



SAMPLE REGISTRATION SYSTEM (SRS) IS A RELIABLE ESTIMATOR IN INDIAN VITAL STATISTICS SYSTEM

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ABSTRACT

There are four major sources of vital statistics in India, namely; (a) the Sample Registration System (SRS), (b) the Civil Registration System (CRS), (c) Indirect estimates from the decennial census and (d) Indirect estimates from the National Family Health Surveys (NFHS). The SRS is the most regular source of demographic statistics in India. It is based on a system of dual recording of births and deaths in fairly representative sample units spread all over the country. The SRS provides annual estimates of (a) population composition, (b) fertility, (c) mortality, and (d) medical attention at the time of birth or death which gives some idea about access to medical care. The population composition from SRS coupled with the decennial census counts, enables fairly reliable estimate of population in the intercensal periods. Average time to publication of SRS annual reports is about two years. SRS estimates are generally valid and reliable for the country as a whole and for bigger states with more than 10 million populations. Recently the sample size of SRS has been increased to allow for estimates by natural divisions within the bigger states. Evaluations during 1970s and 1980s showed that completeness of recording of births and deaths by the SRS was generally good, and errors in recording of events minimal. However, systematic evaluation of the SRS has not been taken up for quite some time. Indirect estimates for 1990s and after suggests that registration completeness has worsened and interstate variations widened. A pluralistic evaluation framework is recommended.

Key words: Sample Registration Systems; India; SRS; Vital Statistics; Civil Registration Systems

I. SOURCES OF VITAL STATISTICS IN INDIA

The important sources of vital statistics in India besides the Population Census are

- (1) Civil Registration System;
- (2) Demographic Sample Surveys such as those conducted by the National Sample Surveys Organization (NSSO)
- (3) Sample Registration System (SRS) and
- (4) Health Surveys, such as National Family Health Surveys, (NFHS) and District Level Household Surveys (D LHS-RCH) conducted for assessing progress under the Reproductive and Child Health programme.

This manual discusses the salient features of each of these sources of vital statistics and their strengths and limitations.

II CIVIL REGISTRATION SYSTEM

According to the United Nations, civil registration is defined as the continuous permanent and compulsory recording of the occurrence of vital events, like, live births, deaths, foetal deaths, marriages, divorces as well as annulments, judicial separation, adoptions, legitimations and recognitions. Civil registration is performed under a law, decree or regulation so as to provide a legal basis to the records and certificates made from the system, which has got several civil uses in the personal life of individual citizens. Moreover, the information collected through the registration process provides very useful and important vital statistics also on a continuous basis at the national level starting from the smallest administrative unit. In fact, obtaining detailed vital statistics on a regular basis is one of the major functions of the Civil Registration System (CRS) in several countries of the world. Vital records obtained under CRS have got administrative uses in designing and implementing public health programmes and carrying out social, demographic and historical research. For an individual, the birth registration records provide legal proof of identity and civil status, age, nationality, dependency status etc., on which depend a wide variety of rights.

The office of the Registrar General of India was created in 1951 and the vital statistics department was transferred to this office from the Director of Health Services in 1960. On the deliberations and recommendation of various committees, the Registration of Births and Deaths Act (1969) were enacted by Parliament to enforce uniform civil registration throughout the country. National Sample Survey 1.4 Data on fertility and mortality from the census are not very reliable and they are also available only once in ten years. In the absence of reliable data from the civil registration system (CRS), the need for reliable vital statistics at national and state levels is being met through sample surveys launched from time to time. At the instance of the then Prime Minister Shri Jawaharlal Nehru, a large scale sample survey agency known as National Sample Survey (NSS) came into existence in 1950 on the recommendations of the National Income Committee chaired by Late Professor P. C. Mahalanobis. In the 1950's and 1960's, the National Sample Survey attempted to provide reliable estimates of birth and death rates through its regular rounds. However, the release of 1961 census data indicated that the birth rates and death rates and consequently, the growth rates were often not estimated correctly. Many analysts, at that point of time, felt that the one time retrospective recall surveys such as National Sample survey may not be able to estimate the vital rates correctly. This resulted in a search for alternative mechanism estimate vital rates. The sample registration system (SRS) was one such attempt. Sample Registration System (SRS) 1.5 The Government of India, in the late 1960s, initiated the Sample Registration System that is based on a Dual Recording System. In the Sample Registration System, there is a continuous enumeration of births and deaths in a sample of villages/urban blocks by a resident part-time enumerator and then, an independent six monthly retrospective survey by a full time supervisor. The data obtained through these two sources are matched. The unmatched and partially matched events are re-verified in the field to get the correct number of events. At present, the Sample Registration System (SRS) provides reliable annual data on fertility and mortality at the state and national levels for rural and urban



n areas separately. In this survey, the sample units, villages in rural areas and urban blocks in urban areas are replaced once in ten years.

