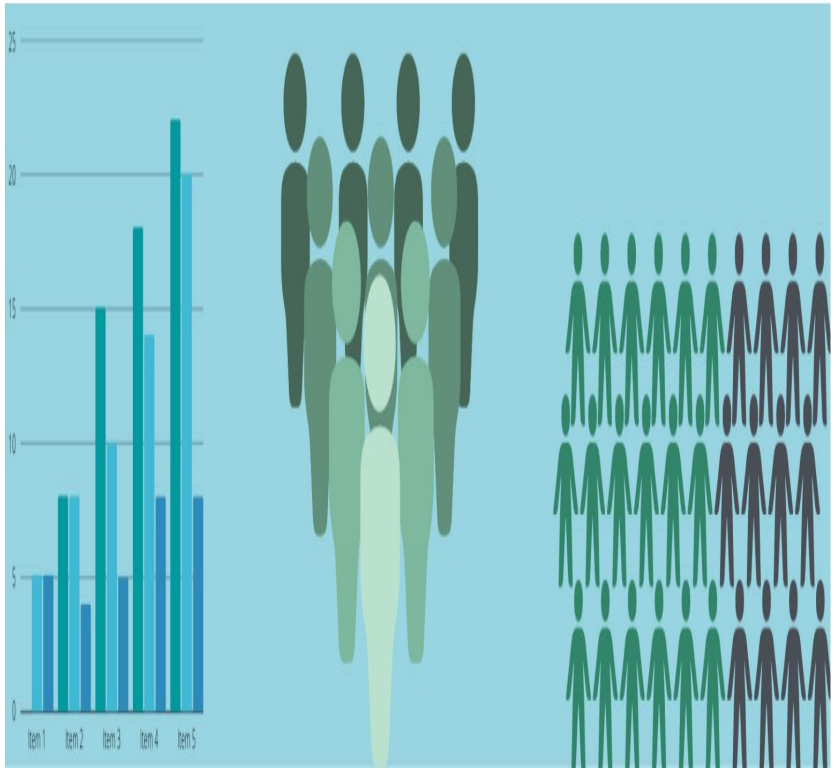

Sample Registration System of India – Lessons and Challenges

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Contents

- Sample registration System in India
- Integrating verbal Autopsy into SRS systems
- Way forward

Key Features of Indian SRS

- Among the first to be started globally
  - a pilot project in 1964-65 and made it fully operational in 1969-70
- Fully funded by the government
  - Administered by Indian Statistics Service Officers
- Among the largest SRS system in the world
  - Covers about 8 million population (0.6% of the population)
- Introduced verbal autopsy in 1999

Need for SRS in India – Focus on Population growth and fertility

Addressing Incomplete Civil Registration:

- The CRS, while legally mandated, was not consistently implemented across all states, resulting in incomplete and unreliable data.

Need for Reliable Data for Planning:

- Accurate demographic data for effective planning in various sectors, including health, education, and economic development. The SRS was designed to provide this data, especially for population projections and evaluating health programs.

Focus on Sub-National Data:

- The SRS was designed to provide data at the state level for urban areas and the natural division level for rural areas, enabling more targeted planning and interventions.

Continuous Data Collection:

- The SRS operates as a continuous survey, collecting data regularly to provide up-to-date information on population trends and vital statistics.

Sample design

Uni-stage stratified simple random sampling without replacement-

- Stratification by various characteristics followed by simple random sampling of population clusters (villages, village segments or census enumeration blocks)

Rural- Villages or village segments are the sample units

- Villages with less than 2000- stratum I
- Villages with 2000 or more- stratum II
- Population less than 200- excluded

Sampling Frame- Based on decennial census
[Max pop of village is 2000, Pop of CEB- 800 TO 1000

Urban- Census enumeration blocks are the sample units

- Stratum I-less than 1 lakh,
- Stratum II- 1 lakh to less than 5,
- Stratum III- 5lakh or more,
- Stratum IV- 4 metro cities

