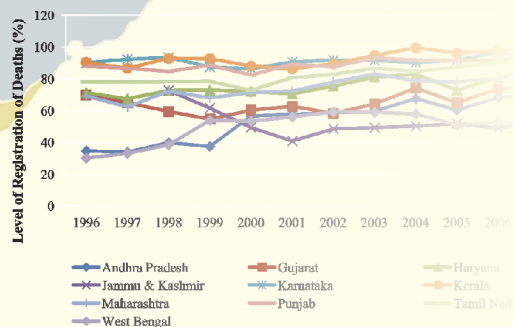
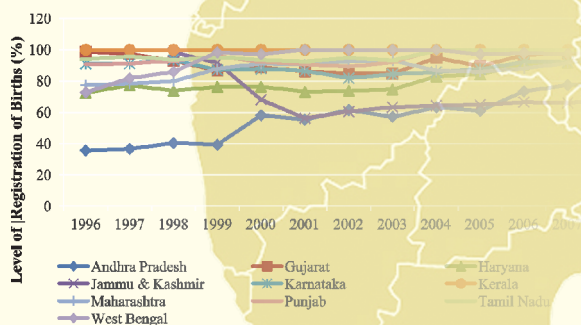


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P M Kulkarni
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K M Sathyanarayana
Sanjay Kumar



Population Research Centre
INSTITUTE FOR SOCIAL AND ECONOMIC CHANGE, Bangalore

Centre for the Study of Regional Development
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From Institute for Social and Economic Change (ISEC), Bangalore

K S James
N Kavitha
Annie George

From Jawaharlal Nehru University (JNU), New Delhi

P M Kulkarni
Sarda Prasad

From United Nations Population Fund (UNFPA), New Delhi

K M Sathyanarayana
Sanjay Kumar

Population Research Centre
Institute for Social and Economic Change, Bangalore

Centre for the Study of Regional Development
Jawaharlal Nehru University, New Delhi

United Nations Population Fund, New Delhi



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EXECUTIVE SUMMARY

Registration of births and deaths provides the basic data on population change, fertility, and mortality, and also serves as the basis for identity, citizenship, and succession. Registration of vital events is mandatory in India as prescribed by the Registration of Birth and Deaths (RBD) Act, 1969 and the Civil Registration System (CRS) is designed to perform the task. Since the system is operated by the state governments, wide variation is found across states in terms of coverage. There are other sources of data on vital rates but these have certain limitations. The Sample Registration System (SRS) has been providing fertility and mortality rates at national and state levels but the sample size prevents estimation of vital rates at district and sub-district levels. Many household surveys do give estimates of vital rates but these are rarely at district levels and the few that do are ad-hoc. As a result, the CRS remains the principal source of data on vital rates for districts at the national level. Therefore, it is important to have a good assessment of CRS data to understand how far it can be used for planning and monitoring of programmes at the district level.

This study has been undertaken to assess the level of civil registration and to examine how well the information from the Civil Registration System (CRS) can be used to update the National Population Register. As a first step, a

preliminary analysis of the available data from civil registration is carried out. This is based on published reports at the national level as well as district-wise reports from selected three states, Kerala, Odisha and Rajasthan; Kerala with a high level of completeness and Odisha and Rajasthan with relatively low levels. The report considers six indicators for assessing the quality of data: crude birth rate, crude death rate, infant mortality rate, still birth rate, sex ratio at birth, and sex ratio at death. The Civil Registration System assesses completeness of coverage at the state level using the SRS as the basis. For assessing the completeness of the crude birth rate at the district level, the indirect estimates of the birth rate obtained from the 2011 census enumeration of population of ages 0-6 are used and for assessing the completeness of the crude death rate and the infant mortality rate, the estimates by the Annual Health Survey 2010-11 are employed; the latter are available only for districts of Odisha and Rajasthan. Sex ratios of registered births and deaths are also examined in order to see whether there is sex-selectivity in registration.

First, at the national level, the level of completeness is higher for births than for deaths. The level is much lower in case of infant deaths. There are notable variations across states. Some states have long had a high level of registration,

more so of births than of deaths. Over time, there has been a secular improvement in the level of completeness and this has been impressive since 2005 in states such as Madhya Pradesh, Rajasthan, Uttar Pradesh, and Bihar. A plausible explanation is that the introduction of the Janani Suraksha Yojana has raised the level of registration; but this needs to be confirmed with some field studies and detailed analysis of the data.

Kerala has long had a high level of registration of births and deaths, nearly universal. It is noteworthy that Odisha has shown a fairly decent coverage in spite of the relatively low level of development. Though Rajasthan was lagging for long, it has made good progress in the recent years. But while the level of birth registration has reached 90 percent in Rajasthan and Odisha, that for registration of deaths it is around 80 percent. Notable variations are seen across districts. States such as Rajasthan and Odisha are large, and socioeconomic as well as physiographic features differ substantially across districts. Broadly, districts with higher level of development show greater completeness though no one-to-one relationship is seen. However, the *de facto* system of registration could cause some distortions as women from some districts go to a place in another district that has good institutional facilities where the births get registered rather than in the district of usual residence.

Registration of infant deaths is very poor in Rajasthan, with some districts recording hardly any infant deaths. It is also not satisfactory in Odisha and even in Kerala, known for overall good registration, this is far from being universal. A correction made for the deficit in the registration of infant deaths brings the CRS based crude death rate close to the AHS

estimates for Rajasthan and Odisha. There is evidence of sex bias in reporting of births in Rajasthan. This is less of an issue in Odisha and Kerala though a few districts including one in Kerala show lower than normal sex ratios of registered births.

The preliminary assessment and discussions with experts in the field suggest some explanations for the probability of registration of an event. The registration of a birth felt to be more important than of a death due to the need to produce a birth certificate at the time of school enrolment. The introduction of the Janani Suraksha Yojana is another factor since deliveries do get covered for services and benefits and this helps registration. The poor registration of infant deaths may be attributed to lack of perceived need as no issues of property or succession are involved in cases of deaths during early childhood. To some extent this would apply to registration of deaths of adult females. Besides, the type of agency entrusted with registration, whether health, revenue, development, education, women and child development, including grassroots workers such as the ANM, ASHA, Anganwadi Worker, may matter. Further, involvement of local government (Panchayati Raj) officials, other community leaders can make a difference.

But these are plausible explanations that need to be examined scientifically. An exploratory study in some localities, which could involve a combination of group and in-depth interviews of adult members of households, is called for. Further, registrars of events as well as local government functionaries and community leaders could be interviewed. The methodology for such investigations needs to be developed.

CHAPTER 1

INTRODUCTION

Registration of births and deaths serves two kinds of purposes, legal and demographic. On the one hand, registration provides the basis for matters such as identity, citizenship, succession, and liability and on the other hand it provides data on population change, fertility, and mortality. Therefore, most countries have evolved systems of continuous and systematic recording of births and deaths. In India, this is being done under the Registration of Birth and Deaths (RBD) Act, 1969 and the system is called the Civil Registration System (CRS). The CRS is the only source which provides vital statistics at district level in India. Although a Central act, its implementation is the responsibility of the state governments, and therefore wide variation is found across states in terms of coverage. Considering the weaknesses of CRS, a Sample Registration System (SRS) was adopted as a way of ensuring reliability of vital data. The Sample Registration System has successfully provided fertility and mortality rates at national and state levels. However, due to its small sample size, SRS does not provide vital statistics at district and sub-district levels. Another recent source of data on vital rates, the Annual Health Survey (AHS) being carried out since 2010-11 also provides CDR at district level but this survey is restricted to districts in

nine states, i.e. Uttar Pradesh, Uttarakhand, Rajasthan, Bihar, Jharkhand, Assam, Odisha, Madhya Pradesh, and Chhattisgarh. Therefore, the CRS is currently the principal source of data on vital rates for districts at the national level. This makes it essential to see how good this source is.

OBJECTIVES

The objective of this report is to assess the quality of CRS data at the district level for the recent years in three states, viz., Kerala, Odisha, and Rajasthan. Various assessments by the Office of the Registrar General and by independent researchers show that the CRS is operating at different levels of efficiency in the country (see, for example, Registrar General, 1980; Sinha, 1982). Besides, recent reports of the CRS routinely estimate of the level of completeness. However, most of these assessments are carried out at the state level. But there may be several good districts in terms of coverage even in states with relatively poor coverage. Therefore, it is important to have a good assessment of CRS data to understand how far it can be used for planning and monitoring of programmes at the district level. The report considers six indicators for assessing the quality of data. They are birth rate, death rate, infant mortality rate, still birth rate, sex ratio at birth, and sex ratio at death.

OVERVIEW OF THE LEVEL OF REGISTRATION AT THE NATIONAL LEVEL AND IN MAJOR STATES

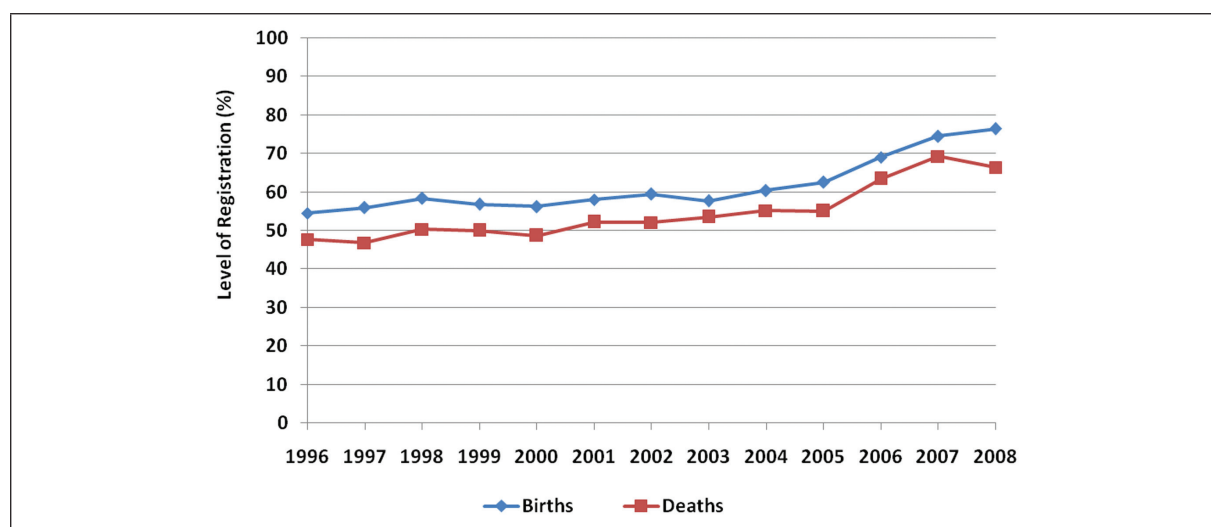
Before examining the data from the three selected states, we present a brief overview for India and the larger states. The civil registration system has been in operation in India for a long time. However, as the administrative systems differed considerably across India prior to independence, the timing of its introduction and the modality has also varied across space. Some uniformity was achieved after the introduction of the Registration of Births and Deaths Act in 1969. However, the actual registration is done by officials in the state governments and the designated functionaries may belong to the health department, be Panchayat officials, school teachers, Gram Sewaks, Village administrative or revenue officials, Police officers, etc. depending on the state. Besides, socioeconomic conditions, especially the level of education, also vary across states. As a result, there is considerable variation in the level of completeness across states. Though registration

is far from complete in India, there has been improvement in the level over the years.