Health Surveys 1.6 In the past about a decade or so, a few important sources for demographic data have emerged. These are the National Family Health Surveys (NFHS) and the District Level Household Surveys (DLHS) conducted for the evaluation of reproductive and child Health programmes. Three rounds of NFHS surveys have since been completed. These provide estimates inter-alia of fertility, child mortality and a number of health parameters relating to infants and children at state level. They also provide information on the availability of health and family planning services to pregnant mothers and other women in reproductive ages. The DLHS provide information at the district level on a number of indicators relating to child health, reproductive health problems and the quality of services available to them. Three rounds of DLHS surveys have been conducted so far. In each of the first two rounds, the survey was conducted in two phases spread over two years, wherein, under each phase of the survey, half of the districts in a state had been covered. However, in the third round of the DLHS survey (2007-08), all the districts were covered in one phase. 1.7 The chapters that follow discuss in detail the data emerging from the above sources, their strengths, limitations, the organizational details and the data

Sample Design

The sample design adopted for SRS is a uni-stage stratified simple random sample without replacement. The primary sampling units (PSU) are villages in the rural areas and census enumeration blocks in the urban areas.

The first level of stratification is by state, rural and urban. The rural part of each state was divided into natural divisions, which is a combination of districts. Some of the smaller states have only one natural division. The rural villages within each natural division were divided into two rural strata based on the population of the village: (1) less than 2,000 and (2) 2,000 or more. Since the very small villages would not be effective for the SRS enumeration, they were excluded from the sampling frame. The cut-off for the population of the small villages to be excluded from the frame. The cut-off for the population of the small villages to be excluded from the frame was determined separately for each natural division in such a way that these small villages represented less than 2 percent of the total population of the natural division. The number of sample villages in each state was allocated to the strata proportionally to their size. The villages within each size stratum were ordered by the female literacy rate based on the 2001 census data, and three equal size strata were established. The sample villages within each female literacy stratum were selected at random with equal probability. In the case of rural stratum 2, each sample village with a population of 2,000 or more was subdivided into segments, and one segment was selected at random at the second sampling stage for the SRS enumeration.

In the case of the urban areas in each state, the towns were stratified by three population size groups (1) less than 1,00,000, (2) 1,00,000 to 4,00,999 and (3) 5,00,000 or more. Each of the four large metropolitan cities (Kolkata, Delhi, Mumbai and Chennai) was treated as a stratum within the corresponding state. These cities are also divided into slum and non-slum areas. Within each urban size stratum the enumeration blocks were ordered by the female literacy rate to create three equal size strata.

Sample size

The SRS sampling frame undergoes revision every ten years, based on the results of latest census. While replicating the sample, factors such as modifications in the sampling design, wider representation of

population, limitations of the existing scheme, additional requirements etc, are taken into account. The first replacement of SRS sample was effected in 1977-78 and the latest in 2004. Whereas, in earlier years, replacement of the sample was undertaken in phases spread over 2-3 years, the replacement on 2004 was carried out within a year. Against the earlier criteria for sample selection Reliability of birth rate at the state level, the new sample for 2004 is based on the reliability of IMR at natural division level. Infant mortality being a comparatively rare event to birth and death, the present sample will ensure a much greater reliability for birth and death rates than in the past. The following table gives the number of sample units along with the period in which replacement was made since inception of SRS on a full scale.

| Census Frame | Replacement period | Number of Sample units | | |
|--------------|--------------------|------------------------|-------|-------|
| | | Total | Rural | Urban |
| 1961 | 1969-70 | 3722 | 2432 | 1290 |
| 1971 | 1977-78 | 5422 | 3684 | 1738 |
| 1981 | 1983-85 | 6022 | 4149 | 1873 |
| 1991 | 1993-95 | 6671 | 4436 | 2235 |
| 2001 | 2004 | 7597 | 4433 | 3164 |
| 2011 | 2014 | 8861 | 4964 | 3897 |

SRS Forms

In the course of implementation of SRs, time to time changes have been introduced in the SRS instruments (Forms) based on the requirement as also for monitoring the health and family welfare programs. Marital status, Residential status, Age at effective marriage, live birth order, Interval between previous and current live births, Total Children born alive, Total children surviving, Causes of death etc, are some of the important parameters that were included in the SRS Forms over time. With the latest replacement of SRS. A complete list of SRs instruments (Forms) used for collection of data in the newly replaced sample units is given below.