Sample size

- Arrived by using binomial model

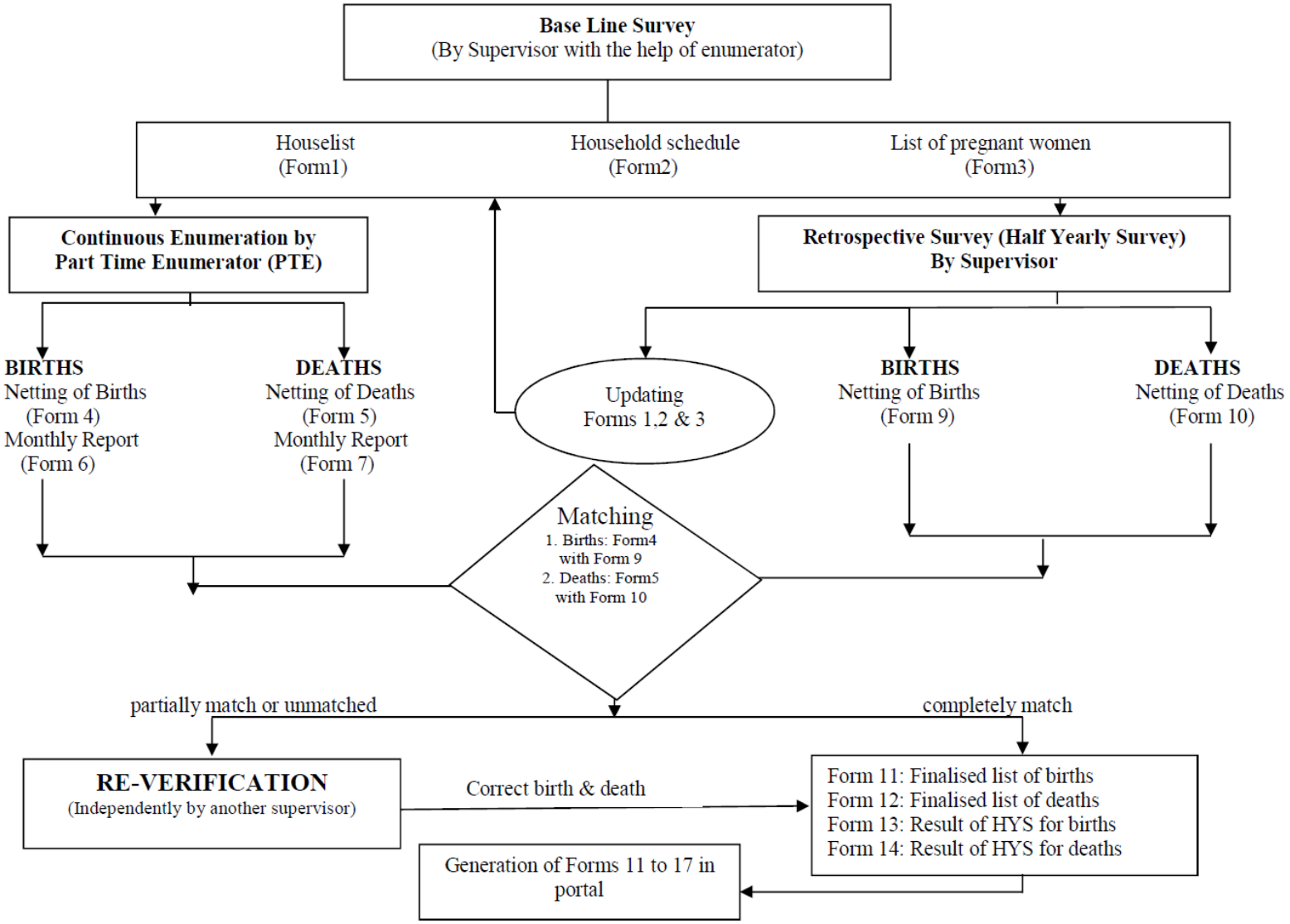
Principles adopted for Determination of SRS Sample Size

Year	Key Indicator (Parameter)	Provisional parameter value	Lowest pop unit	
			Rural	Urban
1969-70	Crude Birth Rate(CBR)	0.04=40 Births /1000 Pop.	Big States: Substate Natural Divisions. Minor States: All State	All State
1977-78	Crude Birth Rate(CBR)	0.03=30 Births /1000 Pop.		
2004	Infant Mortality Rate	SRS Estimate		

SRS Sample Units and population

- Increase in sample size over the years can be attributed to
  - making-up the initial short fall in sample size,
  - emerging demand for smaller area statistics,
  - to provide firm estimates of vital rates for union territories attaining statehood, and newly formed states, and
  - gradual reduction in event rates calling for increase in sample size to sustain the same level of precision for parameter estimates.
  - 2020 – 8841;4958,3883
    - 8310,6081,2229

Addition / Replacement Period	Year	Sample Units			Sample Population		
		Rural	Urban	Total	Rural	Urban	Total
1969 - 70	1970	2,367	1,256	3,623	2,633,349	1,029,687	3,663,036
	1971	2,432	1,290	3,722			
1977 - 78	1978	2,450	1,344	3,794			
	1979	2,460	1,344	3,804			
1982 - 85	1982	4,147	1,875	6,022			
	1989	4,149	1,873	6,022	4,624,293	1,319,323	5,943,616
1993 - 95	1993	4,149	2,151	6,300	4,706,000	1,088,000	5,794,000
	1994	4,420	2,193	6,613	4,668,000	1,265,000	5,933,000
	1995	4,420	2,198	6,618	4,516,000	1,286,000	5,802,000
	1996	4,436	2,235	6,671	4,598,000	1,319,000	5,917,000
	2003	4,410	2,235	6,645	5,064,000	1,387,000	6,452,000
2004	2004	4,433	3,164	7,597	4,936,000	1,798,000	6,734,000
	2013	4,433	3,164	7,597	5,453,000	1,986,000	7,439,000
2014	2014	4,961	3,892	8,853	5,552,000	1,954,000	7,506,000
	2015[3]	4,916	3,859	8,775	5,609,000	2,003,000	7,612,000


Base Line Survey
(By Supervisor with the help of enumerator)
Houselist
(Form1)
Household schedule
(Form2)
List of pregnant women
(Form3)
Continuous Enumeration by
Part Time Enumerator (PTE)
Retrospective Survey (Half Yearly Survey)
By Supervisor
BIRTHS
Netting of Births
(Form 4)
Monthly Report
(Form 6)
DEATHS
Netting of Deaths
(Form 5)
Monthly Report
(Form 7)
Updating
Forms 1,2 & 3
BIRTHS
Netting of Births
(Form 9)
DEATHS
Netting of Deaths
(Form 10)
Matching
1. Births: Form4
with Form 9
2. Deaths: Form5
with Form 10
partially match or unmatched
completely match
RE-VERIFICATION
(Independently by another supervisor)
Correct birth & death
Form 11: Finalised list of births
Form 12: Finalised list of deaths
Form 13: Result of HYS for births
Form 14: Result of HYS for deaths
Generation of Forms 11 to 17 in
portal

Estimation procedure using population weights

- Unbiased estimation
- Applied both in rural and urban areas
- Ensures reliable estimates of vital events at state and national level
- Method-
  - At first the population and number of events at the stratum level is estimated from the observed population and events in sample villages
  - Then add up estimated population of all strata to arrive at the estimated population for respective natural division.
  - The estimated population at the state level is obtained by summing up estimated population at natural division level.

