Congenital	Rural	1.2 (0.7, 1.4)	1.2 (0.7, 1.3)		1.1 (0.7, 1.3)		0.9 (0.5, 1.0)		-0.8	-0.2	-4.7	
	Urban	2.0 (1.3, 2.2)	1.7 (1.1, 1.8)		1.4 (0.9, 1.5)		1.3 (0.8, 1.4)		-3.5	-3.2	-2.0	
Meningitis/encephalitis	Rural	2.1 (0.9, 2.9)	1.9 (0.8, 2.7)		1.3 (0.5, 1.8)		1.0 (0.4, 1.4)		-1.7	-7.5	-4.6	
	Urban	1.9 (0.8, 2.6)	1.6 (0.7, 2.2)		1.0 (0.4, 1.3)		0.3 (0.1, 0.4)		-3.0	-10.2	-21.4	
Acute bacterial sepsis and severe infections	Rural	1.7 (0.5, 2.9)	1.1 (0.3, 1.9)		0.5 (0.2, 0.9)		0.3 (0.1, 0.5)		-7.6	-13.3	-9.8	
	Urban	1.1 (0.3, 1.6)	0.8 (0.2, 1.1)		0.5 (0.1, 0.6)		0.2 (0.1, 0.3)		-7.2	-9.9	-12.2	
Measles	Rural	3.6 (2.3, 3.8)	1.9 (1.2, 2.1)		1.0 (0.6, 1.1)		0.3 (0.2, 0.3)		-11.3	-12.3	-19.4	
	Urban	2.3 (1.6, 2.5)	1.0 (0.7, 1.1)		0.8 (0.5, 0.8)		0.2 (0.1, 0.2)		-14.0	-5.5	-26.5	
Perinatal conditions†	Rural	1.5 (0.6, 2.4)	1.1 (0.4, 1.7)		0.0 (0.0, 0.1)		-		-4.9	-	-	
	Urban	2.0 (0.5, 2.9)	1.1 (0.2, 1.6)		0.0 (0.0, 0.0)		-		-11.1	-	-	
Ill-defined‡	Rural	1.9 (1.1, 3.6)	1.5 (0.9, 2.9)		1.2 (0.7, 2.4)		1.1 (0.7, 2.2)		-4.6	-3.7	-1.3	
	Urban	1.7 (1.0, 2.7)	1.1 (0.7, 1.8)		1.1 (0.7, 1.8)		0.8 (0.5, 1.3)		-8.0	0.1	-6.3	
All causes	Rural	49.6	39.5		29.6		20.9		-4.5	-5.6	-6.8	
	Urban	30.0	23.8		20.2		15.8		-4.4	-3.2	-4.7	
Age 1-59 month child deaths in 000s	Rural	1,070	836		589		402		-4.8	-6.8	-7.4	
	Urban	190	154		135		103		-4.0	-2.6	-5.1	

Notes: ICD-10 codes for each cause are listed in appendix pp 6-7. *Other infections for 1-59 months deaths include TB, tetanus, polio, HIV/AIDS, and other infectious and parasitic diseases. †Improvement in physician cause assignment reduced the number of deaths at ages 1-59 months misclassified under perinatal conditions. ‡Ill-defined conditions include all ICD-10 'R' codes that have not been assigned to defined cause groups. Ill-defined causes averaged 1% in neonatal death and 4% in child death, and decreased in proportion over time.

For 2003-2013, causes of deaths are calculated using 3-yearly backward moving averages of death proportions from Million Death Study, then adjusted to IGME death totals. For 2000-02 and 2014-15, we extrapolated predicted values from a cubic spline polynomial fitted on 2003 to 2013 death rates. We calculated rates by dividing estimated deaths by UNPD live birth estimates for India. For cause-specific rates, lower bounds reflect the rates when two independent physicians had immediate agreement, and the upper bounds reflect the rates when either physician assigned the cause of death. We normalized both rates across all years. §The average annual percent change is the average of simple annual rates of changes in mortality.

