

Extended Abstract

Completeness of death registration in India: An empirical approach

Krishna Kumar¹ & Nandita Saikia²

^{1,2}Centre for the Study of Regional Development, School of Social Sciences III, Jawaharlal Nehru University, New Delhi, India 110067

Introduction

Civil Registration System (CRS) is a permanent, continuous, compulsory and universal recording of vital events with the legal requirements (Office of Registrar General of India [ORGI], 2020; United Nations Children's Fund [UNICEF], 2019). CRS is the main source of vital statistics at national, state, district and block levels. The vital statistics generated through the CRS are legally acceptable and relevant for micro level planning, monitoring and evaluation of developmental and healthcare programmes (ORGI, 2020).

World Health Organisation (WHO) documented about two-third of deaths were not registered. Besides, majority of WHO member obtained incomplete data on mortality and cause of death (WHO, 2014). Previous studies showed estimation of mortality is challenging and quality of information is unsatisfactory in many lower and middle-income countries. Besides, the limitations on vital statistics are persistent over time (Luy et al., 2012; Mikkelsen et al., 2007).

India's Government introduced the Registration of Births and Deaths Act in 1969, which mandates registration of all births and deaths within 21 days (ORGI, 2020). Despite the provision of mandatory birth and death registration, nearly 2.8 million (10 %) birth and 1.1 million (14%) death was not registered in India in 2018 (ORGI, 2020). Besides, there has been huge disparity at the state level in terms of completeness of birth and death registration.

Furthermore, the method use by ORGI for estimating the completeness of birth and death registration is crude and lack disaggregation by age, sex and cause of death. Previous studies used indirect methods for estimating completeness of birth and death registration (Verma et

al., 2017; Oung et al., 2017). The indirect methods of estimation of completeness suffer from a number of limitations and unsatisfactory to their wide application at national and subnational administrative levels (Adair and Lopez, 2018). Further, previous studies documented that there is a need for a simple and accurate method to estimate completeness of registration (Kumar et al., 2017; Adair & Lopez, 2018; Verma et al., 2019). We aim to estimate the completeness of all age death registration at the India's state level.

Methods

We used data from the CRS annual report, 2016. ORGI publishes the annual report on total registered birth, death, infant death and stillbirth at the national, state and district levels. Besides, the report also provides completeness of birth and death registration at the national and state levels.

We estimated the completeness of all age death registration level using the empirical method. The empirical method used logit model that is a function of registered crude death rate, estimates of under-five mortality rate, and the proportion of people aged above 65 years. The model equations were developed using population and mortality rates from 2541 country years which included 110 countries and the period between 1970 and 2015. We used the second variant of the model because death registration completeness at all ages is not expected to be associated with completeness of child death registration (Adair & Lopez, 2018).

We estimated the crude death rate (CDR) for each State/UT. We defined CDR as number of registered deaths in the state/UT divided by estimated mid-year population of 2016, calculated using Census 2011 & 2001 population growth rate and Census 2011 population as the base population. We also estimated the proportion of people aged above 65 years for mid-year 2016 using census 2011 and 2001 population growth rate, and 2011 total population above 65 years as the base population, divided by estimated mid-year total population in 2016. The under-five mortality rate for all states is estimated using NFHS-4 dataset (IIPS & ICF, 2017). Mathematically, the model is written as follows.

$$\begin{aligned} \text{logit}(C_{jk}^{All}) = & \beta_0 + \text{RegCDRsq}_{jk} \times \beta_1 + \text{RegCDR}_{jk} \times \beta_2 + \%65_{jk} \times \beta_3 \\ & + \ln(5q0)_{jk} \times \beta_4 + k \times \beta_5 + e_{jk} + \gamma_j \end{aligned}$$

where C_{jk}^{All} is the completeness of registration at all ages, $logit(C_{jk}^{All})$ is $ln\left(\frac{C_{jk}^{All}}{1-C_{jk}^{All}}\right)$, $RegCDR_{jk}$ is the registered crude death rate (CDR), $RegCDRs_{jk}$ is the $RegCDR$ square, $\%65_{jk}$ is the proportion of the people aged above 65 years, $ln(5q0)_{jk}$ is the natural log of the under-five mortality rate, k is the calendar year, e is an error term, γ is a country-level random effect, j is country. β_0 is intercept and β_1 to β_5 are the regression coefficients.