Estimated Population in j^{th} Stratum of k^{th} natural division:

$$\hat{p}_{jk} = \frac{N_{jk}}{n_{jk}} \sum_{i=1}^{n_{jk}} p_{i_{jk}} = \frac{\textit{Total Number of Villages/Segments in } j^{th} \textit{ stratum of } k^{th} \textit{ Natural Division}}{\textit{Number of Sample Villages/Segments in } j^{th} \textit{ stratum of } k^{th} \textit{ Natural Division}} \times \sum_{i=1}^{n_{jk}} p_{i_{jk}}$$

Where i_{jk} = *Counter for Sample Villages in* j^{th} *Stratum of* k^{th} *Natural Division*,

$\sum_{i=1}^{n_{jk}} p_{i_{jk}}$ = *Sum of Population in Sample Villages/Segments in* j^{th} *Stratum of* k^{th} *Division*

And $\frac{N_{jk}}{n_{jk}}$ = *Stratum Multiplier For* j^{th} *Stratum of* k^{th} *Division*.

SRS Statistical Annual Report

Information	Available Statistics
Population distribution	Population by 5 year age sex groups 0-4, to 70+ until 1994, and to 85+ since 1995
Fertility	Population by Marital Status
	Age Sp. & Marital Fertility Rates
	Age Sp. Fertility Rates by Education
	Birth order and interval wise distribution of births
Mortality	Age Specific Death Rates by 0, 1-4, and 5 year age groups from 5-9 until 70+ 0r 85+
	Mort. Indicators: Crude Death Rate, Child mortality, IMR etc.
	% Distribution of deaths by age
Access to Med. Care	Medical Attention at Birth
	Medical Attention at Death

Key SRS Publications

- SRS Bulletins
- SRS Statistical Report
- Bulletin on Maternal Mortality in Ind
- Compendium of Fertility and Mortality Indicators 1971-2013
- SRS Based Life Tables
- Cause of Death Statistics

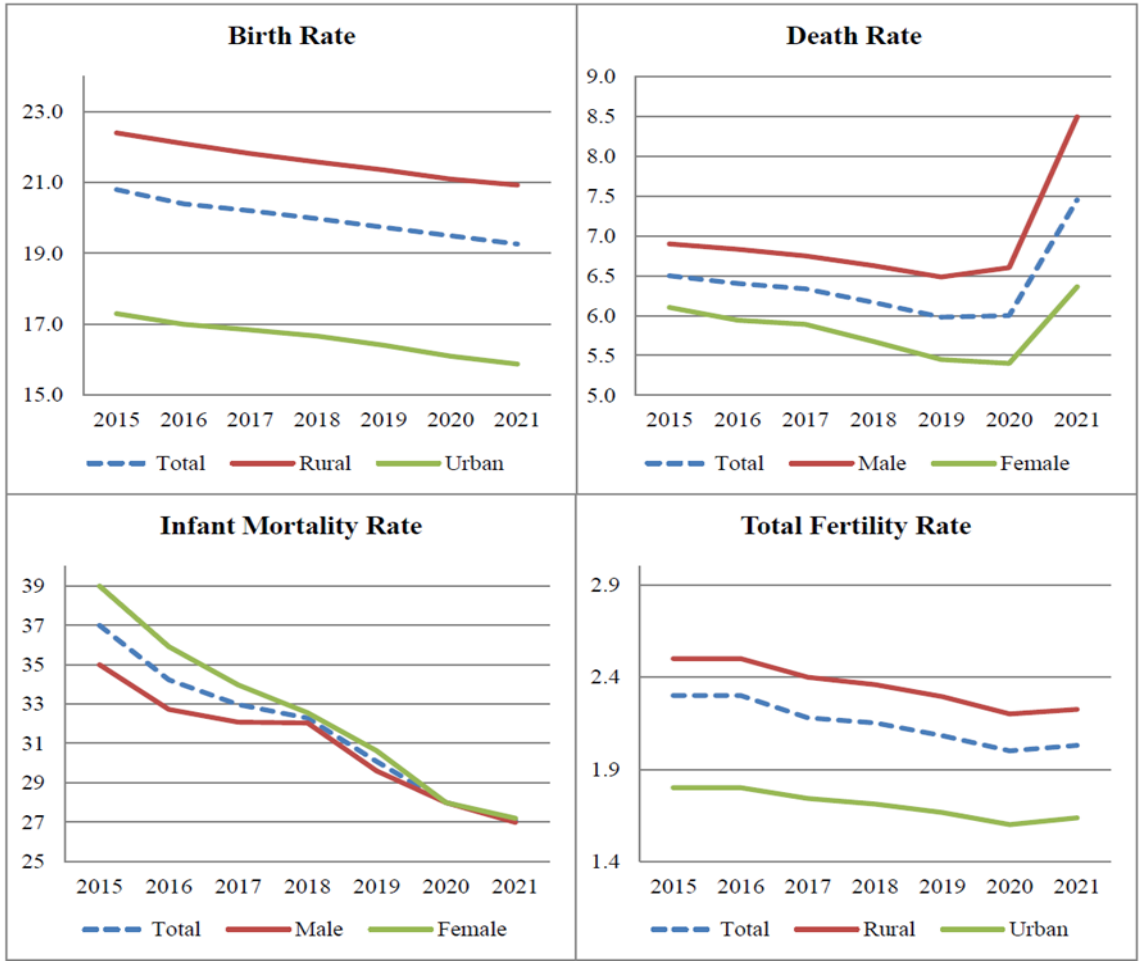
VOLUME 58 No.1

September, 2025
(Reference Year: 2023)

SRS BULLETIN

SAMPLE REGISTRATION SYSTEM
OFFICE OF THE REGISTRAR GENERAL OF INDIA
VITAL STATISTICS DIVISION, JANGANANA BHAWAN, 2/A, MANSINGH ROAD, NEW DELHI-110 011

Trend of Birth Rate, Death Rate, Infant Mortality Rate, Total Fertility Rate and Sex ratio at Birth, India



An Overview of Evaluation Studies on Sample Registration System in India

- Both direct and indirect estimates showed that the incidence of under registration of births and deaths were within the tolerable range of up to 10%.