II. INTRODUCTION

There are four major sources of vital statistics in India, namely; (a) the Sample Registration System (SRS), (b) the Civil Registration System (CRS), (c) Indirect estimates from the decennial census and (d) Indirect estimates from the National Family Health Surveys (NFHS). The first three are operated by the Registrar General India (RGI) working under the Ministry of Home Affairs. The NFHS is organised by the International Institute of Population Sciences (IIPS), working under the Ministry of Health and Family Welfare. Table-1 gives a bird's eye view of these four sources of vital statistics in India.

Table-1: An Overview of Sources of Vital Statistics In India And Their Usability.

| Source | Periodicity | Estimated Parameters | Small-Area Estimates | Usability |
|--------|---|--|---|---|
| SRS | Annual, since 1970 | Fertility and Mortality Indicators | State level Estimates for Bigger States | Representative sample, Regular availability of reports. Relied source of fertility and mortality statistics |
| Census | 10 years | Population count by age sex and area.IMR,Child mortality | Population counts; Down to village level.Mortality District level | Population data, reliable and valid, available within about 2 years Fertility and indirect mortality estimates about 8 years time lag |
| CRS | Annual, since 1958 | Fertility and Mortality Indicators | District Level and large cities with more than 100000 population | Less than 50% deaths are registered. Wide interstate variation. Average time to publication 45 months until 1994.No report since then |
| NFHS | 6 year I-1992-93 II-1998-99 III-2005-06 | IMR(Indirect Estimates) | State level Estimates. Sample not enough for district level est. | Indirect estimates. Quick estimates are available within a year of the survey.IMR and fertility indicators, cross tabuled by socioeconomic variables. |

2.1 Completeness of Registration of Vital Events by the SRS

Several evaluations of the SRS have been made, both in-house by the RGI, and other authors. While many of these studies used analytical methods, some of the evaluations by the RGI were based on intensive inquiry of a sub-sample (Table-4). 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%. However, all these evaluations of the Indian SRS were done for the period in 1970s and 1980s. The Registrar General has not taken up any direct or indirect evaluation study of the SRS during the 1990s and after. As a result, these old evaluations continue to be cited as evidence of completeness of registration of vital events by the SRS.

For example, WHO-HMN on issues in health information cities estimaty by Bhat(1984) to say that “the SRS has been shown to have attained a high level of completeness.

| Completeness | | | | | | | | | | |
|--|--------|--------|--------|--------|------|------------------------|------|------|------|-------|
| Iterated exponential growth rates (<i>r</i>) | | | | | Year | Estimated completeness | | | | |
| AP | MH | OR | UP | India | | AP | MH | OR | UP | India |
| 0.0160 | 0.0236 | 0.0223 | 0.0193 | 0.0219 | 1990 | 0.67 | 0.68 | 0.83 | 0.79 | 0.77 |
| 0.0186 | 0.0241 | 0.0217 | 0.0206 | 0.0223 | 1991 | 0.82 | 0.83 | 0.89 | 0.73 | 0.79 |
| 0.0166 | 0.0244 | 0.0224 | 0.0219 | 0.0253 | 1992 | 0.71 | 0.82 | 0.88 | 0.90 | 0.99 |
| 0.0191 | 0.0251 | 0.0226 | 0.0241 | 0.0243 | 1993 | 0.75 | 0.82 | 0.99 | 0.93 | 0.87 |
| 0.0237 | 0.0252 | 0.0223 | 0.0245 | 0.0245 | 1994 | 0.90 | 0.87 | 0.93 | 0.96 | 0.91 |
| 0.0243 | 0.0230 | 0.0228 | 0.0231 | 0.0251 | 1995 | 0.88 | 0.77 | 0.98 | 0.87 | 0.91 |
| 0.0217 | 0.0236 | 0.0206 | 0.0208 | 0.0247 | 1996 | 0.80 | 0.85 | 0.88 | 0.85 | 0.89 |
| 0.0159 | 0.0130 | 0.0194 | 0.0209 | 0.0243 | 1997 | 0.52 | 0.45 | 0.66 | 0.60 | 0.86 |
| 0.0210 | 0.0222 | 0.0212 | 0.0250 | 0.0255 | 1998 | 0.82 | 0.83 | 0.97 | 0.99 | 0.93 |
| 0.0211 | 0.0208 | 0.0200 | 0.0255 | 0.0227 | 1999 | 0.76 | 0.77 | 0.84 | 0.97 | 0.78 |
| 0.0206 | 0.0204 | 0.0212 | 0.0253 | 0.0223 | 2000 | 0.80 | 0.77 | 0.91 | 0.94 | 0.78 |
| 0.0186 | 0.0235 | 0.0223 | 0.0267 | 0.0236 | 2001 | 0.70 | 0.99 | 0.99 | 0.95 | 0.80 |
| 0.0208 | 0.0224 | 0.0215 | 0.0259 | 0.0236 | 2002 | 0.76 | 0.80 | 0.84 | 0.93 | 0.81 |
| 0.0212 | 0.0212 | 0.0245 | 0.0276 | 0.0256 | 2003 | 0.76 | 0.78 | 0.98 | 1.04 | 0.90 |
| 0.0208 | 0.0204 | 0.0198 | 0.0244 | 0.0242 | 2004 | 0.67 | 0.67 | 0.89 | 0.90 | 0.83 |
| 0.0226 | 0.0197 | 0.0182 | 0.0255 | 0.0245 | 2005 | 0.69 | 0.69 | 0.81 | 0.89 | 0.78 |
| 0.0226 | 0.0210 | 0.0208 | 0.0265 | 0.0245 | 2006 | 0.70 | 0.75 | 0.84 | 0.92 | 0.78 |
| 0.0179 | 0.0201 | 0.0214 | 0.0283 | 0.0244 | 2007 | 0.58 | 0.72 | 0.89 | 1.05 | 0.82 |
| 0.0208 | 0.0224 | 0.0215 | 0.0259 | 0.0236 | 2008 | 0.76 | 0.80 | 0.84 | 0.93 | 0.81 |
| 0.0212 | 0.0212 | 0.0245 | 0.0276 | 0.0256 | 2009 | 0.76 | 0.78 | 0.98 | 1.04 | 0.90 |
| 0.0208 | 0.0204 | 0.0198 | 0.0244 | 0.0242 | 2010 | 0.67 | 0.67 | 0.89 | 0.90 | 0.83 |
| 0.0226 | 0.0197 | 0.0182 | 0.0255 | 0.0245 | 2011 | 0.69 | 0.69 | 0.81 | 0.89 | 0.78 |
| 0.0226 | 0.0210 | 0.0208 | 0.0265 | 0.0245 | 2012 | 0.70 | 0.75 | 0.84 | 0.92 | 0.78 |
| 0.0179 | 0.0201 | 0.0214 | 0.0283 | 0.0244 | 2013 | 0.58 | 0.72 | 0.89 | 1.05 | 0.82 |