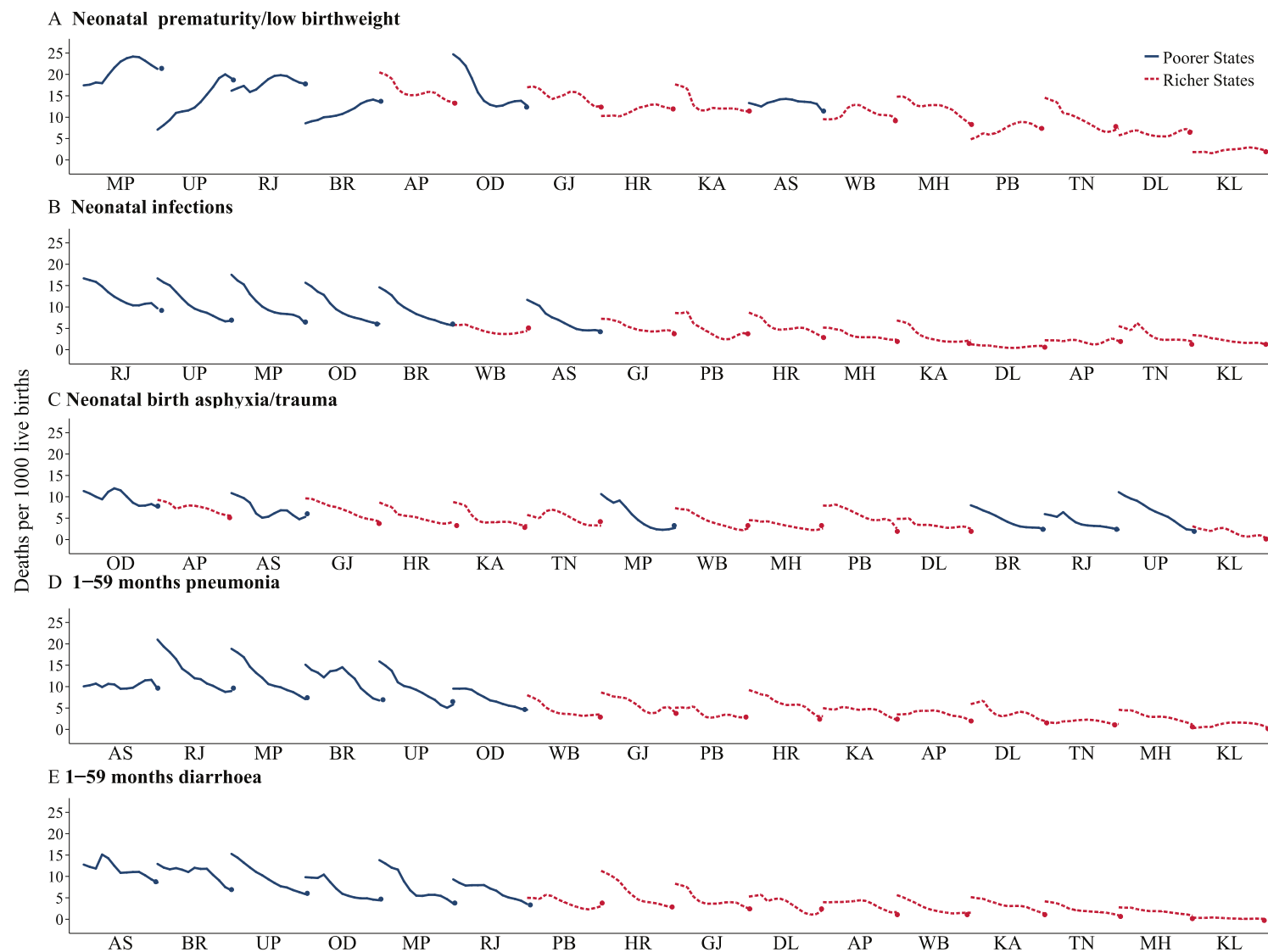
webappendix: Changes in cause-specific in neonatal and 1-59 month child mortality in India from 2000 to 2015