Dates	Study Design	Findings	Ref.
1970-1975	Indirect estimate (Brass 1975)	6% under reporting of adult deaths	RGI, 1982
1971-1976	Indirect est. (Brass 1975; Preston & Coale 1980)	10% under reporting of deaths. Insignificant interstate variations. Excluded Bihar & West bengal for poor data quality.	Bhat et al. 1984
1978	Indirect est. (P/F ratios, UN 1983, Ch-II)	6% under reporting of births. State underestimates in 1978 ranged from <1% (Guj) to >17% (KA)	RGI 1984, Swamy et al. 1992
1980-1981	Intensive inquiry of 10% subsample	3% under estimation of birth and death rates. State underestimates around 1% (Guj, Har, MP) to 11% (KA)	Grover 1988; Swamy et al. 1992.
1985-1986	Intensive inquiry of 10% subsample	State underestimates, <1% (AP, BI, Guj, KE, MP,, MH, OR, TN) to >3% (AS, WB)	Swamy et al. 1992.
…	…	…	…
1978-1992	Comparison of SRS with NFHS fertility est.	At least 10% under registration of births.	Narasimhan et al. 1997

Strengths and limitations

Strengths-

- Done every year
- Elimination of errors of duplication
- Self evaluating technique
- Dual reporting system
- Sampling frame changes every 10 years once. Wider representation of population and overcoming previous limitations

Limitations-

- Only state level indicators calculated
- Sample of population included

Integrating Verbal Autopsy Based Cause of death Reporting within SRS

Need for a Verbal Autopsy based system

Limited Medical Certification:

- In India, the proportion of deaths reported with a medical certification was relatively low (less than 25%). This was especially true in rural areas due to the shortage of medical personnel and facilities.

Need for Reliable Data:

- The lack of accurate cause of death data hindered efforts to understand mortality patterns and plan effective public health interventions.

Introduction of Verbal Autopsy:

- To address this, verbal autopsy (VA) was introduced as a component of the SRS. VA involves interviewing family members or caregivers of the deceased to gather information about the symptoms, medical history, and circumstances surrounding the death.

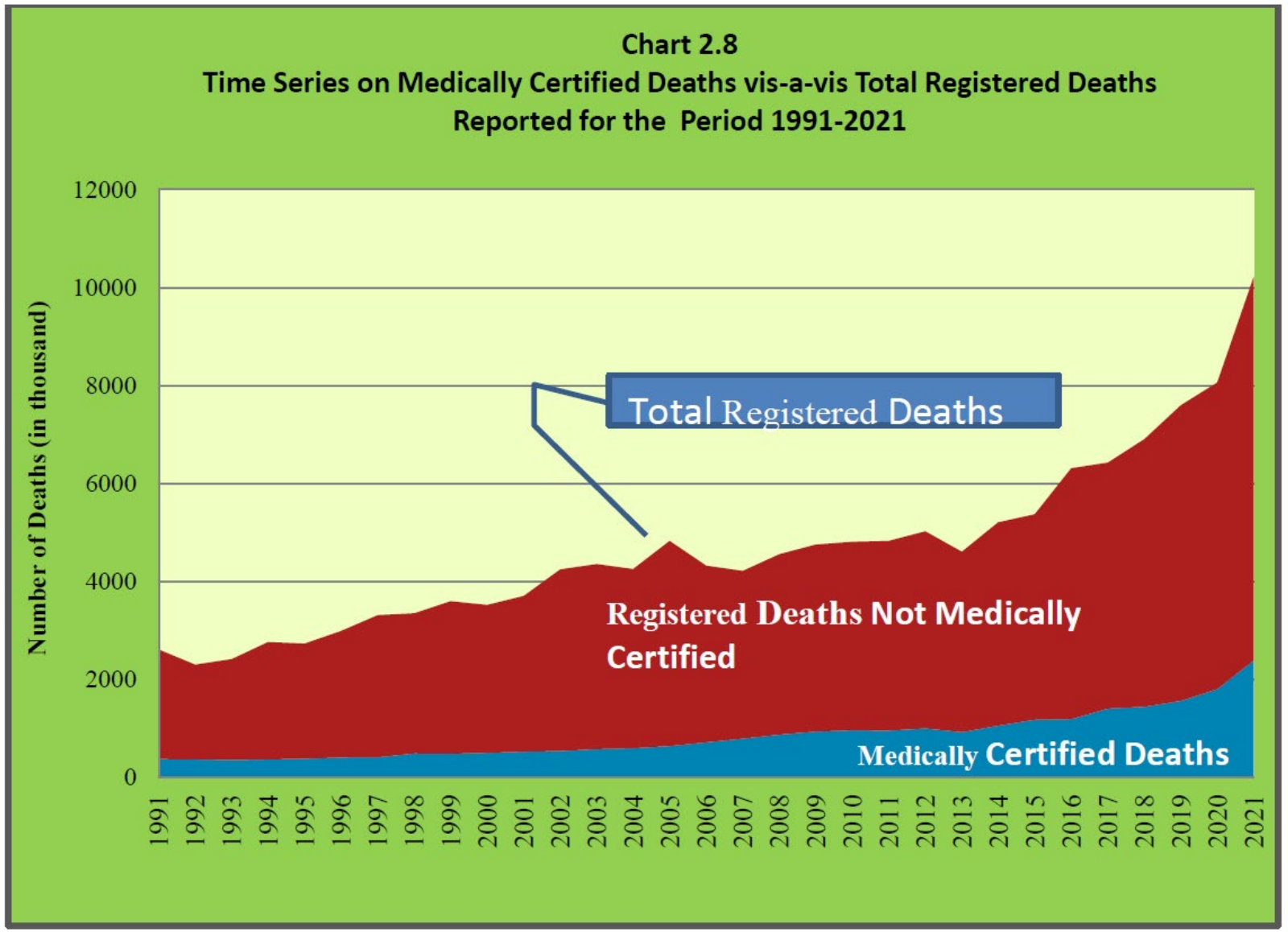


Chart 2.8
Time Series on Medically Certified Deaths vis-a-vis Total Registered Deaths Reported for the Period 1991-2021
Number of Deaths (in thousand)
12000
10000
8000
6000
4000
2000
0
Total Registered Deaths
Registered Deaths Not Medically Certified
Medically Certified Deaths
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021