The Civil Registration System itself estimates the level of registration and publishes these in the reports. The CRS computes the level of registration as the ratio of the number of events (births or deaths) registered to the estimated numbers. The estimated number of births and deaths in a year in a state is obtained from the corresponding rate given by the Sample Registration System (SRS) and the estimated population at mid-year. The SRS rates are accepted as correct because over the years, the SRS has been giving fairly reliable estimates, and therefore considered reliable. Besides, the SRS is the only source of continuous time series of direct estimates of vital rates.

Trends at the all-India level show that only about half of births and deaths were registered up to the mid-1990s; the level has always been lower for deaths than for births. Besides, registration of infant deaths is very poor. The pace of progress in registrations was slow till 2005, but a steep rise after 2005 (Table 1.1 and Fig. 1.1).

Fig. 1.1: Trends in the Level of Registration of Births and Deaths in India, 1996-2008



Source: same as in Table 1.1

Table 1.1: Level of Registration of Births and Deaths in India; 1996-2008

Year	Level of Registration	
	Births	Deaths
1996	54.5	47.7
1997	55.9	46.8
1998	58.3	50.3
1999	56.8	50.0
2000	56.2	48.7
2001	58.0	52.2
2002	59.5	52.1
2003	57.7	53.5
2004	60.4	55.2
2005	62.5	55.0
2006	69.0	63.4
2007	74.5	69.3
2008	76.4	66.4

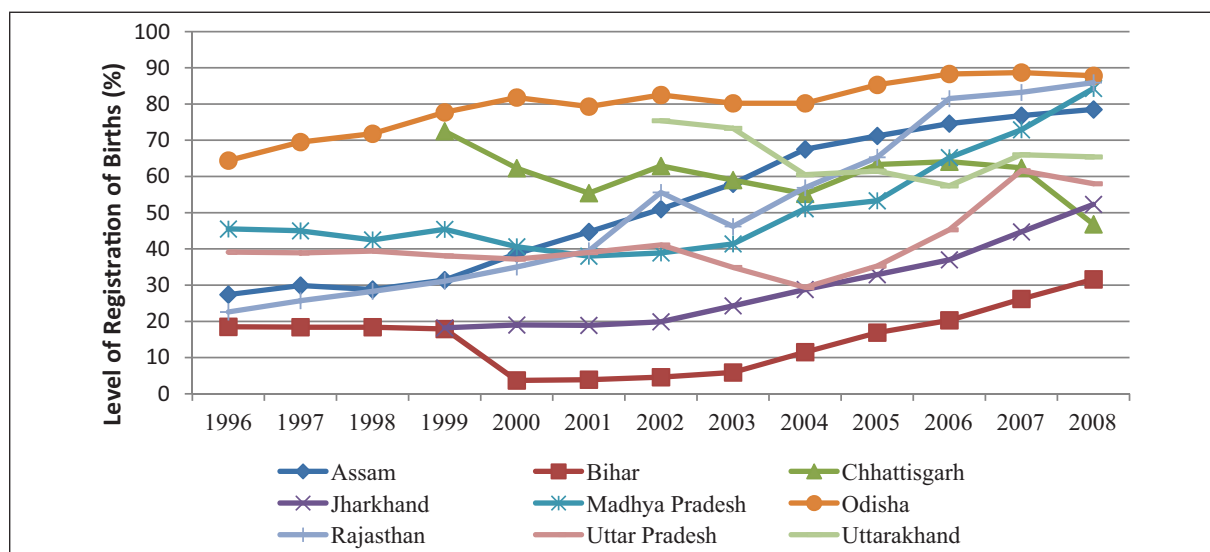
Source: Registrar General (various years); Vital Statistics of India based on Civil Registration System Special Reports

The improvement in registration coincides with the introduction of the National Rural Health Mission (NRHM) and the *Janani Suraksha Yojana* (JSY). Under this scheme, women are paid cash towards expenses related to institutional deliveries and some even for home deliveries. Besides, the Accredited Social Health Activist (ASHA) appointed under the NRHM is given

incentive to promote safe deliveries and antenatal and post-natal care. As such arrangements, especially financial payments, require recording of events, it is probable that this would have induced registration of births. Further analysis is required to see if this indeed is the cause of the rise in the level of registration. There has been a rise in the level of registration of deaths as well but slightly less than the rise for birth registration.

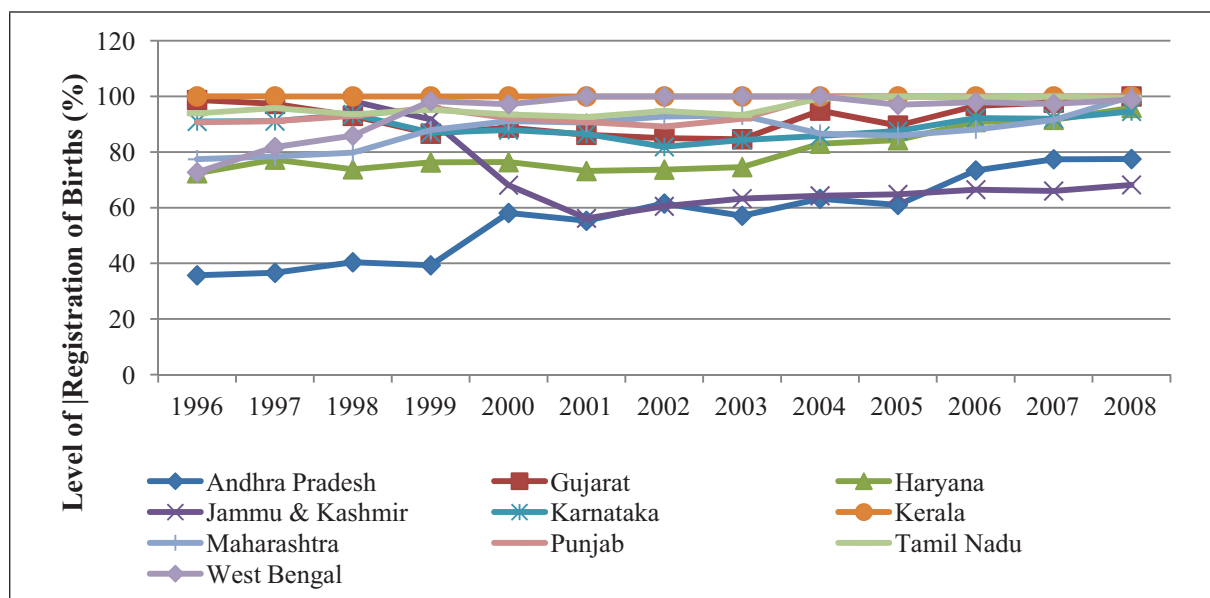
The level varies across states; the discussion below is restricted to larger states since for smaller states, estimates of SRS are based on small sample sizes, making it difficult to obtain reliable estimates of the level of completeness. Registration of births appears near complete in Kerala, Punjab, Maharashtra, Gujarat, Tamil Nadu, and West Bengal and close to it in Karnataka and Haryana (Table 1.2 and Fig. 1.3). In Andhra Pradesh, Assam, Madhya Pradesh, and Rajasthan, it was low until a decade ago but fairly high presently. Other states have also shown improvement but the level is still not satisfactory (Fig. 1.2).

Fig. 1.2: Trends in the Level of Registration of Births in High Focus States, 1996-2008



Source: same as in Table 1.2

Fig. 1.3: Trends in the Level of Registration of Births in Other (than High Focus) States, 1996-2008



Source: same as in Table 1.2

The States of Bihar, Jharkhand, Chhattisgarh and Uttar Pradesh fall in this category. All these are high focus states for the NRHM and, in spite of the JSY, a large number of births are not registered. While improvement after the introduction of the NRHM is noticeable, Rajasthan, Assam, Andhra Pradesh, Odisha, and West Bengal had shown improvement between 1995 and 2005, even before the introduction of NRHM.

Registration of deaths is poorer; it is nearly complete only in Kerala and quite high in Punjab and Tamil Nadu among the larger states (Table 1.3 and Fig. 1.5). There has been a noticeable rise in the level of registration since 1995 in most of the states. Yet, less than half the deaths are registered in Bihar, Assam, and Jharkhand (Fig. 1.4). Generally, states with relatively high level of birth registration also show high level of death registration though not as high as the former. Assam is an exception with fairly high birth registration but quite low death registration; Madhya Pradesh also shows wide gap between the levels of birth and death registration.