Appendix Table 8: Change in rank of COD and estimated deaths (thousands) for neonates and 1-59 month child deaths in India from 2000 to 2005 to 2015

Estimated deaths (2000)		Estimated deaths (2005)		Estimated deaths (2015)	
Neonates		Neonates		Neonates	
1. Prematurity/low birthweight	342	1. Prematurity/low birthweight	345	1. Prematurity/low birthweight	370
2. Neonatal infections*	333	2. Neonatal infections*	223	2. Neonatal infections*	103
3. Birth asphyxia/trauma	252	3. Birth asphyxia/trauma	178	3. Birth asphyxia/trauma	57
4. Non-communicable	68	4. Non-communicable	70	4. Non-communicable	52
5. Congenital	51	5. Congenital	46	5. Congenital	28
6. Tetanus	46	6. Diarrhoea	37	6. Diarrhoea	27
7. Diarrhoea	44	7. Tetanus	35	7. Injuries	13
8. Injuries	7	8. Injuries	10	8. Tetanus	0.6
Other conditions†	89	Other conditions†	89	Other conditions†	41
Ill-defined‡	22	Ill-defined‡	20	Ill-defined‡	6
All causes	1254	All causes	1054	All causes	696
1-59 months		1-59 months		1-59 months	
1. Pneumonia	311	1. Pneumonia	229	1. Pneumonia	108
2. Diarrhoea	262	2. Diarrhoea	198	2. Diarrhoea	82
3. Non-communicable	98	3. Other infection §	92	3. Injuries	69
4. Other infection §	96	4. Non-communicable	78	4. Non-communicable	54
5. Measles	92	5. Injuries	66	5. Other infection §	53
6. Injuries	63	6. Meningitis/encephalitis	53	6. Nutritional	29
7. Meningitis/encephalitis	59	7. Nutritional	49	7. Malaria	28
8. Malaria	55	8. Measles	47	8. Congenital	26
9. Acute bacterial sepsis and severe infections	44	9. Malaria	44	9. Meningitis/encephalitis	22
10. Nutritional	43	10. Congenital	37	10. Acute bacterial sepsis and severe infections	8
11. Congenital	40	11. Acute bacterial sepsis and severe infections	29	11. Measles	7
Perinatal conditions¶	43	Perinatal conditions¶	29	Perinatal conditions¶	--
Ill-defined‡	52	Ill-defined‡	39	Ill-defined‡	20
All causes	1259	All causes	990	All causes	505

Note: ICD-10 codes for each cause are listed in appendix pp 6-7. *Neonatal infections are predominantly pneumonia, followed by sepsis and meningitis/encephalitis. †Other conditions for neonatal deaths include polio, measles, malaria, other infectious and parasitic diseases, and nutritional diseases. ‡Ill-defined conditions include all ICD-10 'R' codes that have not been assigned to defined cause groups. Ill-defined causes averaged 1% in neonatal death and 4% in child death, and decreased in proportion over time. §Other infections for 1-59 months deaths include TB, tetanus, polio, HIV/AIDS, and other infectious and parasitic diseases. ¶Improvement in physician cause assignment reduced the number of deaths at ages 1-59 months misclassified under perinatal conditions. Causes of deaths are calculated using 3-yearly backward moving averages of death proportions from Million Death Study, then adjusted to IGME death totals. For 2000 and 2015, we extrapolated predicted values from a cubic spline polynomial fitted on 2003 to 2013 death rates.

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Appendix Figure 2: Cause-specific child mortality rates for top five causes of death in richer and poorer states in India, 2001-2013. States are ordered by decreasing 2013 cause-specific mortality rate. Richer states include Andhra Pradesh (AP), Delhi (DL), Gujarat (GJ), Haryana (HR), Karnataka (KA), Kerala (KL), Maharashtra (MH), Punjab (PB), Tamil Nadu (TN), and West Bengal (WB). Poorer states include Assam (AS), Bihar (BR), Madhya Pradesh (MP), Odisha (OD), Rajasthan (RJ), and Uttar Pradesh (UP). Each horizontal axis shows the 2001-13 trends in mortality rates.