III. SUMMARY AND RECOMMENDATIONS

Overall the Indian SRS has been a reliable and trusted source of fertility and mortality statistics for the whole country and major states. Half yearly bulletins containing aggregate vital statistics are usually available quickly. SRS Annual reports containing detailed statistical tables and some analysis are released after a production time lag of about two years. Definition of statistical concepts and data gathering process are consistent over time and uniformly implemented all over the country. After initial difficulties during the 1970s, the SRS achieved 90% and better completeness of registration during the 1980s. Both direct and indirect evaluations during this period contributed to consolidation of the system. These old evaluations continue to be cited as evidence of completeness of registration of vital events by the SRS. There is evidence to suggest that completeness of registration might have deteriorated during the 1990s and after. Significant interstate differences appear to have emerged. Hence, evaluation studies at regular intervals should be built into the system. Both direct and indirect estimation of completeness should be taken up. A pluralistic evaluation framework consisting of in-house evaluations by the RGI and studies by independent researchers is very much required. There is also scope to improve the metadata content of SRS annual reports by expanding the statement of populations to include details by sex, reporting of the population figures to the last digit, and incorporating standard tables on incidence of missing data. There is further scope to improve accessibility of SRS by publication of the annual reports in portable document format, and eventual publication of the SRS data sets in appropriate electronic database formats. User service may be improved by outsourcing the publication and distribution functions and identifying a network of libraries to act as vital statistics document repositories.

REFERENCES

- [1]. Bhat P. N. Marri ; Preston Samuel H., and Dyson Tim. Vital rates in India 1961-1981. Washington DC: National Academy Press; 1984.
- [2]. Bhatt Marri, Preston Samuel and Dyson Tim; Vital rates in India 1961-1981, National Academy Press 1984.
- [3]. Also published as: "Preston S, Bhat P (1984). New evidence on fertility and mortality trends in India. Population and Development Review, 10(3):481–503"
- [4]. Bhat P. N. Marri. Age misreporting and its impact on adult mortality estimates in south Asia. Demography India. 1995; 24(1):59-80.
- [5]. Brass William. Methods for estimating fertility and mortality from limited and defective data. Chapel Hill, NC: Carolina Population Center; 1975. Occasional Publication. International Program of Laboratories for Population Statistics,
- [6]. Chapel Hill. Grover SP. Sample Registration System. in: RGI. Workshop on Sampling and Sample Surveys. New Delhi: Registrar General of India; 1988 Nov 29: 53-60.
- [7]. Gunasekharan Subbiah and Palmore James A. Regression Estimates of the Gross Reproduction Rate Using Moments of the Female Age Distribution. Asian and Pacific Census Forum. 1984; 10(4):5-10.