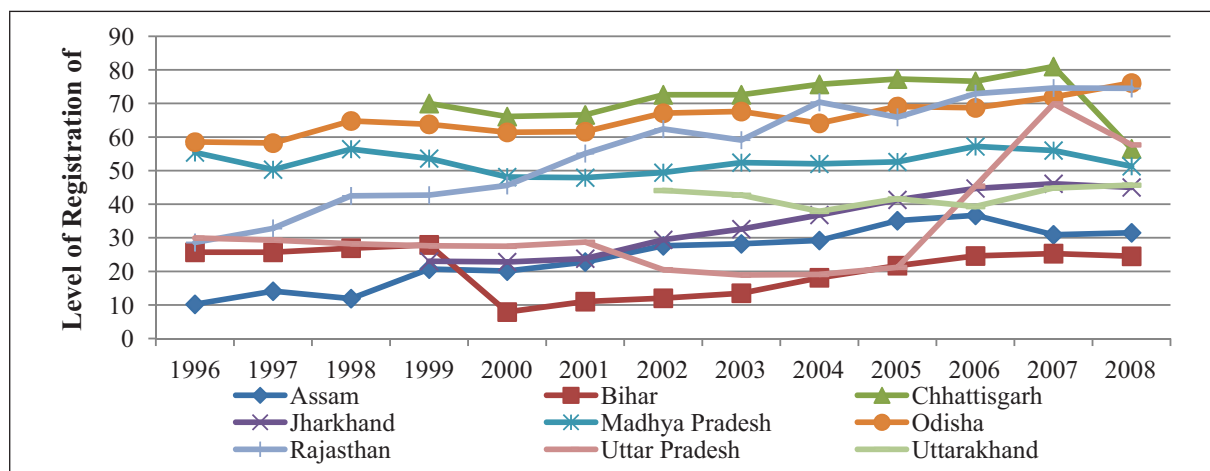
As expected, by and large, states with higher level of socioeconomic development show better registration than others. This is true of both birth and death registration. It would not be correct to compute levels of registration for rural and urban areas separately since women from rural areas often go to institutions located in urban areas for deliveries, and the births would then get registered in urban areas. Similarly, hospitals are located primarily in urban areas and many of the deaths occurring in these would be of usual residents of rural areas.

Overall, registration of births and deaths seems to have improved over the years. The change is greater since 2005, coinciding with the introduction of the NRHM and its important component, the JSY. Yet, the level of completeness is far from satisfactory. While some states have moved to almost complete registration of births and near complete registration of deaths, a few large states are lagging. Clearly, in these states, it would be wrong to expect civil registration to yield either vital rates or information for updating population registers.

In the following chapters, we look at the district level CRS estimates for specific parameters and examine their quality. We also

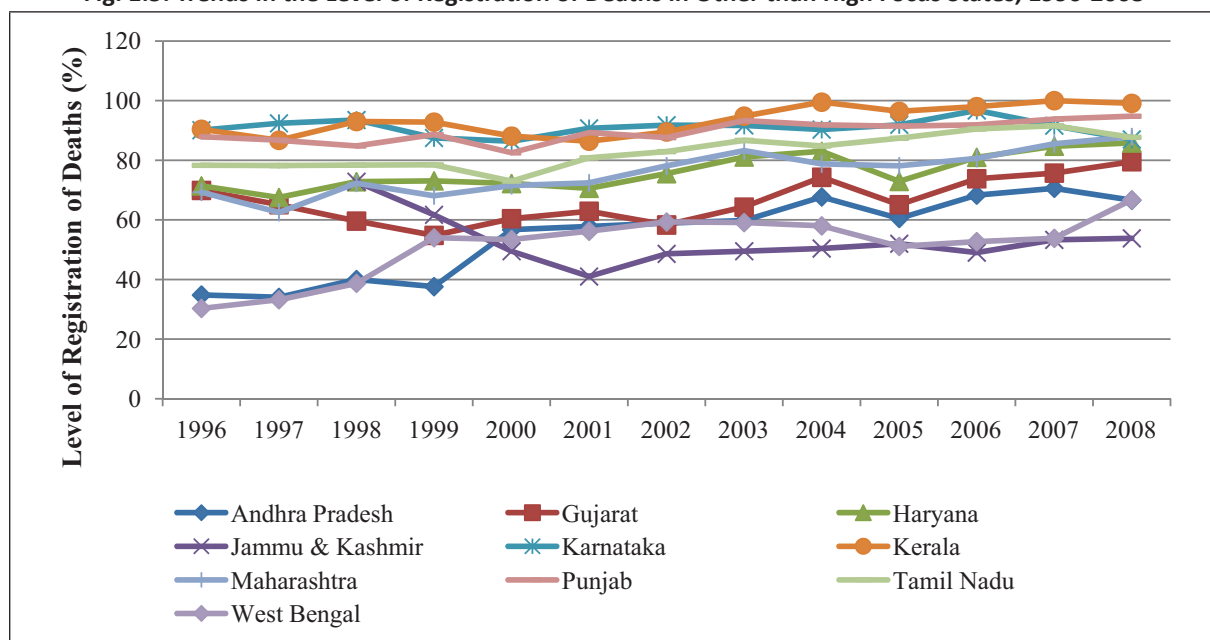
provide estimates to correct the crude death rate. The analysis is for districts in the three states of Rajasthan, Odisha and Kerala.

Fig. 1.4: Trends in the Level of Registration of Deaths in High Focus States, 1996-2008



Source: same as in Table 1.3

Fig. 1.5: Trends in the Level of Registration of Deaths in Other than High Focus States, 1996-2008



Source: same as in Table 1.3

Table 1.2: Level of Registration of Births in Major States of India from 1996-2008

State	High Focus States												
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Assam	27.4	29.9	28.8	31.4	38.7	44.7	51.0	58.0	67.5	71.2	74.6	76.8	78.5
Bihar	18.5	18.4	18.4	17.9	3.7	3.9	4.6	5.9	11.5	16.9	20.3	26.2	31.6
Chhattisgarh	N.A	N.A	N.A	72.5	62.3	55.4	62.9	59.0	55.2	63.3	64.1	62.4	46.8

High Focus States													
State	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Jharkhand	N.A	N.A	N.A	18.2	19.0	18.9	19.9	24.3	28.8	32.9	37.0	44.7	52.3
Madhya Pradesh	45.5	45.0	42.5	45.4	40.6	38.0	38.9	41.4	51.1	53.3	65.2	72.9	84.3
Odisha	64.4	69.5	71.8	77.7	81.8	79.3	82.5	80.2	80.2	85.3	88.3	88.7	87.8
Rajasthan	22.6	25.7	28.3	31.1	35.0	39.5	55.6	46.2	56.9	65.3	81.5	83.2	85.9
Uttar Pradesh	39.1	38.9	39.4	38.1	37.2	39.0	41.1	34.9	29.4	35.3	45.3	61.6	58.0
Uttarakhand	N.A	N.A	N.A	N.A	N.A	N.A	75.4	73.3	60.5	61.5	57.4	66.0	65.4
Other States													
Andhra Pradesh	35.7	36.6	40.4	39.3	58.1	55.3	61.5	57.1	63.2	61.0	73.4	77.4	77.5
Gujarat	98.7	97.3	93.0	86.6	88.8	86.2	85.0	84.6	94.9	89.5	96.6	97.8	100.0
Haryana	72.4	77.3	73.8	76.3	76.4	73.2	73.7	74.6	83.0	84.3	90.8	91.6	95.9
Jammu & Kashmir	N.A	N.A	98.3	91.7	68.1	56.2	60.5	63.3	64.3	64.8	66.5	66.0	68.2
Karnataka	91.0	91.1	93.5	87.0	87.9	86.5	81.9	84.3	85.8	87.6	92.2	92.0	94.6
Kerala	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Maharashtra	77.4	78.4	79.8	87.9	91.1	90.6	92.8	93.1	86.6	85.9	88.1	91.5	100.0
Punjab	90.7	91.1	93.0	95.9	92.2	90.8	89.2	92.0	100.0	100.0	100.0	100.0	100.0
Tamil Nadu	93.9	95.8	93.6	95.2	93.5	92.6	94.7	93.3	99.3	100.0	99.7	100.0	99.4
West Bengal	72.7	81.8	85.9	98.3	97.2	100.0	100.0	100.0	100.0	97.0	97.9	97.3	98.9

Source: Registrar General, India; reports of the Civil Registration System for various years.

Table 1.3: Level of Registration of Deaths in Major States of India from 1996-2008

High Focus States													
State	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Assam	10.2	14.1	11.9	20.7	20.1	22.8	27.6	28.2	29.2	35.1	36.7	30.9	31.5
Bihar	25.7	25.7	26.9	27.9	7.9	11.0	12.0	13.5	18.1	21.7	24.6	25.3	24.5
Chhattisgarh	N.A	N.A	N.A	70.0	66.1	66.6	72.6	72.6	75.7	77.3	76.6	81.0	56.5
Jharkhand	N.A	N.A	N.A	23.0	22.8	23.8	29.4	32.6	36.8	41.3	44.7	46.1	45.0
Madhya Pradesh	55.4	50.3	56.4	53.6	48.1	47.9	49.4	52.4	52.0	52.6	57.2	56.0	51.3
Odisha	58.5	58.2	64.8	63.8	61.4	61.6	67.1	67.6	64.1	69.1	68.7	71.9	76.1
Rajasthan	28.6	32.8	42.5	42.7	45.6	55.1	62.4	59.1	70.4	65.9	72.9	74.6	74.5
Uttar Pradesh	29.9	29.3	28.2	27.6	27.5	28.7	20.5	18.9	19.1	21.2	45.4	69.9	57.7
Uttarakhand	N.A	N.A	N.A	N.A	N.A	N.A	44.1	42.7	37.9	41.6	39.3	44.8	45.7
Other States													
Andhra Pradesh	34.8	34.0	40.0	37.6	56.7	57.8	58.9	59.8	67.7	60.5	68.3	70.6	66.6
Gujarat	69.9	65.1	59.6	54.8	60.4	62.9	58.3	64.3	74.3	65.1	73.8	75.7	79.5
Haryana	71.4	67.5	72.8	73.1	72.2	70.6	75.5	81.1	83.0	72.9	81.0	84.7	85.8
Jammu & Kashmir	N.A	N.A	72.8	61.7	49.5	41.0	48.6	49.5	50.4	52.0	49.0	53.3	53.8
Karnataka	90.1	92.4	93.5	87.5	86.4	90.7	91.8	91.7	90.3	91.9	96.7	91.6	87.0
Kerala	90.4	86.7	93.0	92.8	88.1	86.4	89.5	94.8	99.5	96.4	98.0	100.0	99.1
Maharashtra	69.3	62.5	72.3	68.1	71.5	72.4	78.1	83.2	78.8	78.1	80.6	85.5	87.9
Punjab	87.9	86.7	84.8	88.6	82.5	89.3	87.6	93.3	91.9	91.4	91.9	93.8	94.8
Tamil Nadu	78.3	78.2	78.4	78.5	73.0	80.8	82.9	86.7	84.8	87.4	90.5	91.6	87.7
West Bengal	30.3	33.2	38.7	54.0	53.4	56.2	59.3	59.1	58.0	51.1	52.7	53.8	66.7

Source: Registrar General, India; reports of the Civil Registration System for various years.