Verbal Autopsy in India

Until December 1998, cause of death data for rural areas used to be collected under Survey of Cause of Death Rural Scheme, from a sample of villages by lay diagnosis and reporting system

Dec. 1998

In 2001, GOI initiated Verbal Autopsy of about 45,000 deaths identified under SRS every year

2001

Jan. 1999

From January 1999, a cause of death component was merged with SRS

MINErVA

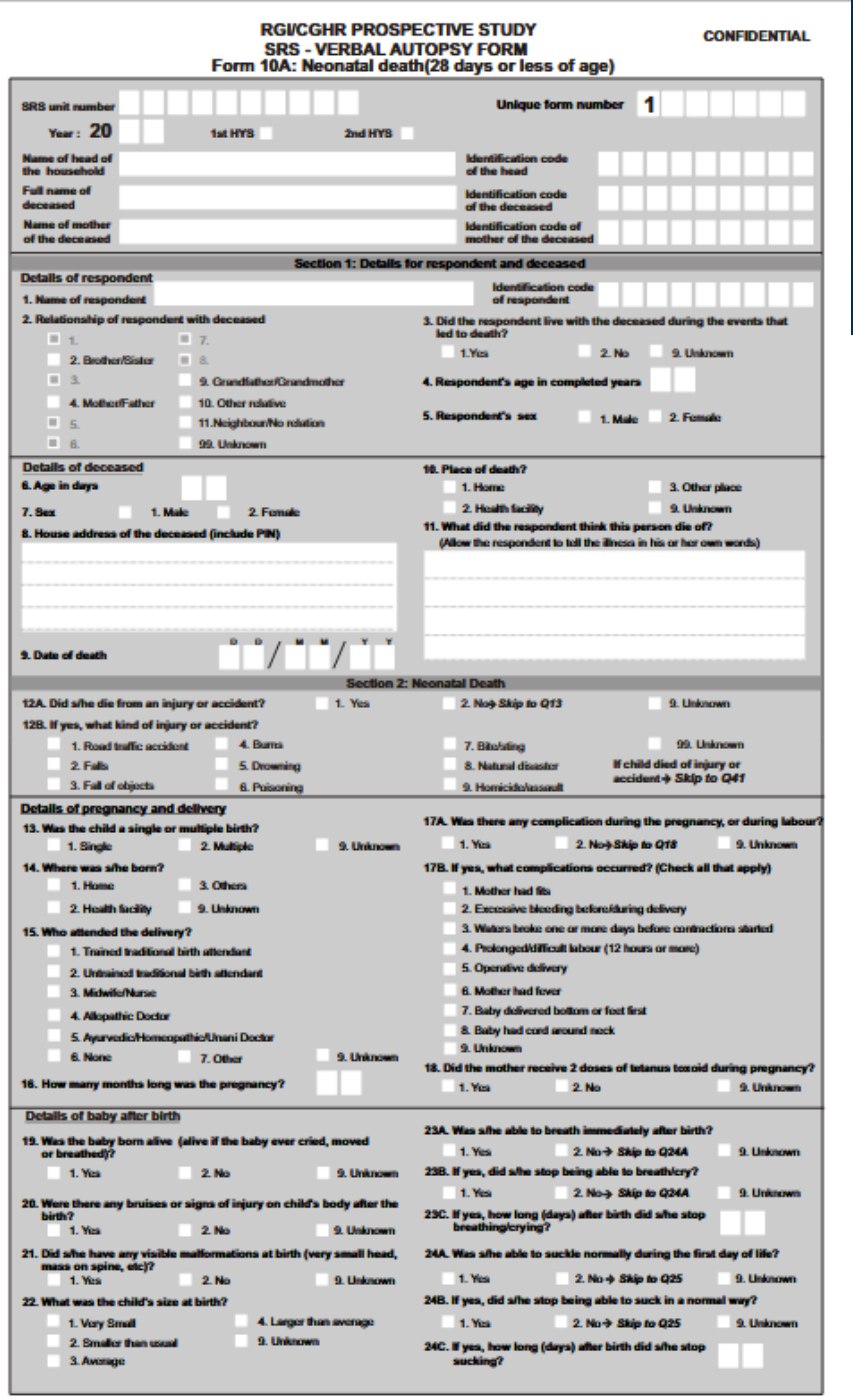
2017 (VA forms from 2015 onwards)

cghr

VA forms 2001-2014

Cause of death through SRS

- Since 2001, the SRS uses formal verbal autopsy (VA) methods for ascertaining causes of death.
- Contains both close ended questions and open narrative part
- Based on the assumption- Most CoD have distinct symptom complexes that can be recognized, remembered and reported by lay respondents
- Study has shown the feasibility of use of verbal autopsy tool by health workers to find out the cause of death



RGI/CGHR PROSPECTIVE STUDY
SRS - VERBAL AUTOPSY FORM
Form 10A: Neonatal death(28 days or less of age)

CONFIDENTIAL

SRS unit number
Unique form number 1
Year : 20 1st HYS 2nd HYS
Name of head of the household
Identification code of the head
Full name of deceased
Identification code of the deceased
Name of mother of the deceased
Identification code of mother of the deceased