Completeness is predicted by using inverse logit formula, given by, $\frac{e^{logit(C_{jk}^{All})}}{e^{logit(C_{jk}^{All})} + 1}$.

Results

We found that completeness of death registration at the national level was 70 percent, which was 8 percent lower than ORGI estimates (78.1%) in 2016. We also found that higher variation in terms of completeness of all age death registration at the state level, ranging from 16.8 percent in Bihar to 99 percent in Kerala. Besides, we found out of eight Empowered Action Groups (EAGs), seven states showed lower than 80 percent completeness of death registration. On the other hand, completeness of all age death registration was higher in southern and western states of India. Besides, a higher completeness of death registration was observed in Chandigarh (98.7%), New Delhi (94.2%), Punjab (91.8%) and Odissa (90.4%). Table 1 shows comparison of empirical method estimates and ORGI estimates of all age death registration completeness by India's States. The empirical method takes account of age structure, sex, and mortality level of population therefore; it provides more reliable death registration level estimates.

Conclusion

ORGI provided estimates of completeness of death registration for 2016 at the national level was over reported by 8 percent. The empirical method fit better in estimation of registered death completeness at the national and sub-national level and could be useful in comparison of death registration level with other administrative regions or countries.

References

1. Adair, T., & Lopez, A. D. (2018). Estimating the completeness of death registration: an empirical method. *PloS one*, *13*(5): Article e0197047.
2. Verma, A., Singh, G. P., & Singh, A. (2017). Completeness of Death Registration under CRS and Construction a Life Table with Adjusted ASDR for India and States. *mortality*, *16*, 17.
3. WHO. Civil registration: why counting births and deaths is important. WHO. 2014
4. Zeng, X., Adair, T., & Wang, L. (2020). Measuring the completeness of death registration in 2844 Chinese counties in 2018. *BMC medicine*, *18*(1), 1-11.

Table 1. Empirical method estimates and ORGI estimates of death registration completeness by states, India, 2016.

	Completeness of death registration (%)			Completeness of death registration (%)	
	Empirical method	ORGI		Empirical method	ORGI
Nagaland	26.49	19.90	Rajasthan	77.12	93.00
Bihar	16.89	28.30	Maharashtra	84.75	93.70
Arunachal Pradesh	43.16	31.70	Kerala	99.00	94.30
Manipur	33.06	34.00	Chhattisgarh	79.97	95.20
Uttar Pradesh	23.66	40.20	Goa	98.84	98.70
Tripura	48.85	49.40	Punjab	91.89	100.00
J & K	45.39	58.50	Haryana	88.25	100.00
Assam	54.10	59.80	New Delhi	94.27	100.00
Madhya Pradesh	50.67	60.90	Mizoram	80.02	100.00
Lakshadweep	83.01	65.20	Odissa	90.40	100.00
Uttarakhand	62.53	67.40	Gujarat	86.45	100.00
Jharkhand	51.07	70.30	Karnataka	89.77	100.00
Himachal Pradesh	71.60	75.00	Tamil Nadu	94.18	100.00
Meghalaya	82.67	78.20	Sikkim	87.31	100.00
Daman & Diu	79.90	81.40	Chandigarh	98.71	100.00
Andman & Nicobar	97.65	81.60	Dadar & Nagar Haveli	76.23	100.00
West Bengal	77.52	81.90	Puducherry	98.74	100.00
Andhra Pradesh	84.47	88.70	India	69.93	78.10

Source: Authors calculation

Note: - Data for Andhra Pradesh and Telangana are combined. In case of Manipur and Meghalaya, registered death of 2015 was considered and compared with ORGI estimates of 2015 due to unavailability of data for these two states in the CRS annual report of 2016.