Chapter 2

BIRTH STATISTICS

This chapter presents quality assessment of birth statistics in three selected states. The completeness of birth rate from CRS is assessed in comparison to other available estimates. Indirect estimate of fertility from 2011 census using information on 0-6 age group population is already available (Sathyanarayana and Kumar 2012). As the census estimates are based on 0-6 age group population, the CBR estimate from census corresponds to 2004-11 period. But no adjustment is made in the estimate to match precisely with the year of data available from CRS. The state level estimate of CRS, however, is compared with the corresponding data from the Sample Registration System (SRS) for the same period.

Table 2.1 presents information on the coverage of CBR at the state level as compared to the SRS estimates for these three states. While data were gathered for Odisha for the three year period 2009-11, the data for Kerala and Rajasthan were gathered only for 2009 and 2010 respectively.

Interestingly, while birth rates from SRS are higher than CRS for Odisha and Rajasthan, it is not the case with Kerala where the birth rate was higher as per CRS than SRS in 2009. It indicates better reporting of births in CRS in Kerala. The difference in birth rate between CRS and SRS is lower in Rajasthan as compared to Odisha. Perhaps, it is an indication of better registration of births in Rajasthan compared to Odisha. However, to understand the situation better, it is important to have a district level analysis across these states.

Table 2.1: Reporting of births in CRS compared to SRS estimates for Kerala, Odisha and Rajasthan

States	2009			2010			2011		
	CRS CBR	SRS CBR	Percent Reporting	CRS CBR	SRS CBR	Per cent Reporting	CRS CBR	SRS CBR	Percent Reporting
Kerala	16.5	14.7	112.2	-	14.8	-	-	15.2	-
Odisha	18.0	21.0	85.7	18.5	20.5	90.2	18.4	20.1	91.5
Rajasthan	-	27.2	-	25.9	26.7	97.0	-	26.2	-

Source: Registrar General, India; reports of the Civil Registration System and the Sample Registration System, various years.

Table 2.2 presents the birth rate from CRS and 2011 census to understand the district level coverage of births in these three states. The table also provides percentage reporting of births in CRS estimates in relation to the census based estimates. The value below 100 indicate how far CRS estimates are lower than the census estimates and over 100 provides information on the magnitude of SRS estimates lower than CRS estimates. The number of births not registered across districts based on the percent reporting is also provided in the table. In districts with reporting of over 100 per cent, the number of births not reported is taken as zero.

Table 2 shows that in the case of Kerala, the CRS estimates of birth rate are invariably higher than census estimates except for three districts. In one district, Pathanamthitta, the CRS value is 35 percent high as compared to the census value. However, it must be noted here that the census estimates are also indirect estimates based on 0-6 population, and any underreporting of children in census enumeration will push the census fertility estimates downward. It is not possible, at this stage, to attribute the observed differences between CRS and census based estimates in districts of Kerala to this phenomenon (a detailed analysis of census age distributions is called for). Yet, since overall CRS estimates are higher than both the SRS estimate at the state level and the census based estimates for most districts, a fairly complete coverage of births in the state is indicated. The under-registration of births in Kerala is primarily concentrated in two districts; viz., Alappuzha and Palakkad. If efforts are made to reduce the underreporting

in these two districts, Kerala's birth statistics from CRS would be most reliable.

However, this is not the case with the other two states. Both in Odisha and Rajasthan, the percentage reporting of births is poor in many districts and the percent reporting is as low as 59 in Kalahandi district of Odisha and 62 per cent in Barmer district of Rajasthan. Interestingly, both these states also show far higher values of CRS estimates of birth rate as compared to census estimates in some districts. For instance, the CRS estimate is 40 percent higher than the census estimates in Bargarh district of Odisha and 81 per cent higher in the case of Kota district of Rajasthan. Such patterns could be due to the uneven spread of health facilities across districts. As the CRS births are reported on *de facto* basis, that is, a birth is recorded in the district in which it occurs, districts having good facilities will also record higher births as many complicated deliveries of women from other districts might take place in these facilities. Therefore, a relatively higher CRS estimate in a few districts is not unusual and need not imply better coverage of CRS in these districts; correspondingly, estimates in other districts would be lower. The districts with under-registration of births are almost uniformly distributed in Odisha whereas such under-registration is concentrated among a small number of districts in Rajasthan. It means that by making extra efforts in selected districts, the under-registration of births can be addressed to a greater extent in Rajasthan. On the other hand, the situation is different in Odisha. As under-registration is spread almost universally across districts, greater efforts are needed to address this issue.

Table 2.2: District level estimates of CBR from CRS compared to Census 2011 based estimates for Kerala, Odisha and Rajasthan

Districts (Kerala)	CRS 2009	CENSUS CBR	% Reporting	Implied Number of Births not reported	Districts (Odisha)	CRS 2011	CENSUS CBR	% Reported	Implied Number of Births not reported	Districts (Rajasthan)	CRS 2010	CENSUS CBR	% Reported	Implied Number of Births not reported
Alappuzha	11.1	12.8	87.0	3059	Puri	12.13	15.90	76.3	4885	Chittaurgarh	18.5	23.2	79.7	12157
Idukki	13.8	13.1	105.0	0	Kalahandi	13.73	23.20	59.2	12880	Bundi	18.6	23.6	79.0	20016
Palakkad	14.4	15.3	94.0	2390	Sonepur	14.16	19.10	74.1	2664	Barmer	20.5	33	62.0	15491
Kollam	14.5	13.3	108.7	0	Bhadrak	14.69	19.10	76.9	5648	Hanumanagarh	21.0	20.8	101.1	0
Pathanamthitta	14.9	11	135.2	0	Jagatsinghpur	14.80	14.40	102.8	0	Dungarpur	21.3	30.9	68.8	16154
Kottayam	15.0	12.4	120.6	0	Nayagarh	15.00	17.10	87.7	1690	Ganganagar	21.5	20	107.3	0
Ernakulam	15.3	13.1	116.6	0	Bolangir	15.22	20.80	73.2	8682	Jhalawar	21.5	24.2	88.7	7116
Thiruvananthapuram	15.6	12.9	120.7	0	Boudh	16.61	22.60	73.5	1663	Karauli	22.1	27.6	80.2	10380
Kasaragod	16.4	17	96.7	692	Dhenkanal	16.76	18.10	92.6	1316	Dausa	22.4	26.5	84.6	3158
KERALA	16.5	14.7	112.0		Kendrapara	16.85	17.30	97.4	571	Tonk	22.7	24.1	94.3	1641
Thrissur	17.2	13.6	126.8	0	Deogarh	17.01	20.60	82.6	779	Bharatpur	22.8	28.1	81.1	13274
Kozhikkode	18.3	15.5	117.9	0	Koraput	17.17	26.40	65.0	10201	Bikaner	22.9	28.1	81.6	6621
W ayanaad	18.4	16.3	113.1	0	Ganjam	18.38	18.30	100.4	0	Dhaulpur	23.0	30.6	75.1	6763
Kannur	19.1	15.4	123.8	0	ORISSA	18.43	19.60	94.0	43950	Banswara	23.1	32	72.1	8052
Malappuram	21.7	20.2	107.3	0	Jajapur	18.44	18.30	100.7	0	Ajmer	23.6	24.2	97.4	1099
					Balasore	18.60	19.20	96.9	1283	Jhunjhunumun	24.4	20.8	117.1	0
					Keonjhar	19.02	23.00	82.7	5512	Baran	24.4	24.8	98.6	2692
					Jharsuguda	19.39	16.70	116.1	0	Pali	24.8	24.4	101.8	0
					Sundargarh	19.53	19.20	101.7	0	Nagar	24.9	24.7	100.7	0
					Mayurbhanj	19.56	21.10	92.7	3370	Udaipur	25.7	28.3	90.9	2710
					Cuttack	20.18	15.50	130.2	0	Rajasthan	25.9	25.6	101.2	0
					Gajapati	20.58	24.30	84.7	1512	Alwar	26.5	26.2	101.0	0
					Rayagada	20.73	24.90	83.2	3147	Bhiliwara	26.6	25.6	104.0	0
					Khurda	20.94	16.10	130.0	0	Jodhpur	26.8	26.8	99.8	124
					Angul	21.12	18.30	115.4	0	Rejsamand	28.6	25.6	111.7	0
					Kandhamal	21.34	25.10	85.0	2066	Jaipur	29.3	23	127.2	0
					Nawarangpur	21.60	28.20	76.6	6034	Sirohi	29.4	28.2	104.2	0
					Sambalpur	22.18	17.40	127.4	0	Jaisalmer	29.6	33.1	89.3	3472
					Nuapara	22.38	23.10	96.9	455	Sawai Madhopur	29.7	25.3	117.5	0
					Bargarh	23.27	16.60	140.2	0	Jalor	30.6	29.5	103.9	0
					Malkangiri	23.29	29.50	78.9	2987	Sikar	33.8	22.3	151.7	0
										Churu	34.5	24	143.8	0
										Kota	38.2	21.1	180.9	0
										Chittaurgarh	18.5	23.2	79.7	12157

Sources: Kumar and Sathyanarayana (2012) and Registrar General, India, reports of the Sample Registration System, various years.

COMPARISON OF CRS BIRTH RATE WITH CENSUS USING SCATTER DIAGRAM

The correspondence between CRS and census based CBR estimates are further validated using scatter plots. Figures 2.1 to 2.3 present the scatter plots for Kerala, Odisha and Rajasthan respectively. In the scatter plots, the diagonal line shows perfect correspondence between CRS and census based estimates. Any point below the diagonal represents under-reporting in CRS births in comparison with the census estimates. If the points fall above the diagonal, the census based birth rate is lower than CRS estimate.