Section 1: Details for respondent and deceased

Details of respondent
1. Name of respondent
Identification code of respondent
2. Relationship of respondent with deceased
1. 2. Brother/Sister 3. 4. Mother/Father 5. 6. 7. 8. 9. Grandfather/Grandmother 10. Other relative 11.Neighbour/No relation 99. Unknown
3. Did the respondent live with the deceased during the events that led to death? 1.Yes 2. No 9. Unknown
4. Respondent's age in completed years
5. Respondent's sex 1. Male 2. Female

Details of deceased
6. Age in days
7. Sex 1. Male 2. Female
8. House address of the deceased (include PIN)
9. Date of death D D / M M / Y Y
10. Place of death? 1. Home 2. Health facility 3. Other place 9. Unknown
11. What did the respondent think this person die of? (Allow the respondent to tell the illness in his or her own words)

Section 2: Neonatal Death

12A. Did s/he die from an injury or accident? 1. Yes 2. No→ Skip to Q13 9. Unknown
12B. If yes, what kind of injury or accident? 1. Road traffic accident 2. Falls 3. Fall of objects 4. Burns 5. Drowning 6. Poisoning 7. Bite/sting 8. Natural disaster 9. Homicide/assault 99. Unknown
If child died of injury or accident→ Skip to Q41

Details of pregnancy and delivery
13. Was the child a single or multiple birth? 1. Single 2. Multiple 9. Unknown
14. Where was s/he born? 1. Home 2. Health facility 3. Others 9. Unknown
15. Who attended the delivery? 1. Trained traditional birth attendant 2. Untrained traditional birth attendant 3. Midwife/Nurse 4. Allopathic Doctor 5. Ayurvedic/Homeopathic/Unani Doctor 6. None 7. Other 9. Unknown
16. How many months long was the pregnancy?
17A. Was there any complication during the pregnancy, or during labour? 1. Yes 2. No→ Skip to Q18 9. Unknown
17B. If yes, what complications occurred? (Check all that apply) 1. Mother had fits 2. Excessive bleeding before/during delivery 3. Waters broke one or more days before contractions started 4. Prolonged/difficult labour (12 hours or more) 5. Operative delivery 6. Mother had fever 7. Baby delivered bottom or feet first 8. Baby had cord around neck 9. Unknown
18. Did the mother receive 2 doses of tetanus toxoid during pregnancy? 1. Yes 2. No 9. Unknown

Details of baby after birth
19. Was the baby born alive (alive if the baby ever cried, moved or breathed)? 1. Yes 2. No 9. Unknown
20. Were there any bruises or signs of injury on child's body after the birth? 1. Yes 2. No 9. Unknown
21. Did s/he have any visible malformations at birth (very small head, mass on spine, etc)? 1. Yes 2. No 9. Unknown
22. What was the child's size at birth? 1. Very Small 2. Smaller than usual 3. Average 4. Larger than average 9. Unknown
23A. Was s/he able to breath immediately after birth? 1. Yes 2. No→ Skip to Q24A 9. Unknown
23B. If yes, did s/he stop being able to breath/cry? 1. Yes 2. No→ Skip to Q24A 9. Unknown
23C. If yes, how long (days) after birth did s/he stop breathing/crying?
24A. Was s/he able to suckle normally during the first day of life? 1. Yes 2. No→ Skip to Q25 9. Unknown
24B. If yes, did s/he stop being able to suck in a normal way? 1. Yes 2. No→ Skip to Q25 9. Unknown
24C. If yes, how long (days) after birth did s/he stop sucking?

Gajalakshmi V, Peto R, Kanaka S, Balasubramanian S. Verbal autopsy of 48 000 adult deaths attributable to medical causes in Chennai (formerly Madras), India. BMC Public Health. 2002 May 16;2:7. doi: 10.1186/1471-2458-2-7. PMID: 12014994;

Vision of ATSU-ORGI

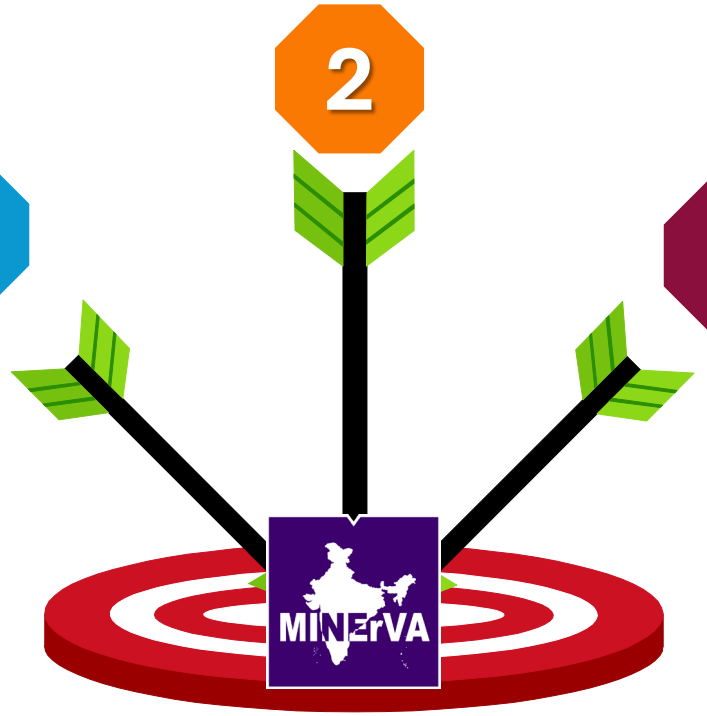
Strengthen SRS-VA System to make it of Global Standards