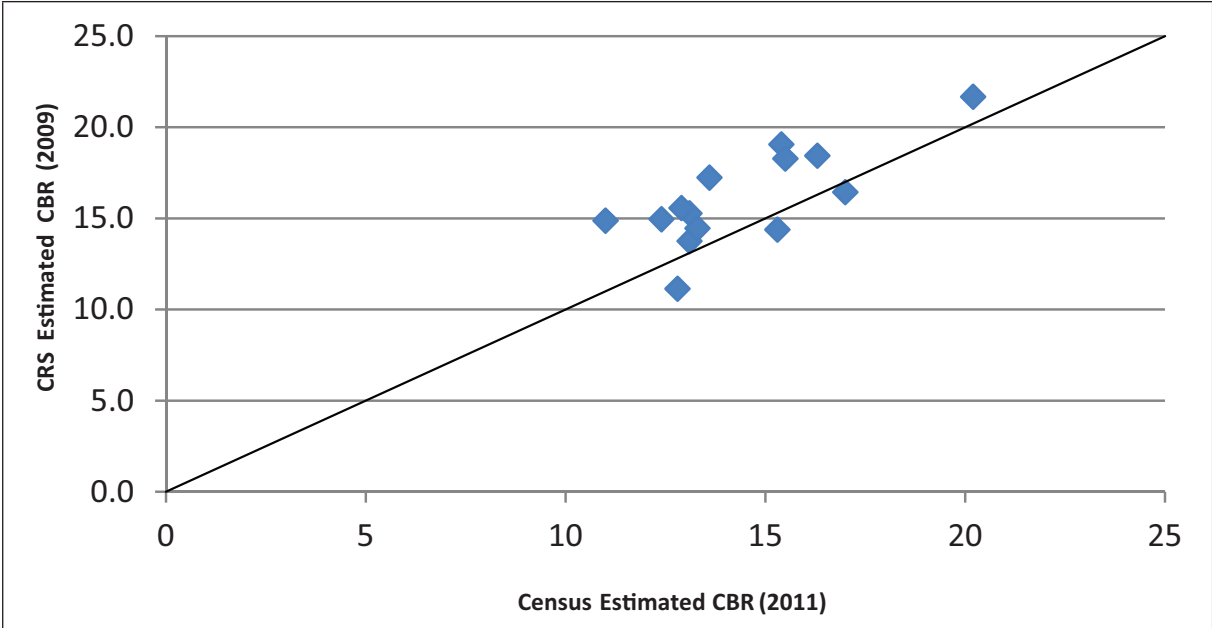
It is clear from the scatter plots that while for Kerala most observations fall above the diagonal, for Odisha and Rajasthan the opposite is true. In the case of Orissa the deviation from the diagonal is substantial for some districts. There are,

however, many observations that fall close to the diagonal line in the case of Rajasthan. Therefore, it appears that Rajasthan data on birth rate are more complete compared to Odisha data. This is in spite of the fact that Odisha has had a faster decline in birth rate in recent years with fertility level nearly close to replacement. In the case of Kerala, as already pointed out, not only that the observations fall very close to the diagonal line but most of them fall above the diagonal, also indicating good quality of CRS data on CBR.

THE COMPLETENESS OF CRS BIRTH RATE

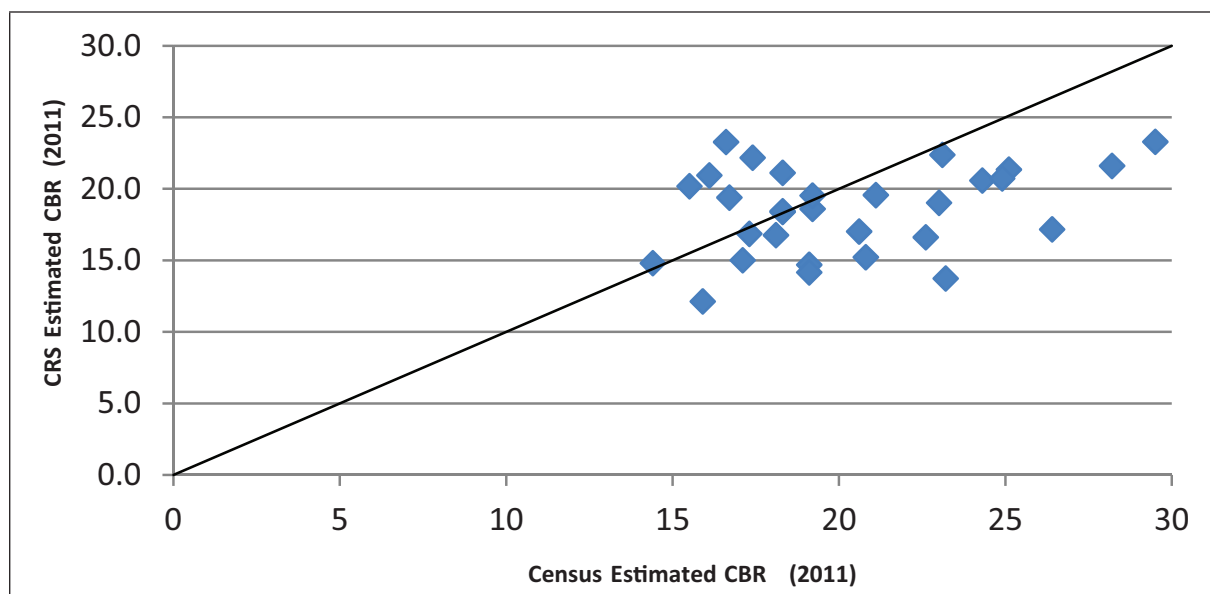
The study has attempted to estimate the completeness of CRS birth rate in each district in the three selected states using information from the census based estimates. CRS birth rate as percentage of census based estimate provides the percentage reporting of CRS births in the districts.

Fig. 2.1: Comparison of CBR based on Census and CRS for Kerala



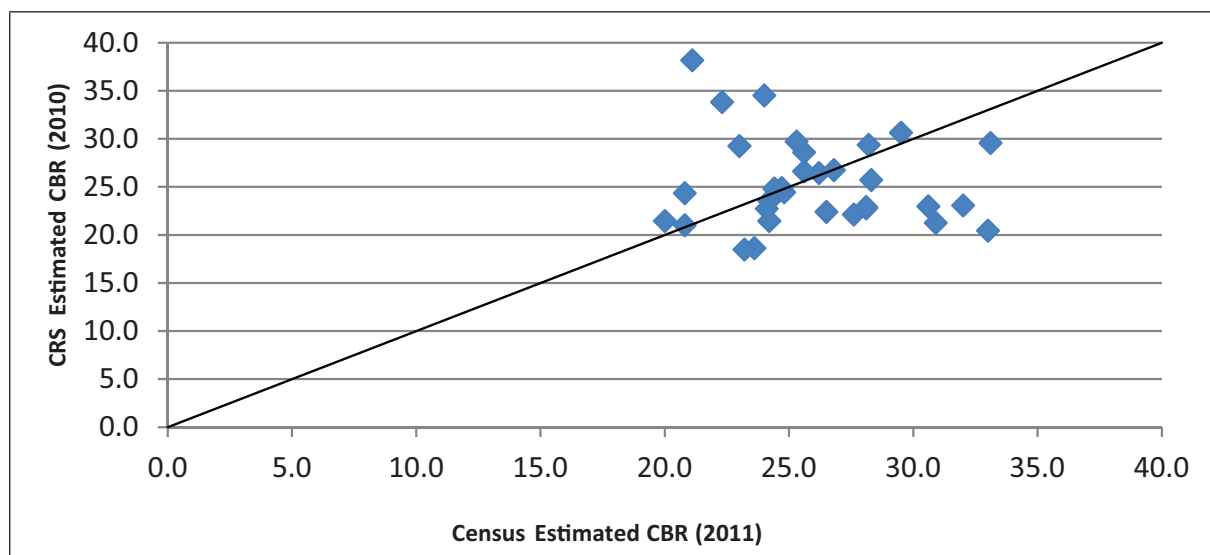
Source: same as in Table 2.2

Fig. 2.2: Comparison of CBR based on Census and CRS for Orissa



Source: same as in Table 2.2

Fig. 2.3: Comparison of CBR based on Census and CRS for Rajasthan

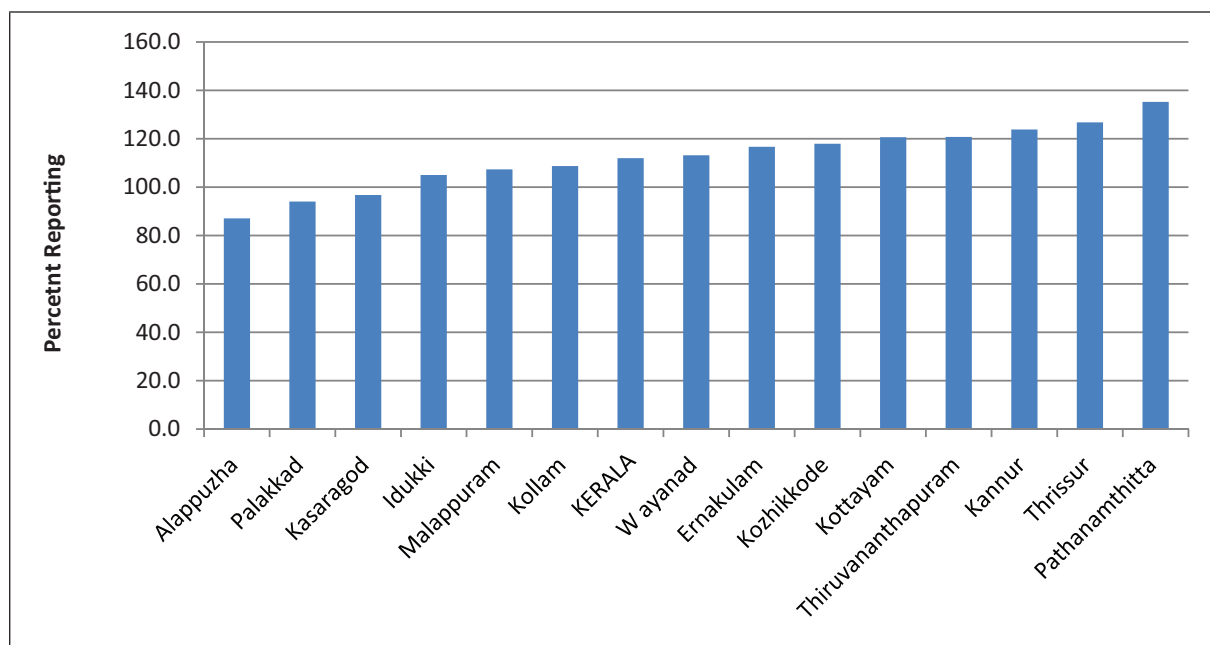


Source: same as in Table 2.2

Figures 2.4 to 2.6 present the percentage reporting of births in CRS across districts in Kerala, Odisha and Rajasthan respectively. The

summary of the figures are presented in Table 2.3, which provides the number of districts with the percentage of completeness in different states.

Figure 2.4: Reporting of Births by Districts in Kerala (CRS, 2009)



Source: same as in Table 2.2

There are only three districts in Kerala reporting less than 100 per cent, and only one district falls below 90 per cent. For five districts in the state, the CRS estimate of CBR is over 120 per cent of the census estimate. But these five districts are also comparatively developed ones with good health facilities and thereby attracting deliveries from other districts as well. Therefore, the over-reporting indicates availability of good referral hospitals in these districts. Overall, it appears that except for one or two districts, the CRS estimate of CBR is of good quality in Kerala. In contrast in Odisha, 20 districts fall below the 100 per cent mark indicating under registration of births in these districts. Of these, around 15 districts fall below 90 per cent. Also, there are four districts with over 120 per cent registration of births. Perhaps, the registration of births in Odisha has a direct linkage with the

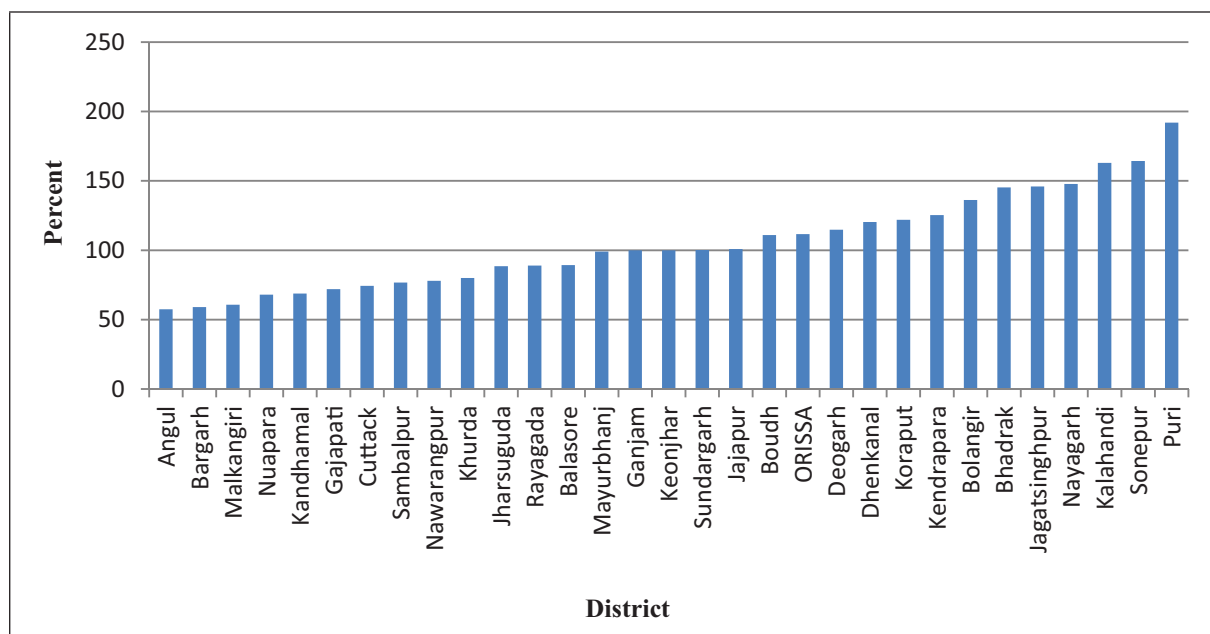
hospital births in bigger cities in the state, as people from other districts also would be taking advantage of better hospital facility in a few districts. In Rajasthan, 12 districts fall below the 90 per cent mark in registration, while districts have registration over 120 per cent. However, 17 districts are in the expected range of 90 to 120 per cent indicating comparatively reliable data in these districts.

Table 2.3: Distribution of Districts by the level of birth registration, Kerala, Odisha and Rajasthan

Percentage of Birth Registration	Number of Districts		
	Kerala 2009	Orissa 2011	Rajasthan 2010
50-70	-	2	2
70-90	1	13	10
90-100	2	5	4
100-120	6	6	13
120+	5	4	4
Total districts	14	30	33

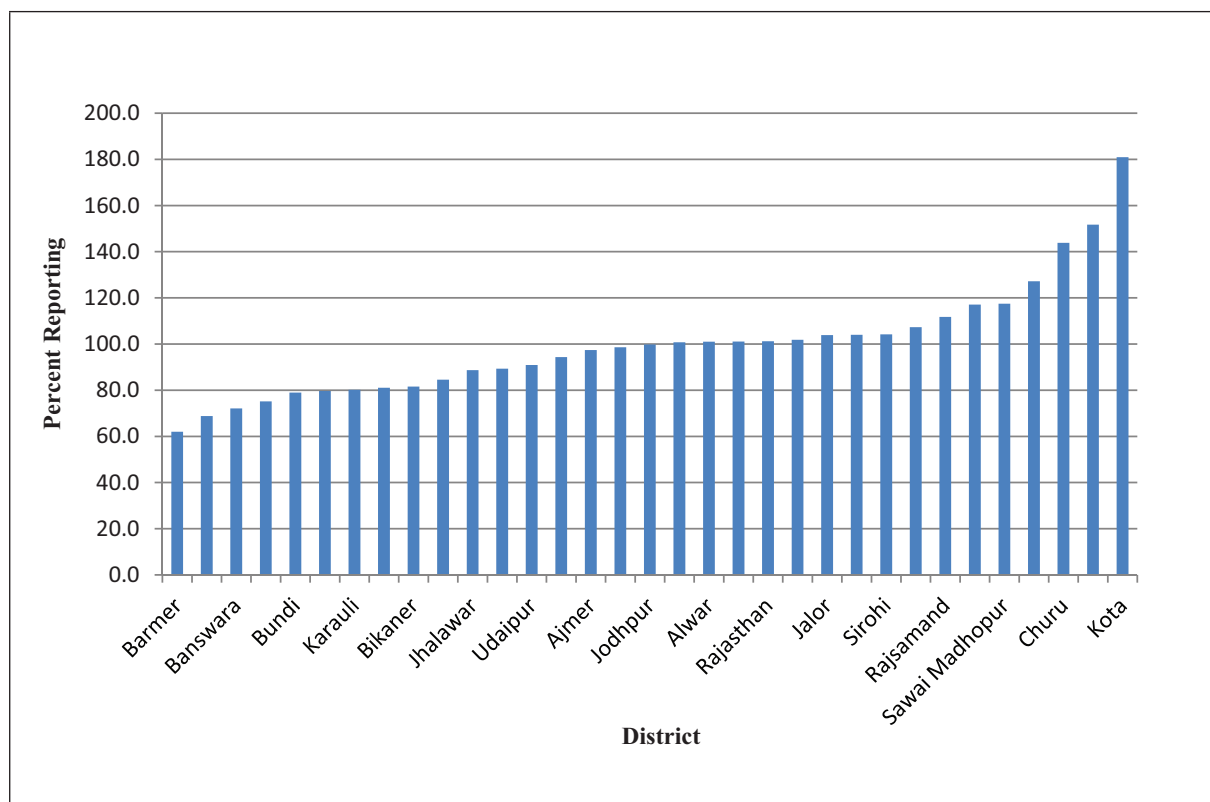
Source: same as in Table 2.2

Figure 2.5: Reporting of Births by Districts in Odisha (CRS, 2011)



Source: same as in Table 2.2

Figure 2.6: Reporting of Births by Districts in Rajasthan (CRS, 2010)



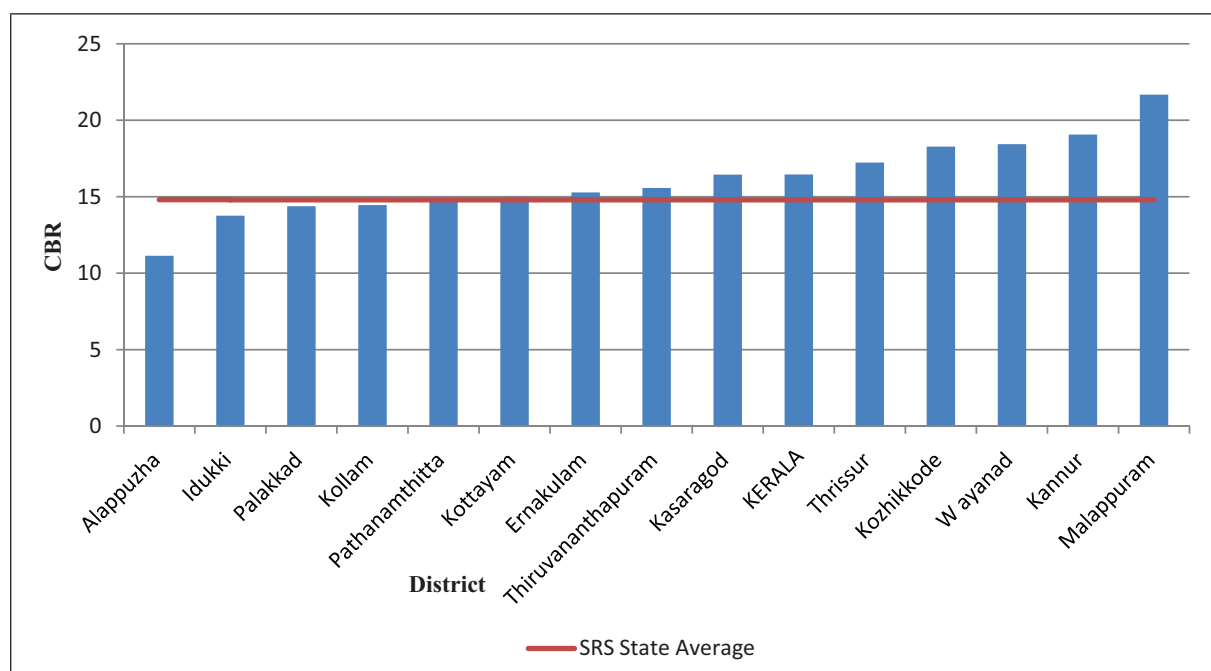
Source: same as in Table 2.2

ASSESSING CRS BIRTH RATE USING SRS ESTIMATES

Yet another method of assessing the quality of CRS estimates is to compare it with the state level SRS estimate. Census based estimate of birth rates has the deficiency that the computations are based on 0-6 age group population which would possibly be an undercount. However, SRS estimates are more reliable at the state level and widely used to understand the fertility levels in the state. If there were no under registration of births in CRS, nearly half of the districts would fall below the SRS birth rate and the other half above the SRS rate. If the CRS estimates are better than SRS, it is expected that more districts in the state would be above the SRS average. Figures 2.7 to 2.9 present the comparison of CRS estimate of CBR with that of the SRS state estimate in Kerala, Odisha and Rajasthan respectively.