- Good Quality of Verbal Autopsy
- Good Quality of Coding

ENSURE GOOD QUALITY OF DATA

GENERATE TIMELY ESTIMATES

- Reduce time between death & VA
- Reduce Time between VA & uploading
- Reducing time in Coding
- Reduce time in release of reports



USE OF DATA FOR ACTION

- Improve Availability of Data
- Produce better reports/data products

MINErVA

TAG

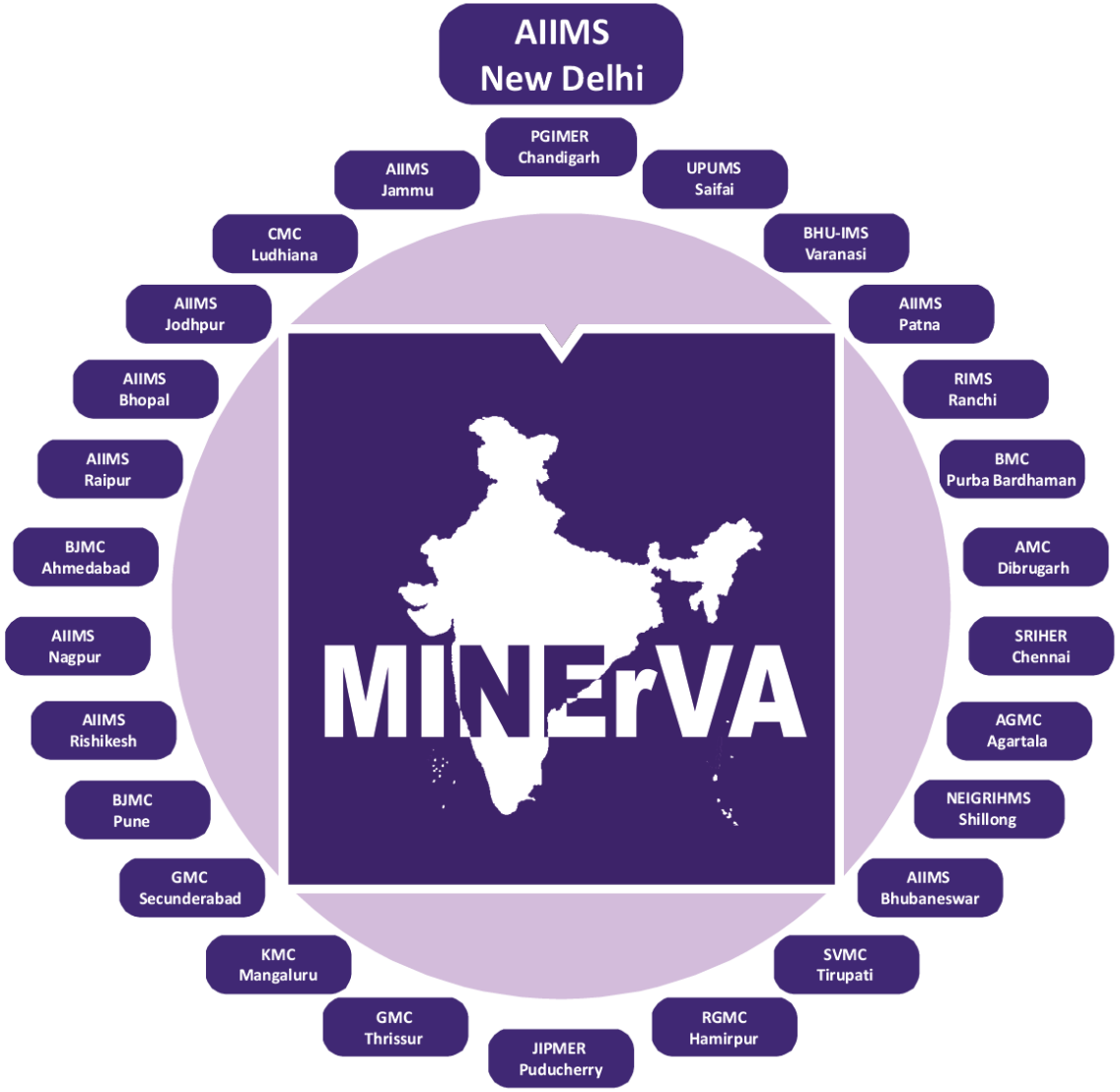
ATSU

IT Platform

Network Institutions

Physician Coders

Network Institutions



MINErVA: What do we do?

- Technical support to Office of the Registrar General of India (RGI) for SRS-VA
- Training of 800 Supervisors conducting Verbal Autopsy under SRS
- Quality control of Verbal Autopsy under SRS
- Maintaining network of trained multi-lingual physician VA coders
- Cause of Death assignment of ~ 45000 deaths/yr through online platform
- Preparation of final tables for each year

MINErVA Network: Milestones in Evolution

2017

New Beginnings- MoU signed between AIIMS & ORGI

1st Network & TAG meeting

2018

2nd Network & TAG meeting

Website launch- www.causeofdeathindia.com www.minervacoding.aiims.edu

2019

Coding of VA forms for 2015-2017

3rd Network & TAG meeting

2020

Development of app for mobile based data

2021

Coding of 2018 VA forms

4th Network & TAG meeting

17 Network Partner Institutes

2022

5th Network & TAG meeting

Coding of 2019 VA forms

2023

6th Network & TAG meeting

2024

7th Network & TAG meeting

Coding of 2021 and 2022 VA forms

SRS Coding platform

2025

MoU signed between AIIMS & ORGI for 2025-2030

Coding of 2023 VA forms

27 Network Partner Institutes & 1300 registered VA coders

Key modifications introduced in SRS-VA system

- Improve Verbal Autopsy Quality
  - Annual training of Supervisors for data collection through VA with 90% coverage
  - VA Tool- Key symptoms included in Adult form