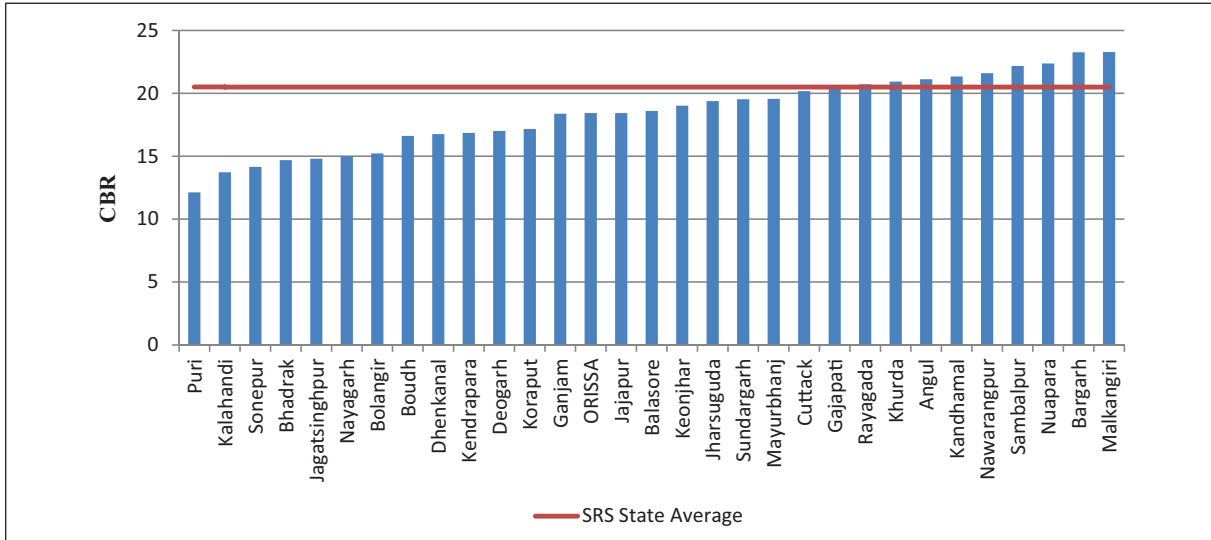
The completeness of CRS estimate in Kerala is further confirmed by comparing CRS estimate of CBR across districts with SRS estimate of the state. Around half of the 14 districts (eight districts) are above the state average and the rest are below the state average in Kerala. This clearly indicates that the CRS estimate of CBR is also very close to the SRS state estimate in the state. But this is not true in Odisha where majority of the districts fall below the SRS state average. Only 10 districts out of 30 have birth rates above the SRS state average which shows that the CRS registration of births is far from complete in Odisha. By and large, the same picture emerges from Rajasthan as well; there are only nine districts out of the total 33 with CBR above the SRS average. This confirms further that in the case of Odisha and Rajasthan, there is considerable under registration of births in CRS, even considering an estimate other than the census indirect estimates.

Fig. 2.7: Estimated CBR by Districts of Kerala



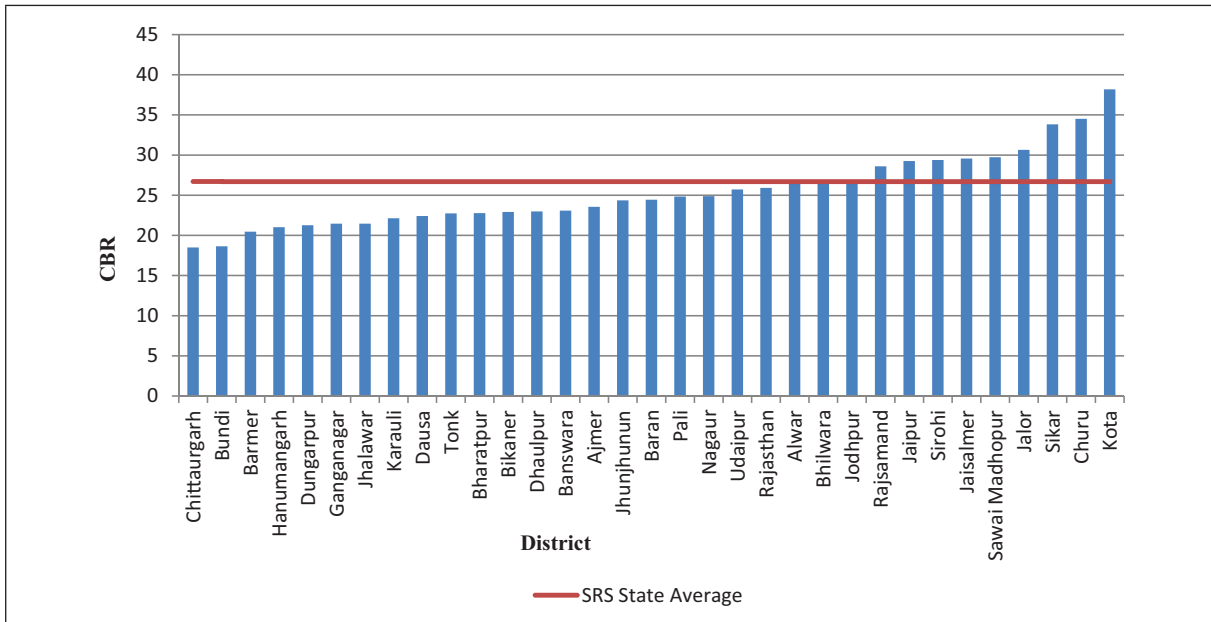
Source: same as in Table 2.2

Fig. 2.8: Estimated CBR by Districts of Odisha



Source: same as in Table 2.2

Fig. 2.9: Estimated CBR by Districts of Rajasthan



Source: same as in Table 2.2

Overall, the attempt here is to understand the quality of district level estimate of births in Kerala, Odisha and Rajasthan. Undoubtedly, Kerala CRS estimates are nearly complete, while under registration of births exists both in Odisha and Rajasthan. The magnitude of under registration appears to be small in Rajasthan as

compared to Odisha. This analysis has primarily depended upon the indirect estimate of CBR from 2011 census for comparison. The CBR in Rajasthan in many districts are comparable to the census based estimate, but this is not the case in Odisha where the CRS estimate deviates substantially from the census based estimates.

Chapter 3

DEATH STATISTICS: CRUDE DEATH RATE

Registration of deaths is to be done on the basis of reports by family members of the deceased or other informants. In case of deaths occurring in institutions, the institution is responsible for registration. While cause of death is reported and recorded, it is not included in the death certificate. The CRS also records still births (technically still births are not counted as deaths). Data on the number of total deaths and infant deaths by sex are also released at the district level with rural-urban breakdown and the CRS routinely publishes crude death rate and the infant mortality rate for districts. We look at estimates of both the Crude Death Rate and the Infant Mortality Rate for the districts in the three states.

CRUDE DEATH RATE

It was noted earlier in (Chapter 1) that the CDRs based on the CRS are much lower than the SRS rates for the corresponding states and periods. Assuming that the SRS estimates are fairly correct, this means that registration of deaths in the CRS is highly incomplete. A glance at the published rates *prima facie* indicates that for many states the CRS estimates of the CDR are gross underestimates even in the recent years.

For the three states under consideration in this report, Table 3.1 presents both the CRS and SRS rates in the recent years. Clearly, reporting of deaths under CRS is much lower than SRS for Odisha and Rajasthan, the level of registration being slightly lower in Odisha (76-78%) than Rajasthan (82%). It seems reporting of deaths is poor both in Odisha and Rajasthan. On the other hand, the CRS rate for 2009 is very close to the SRS rate in Kerala indicating a nearly complete coverage.

Table 3.1: Crude Death Rate from the Civil Registration System compared to SRS estimate for Rajasthan, Odisha, and Kerala

State	2009			2010			2011		
	CRS	SRS	Percent Reporting	CRS	SRS	Percent Reporting	CRS	SRS	Percent Reporting
Odisha	6.9	8.8	78.4	6.7	8.6	77.9	6.5	8.5	76.5
Rajasthan	--	6.6	--	5.5	6.7	82.1	--	6.7	--
Kerala	7.0	6.8	102.9	--	7.0	--	--	7.0	--

Source: Registrar General, India; reports of the Civil Registration System and the Sample Registration System, various years.

However, this does not necessarily imply that the coverage has been good throughout Kerala. In order to assess this, one needs to compare district CDRs from CRS with those from a standard source which is likely to be accurate. For many states, the AHS gives district level estimates but this survey was not conducted in Kerala. Therefore, as a rough check, one can see whether estimates for individual districts vary from the state level estimates. This is admittedly not a satisfactory method since there are variations in the level of mortality across districts, and hence there can be true deviations from the state average. However, given that mortality in Kerala is low in all districts, as seen by independent estimates of infant mortality, and as age distributions do not vary substantially, *one does not expect large inter-district variations* in the CDR. Hence, we look for any large deviations from the state average. A scan of the CDR for 2009 reveals that only in one district (Mallappuram) the CDR coverage is lower than the state average by over two points and in one district (Thiruvananthapuram), it is higher by over two points. In all the other districts, the CDR is within two points of the state average. Even in the two districts noted above, the departure is within three points. Overall, the estimates of the CDR based on the CRS do not show conspicuous anomalies for districts of Kerala.