27. Key symptoms (check all that apply,and then use symptom list for narrative)

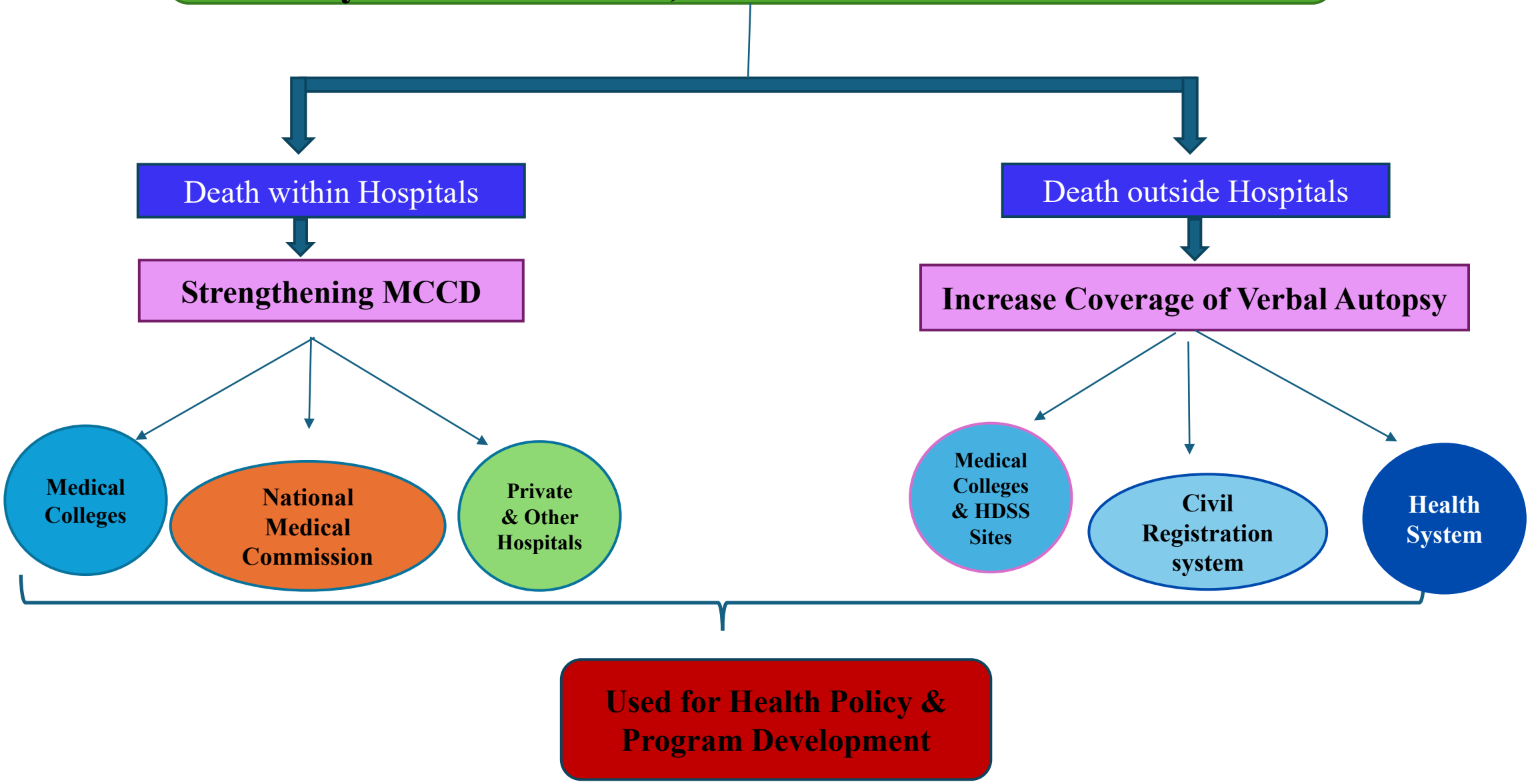
1. Fever	5.Chest pain	9a.) Diarrhoea or Vomiting
2. Weight Loss	6. Cough	9b.) Difficulty/pain with swallowing solids, liquids
3. Oedema/Swelling	7.Difficulty, fast breathing or Breathlessness	10 .Urinary problem
4a.) Skin yellowishness (Jaundice)	8a.) Pain/mass in abdomen	11.Paralysis/stroke
4b.) Skin rash	8b.) Abdominal distension	12.Unconscious/fits

Current challenges identified in SRS-VA

System level	• Representation of the population- includes 0.6% of the population	Shift towards VA of all the deaths
VA level	• Multiple regional languages	Translation to english
Assigning Cause of Death	• Depends largely on the quality of VA • Multilinguistic representation of physicians are required	
Use of CoD Data	• Too few and focused to give information regarding the cause of death • Chronology of the events are not captured uniformly	

Goal for India

Every death is counted, and cause of death ascertained



Strategies to reach the goals to strengthen mortality surveillance in India

- **Short –term**
- Strengthen SRS-VA system
- Supplement SRS-VA with additional VA based system like medical college field practice areas or demographic surveillance sites

- **Long–term**
- Establish VA based system to cover non-institutional deaths
- Employ digital VA solutions
- Integrate all data at district level
- Set-up a data resource centre to support mortality estimation efforts.

Way forward

VA of all the deaths

Provide cause of death data for district level planning

Use of computer coding of VA or Machine learning

Development and use of algorithms

Key lessons

- Plan long-term - increasing Sample size and arrange resources
- Set up National Technical advisory group/academic institutional collaboration.
  - Helpful to pilot test interventions, evaluate etc.
- Include CoD ascertainment as an inherent part of SRS
- Adopt digital solutions to the extent possible – Adapt global solutions
- Strong linkage to data users – else the whole process is without purpose.
- Do not decrease efforts for universal registration and certification.