Table 3.2: Crude Death Rate in Districts of Kerala, Civil Registration System, 2009

(Districts arranged in ascending order of CDR)

Districts	CRS 2009	Deviation from SRS estimate for the state
Mallappuram	4.6	- 2.2
Wayanad	5.0	-1.8
Kasaragod	5.1	-1.7
Idukki	5.7	-1.1

Districts	CRS 2009	Deviation from SRS estimate for the state
Pallakad	6.2	-0.6
Kollam	6.6	-0.2
Kannur	7.0	0.2
Alappuzha	7.1	0.3
Ernakulam	7.8	1.0
Kozhikode	7.9	1.1
Kottayam	8.4	1.6
Thrissur	8.5	1.7
Pathanamthitta	8.8	2.0
Thiruvanthapuram	9.6	2.8
State (SRS)	6.8	

Source: Registrar General, India; reports of the Civil Registration System, various years

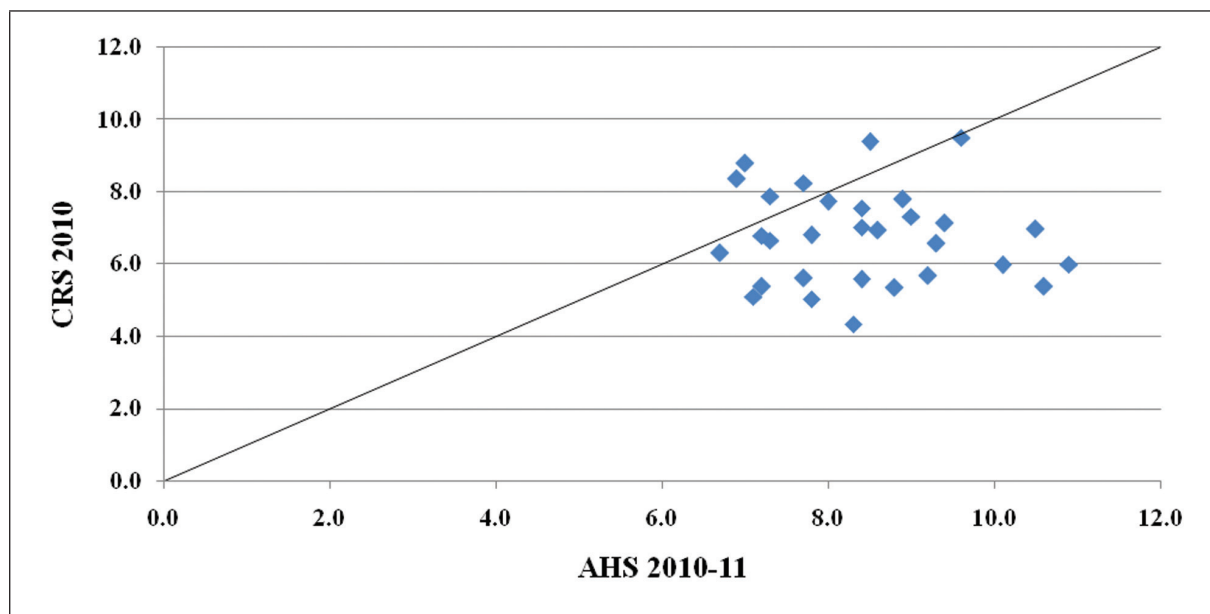
For both Odisha and Rajasthan, we do have estimates from the AHS at the district level. Table 3.3 shows CDR from the CRS and the AHS (2010-11) for all districts of Odisha. The table also shows estimated level of coverage, which is obtained simply as the CRS CDR as percent of AHS CDR, on the assumption that the AHS estimates are fairly accurate. Note that the estimate of coverage shown here is only a point estimate since the AHS estimates are subject to sampling error. However, the sample sizes in the AHS were large and consequently sampling errors are small. According to the AHS reports, in almost all the districts, the 95 % confidence is narrower than CDR ± 1 ; i.e., the standard error is less than 0.5. This allows us to assess the completeness of coverage.

The scatter plot of CRS and AHS rates shows that values of the CDR from the CRS for most districts of Odisha are below the line of equality, indicating under-reporting of deaths in civil registration (Fig. 3.1). Table 3.3 shows that many districts, Baudh, Bhadrak, Dhankenal, Baragarh, Puri, Kendrapara, Jajapur, Balangir and Khorda, had poor reporting of deaths in CRS (coverage varied from 50-67, that is,

between half and below two thirds). Many other districts also show the CRS values to be two points below the AHS, clearly indicating under-reporting of deaths. Apparently, in many districts, over 3000 deaths went unreported. Malkangiri and Cuttack show the CRS values

to be above the AHS estimates by over twenty percent. The high coverage of deaths in CRS for Cuttack may be attributed to the presence of hospitals in the city drawing patients from other districts thereby raising the number of reported deaths.

Fig. 3.1: Comparison of CDR based on CRS and AHS for Odisha



Source: same as in Table 3.3.

Table 3.3: Crude Death Rates from the Civil Registration System and the Annual health Survey, and Level of Coverage, Districts of Odisha 2010

(Districts arranged in ascending order of CRS estimate of CDR)

Districts	CRS, 2010	AHS, 2010-11	Percent Reporting	Implied Number of Deaths Not Reported
Bhadrak	4.3	8.3	52.3	3197
Jajapur	5.0	7.8	64.4	3286
Baleshwar	5.1	7.1	71.8	3404
Puri	5.3	8.8	60.7	3811
Baudh	5.4	10.6	50.8	1194
Jagatsinghpur	5.4	7.2	74.8	1674
Khorda	5.6	8.4	66.5	3936
Sonapur	5.6	7.7	72.8	962
Kendrapara	5.7	9.2	61.8	3318
Dhenkenal	6.0	10.9	55.0	3419
Baragarh	6.0	10.1	59.2	3623
Kalahandi	6.3	6.7	94.0	583
Nayagarh	6.6	9.3	70.8	1734
Angul	6.7	7.3	91.2	852
Gajapati	6.8	7.8	87.3	481
Sundargarh	6.8	7.2	94.3	822

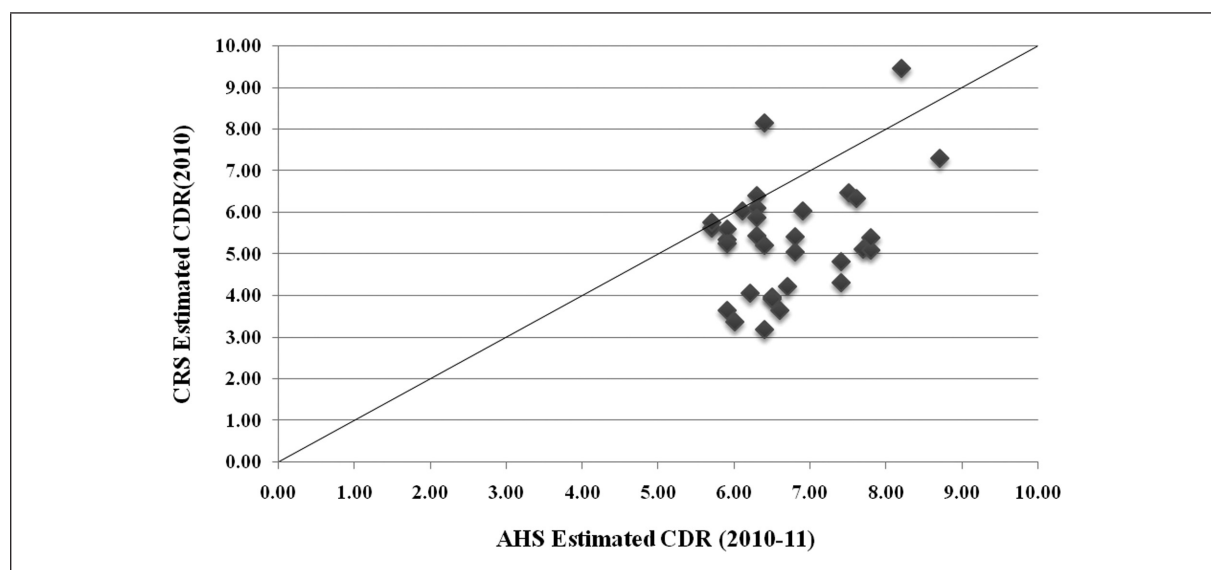
Districts	CRS, 2010	AHS, 2010-11	Percent Reporting	Implied Number of Deaths Not Reported
Debagarh	6.9	8.6	80.7	424
Balangir	7.0	10.5	66.3	3779
Ganjam	7.0	8.4	83.5	4118
Kendujhar	7.1	9.4	75.9	3451
Mayurbhanj	7.3	9.0	81.3	3902
Jharsuguda	7.5	8.4	89.9	397
Koraput	7.7	8.0	96.6	351
Kandhamal	7.8	8.9	87.6	682
Nuapada	7.9	7.3	107.9	0
Nabarangpur	8.2	7.7	107.0	0
Cuttack	8.4	6.9	121.1	0
Malkangiri	8.8	7.0	125.7	0
Rayagada	9.4	8.5	110.4	0
Sambalpur	9.5	9.6	99.0	98

Source: Registrar General, India; reports of the Civil Registration System and the Annual Health Survey, 2010-11

A similar analysis has been carried out for districts of Rajasthan since the AHS also covered Rajasthan, allowing one-to-one comparison of estimates for districts. It is observed that reporting of deaths in Rajasthan is very poor in CRS. Estimated CDR from CRS varies from 3 to 6 per thousand in most of the districts of Rajasthan clearly indicating massive under-reporting. Overall, the scatter plot does not show a pattern and is not close to the line of equality (Fig. 3.2).

Districts like Barmer, Dausa, Bharatpur, Jalore, Nagaur, Dungarpur, Dhaulpur, Jaisalmer, Sawai Madhopur, Budni, Karauli, and Banswara had very poor reporting of deaths in CRS (coverage below 67 percent, that is, CRS rates being less than two thirds of the AHS estimates and the deficits exceeding two points). In fact, the CRS estimates for these districts are incredibly low, and gross under-reporting is quite evident. In many of these districts over 3000 deaths did not get reported.

Fig. 3.2: Comparison of CDR based on CRS and AHS for Rajasthan



Source: same as in Table 3.4.

In contrast, in Ajmer and Udaipur, the CRS rate is well above the AHS and the difference is not explained by sampling error. These two districts have large number of medical facilities which draw patients from other districts. In the event of death in these hospitals, it gets

registered in the district of occurrence rather than in the actual usual residence; therefore, the registered deaths in these districts probably include many who were residents of other districts. The two districts can be seen as clear outliers in the scatter diagram (Fig. 3.2).

Table 3.4: Crude Death Rates from the Civil Registration System and the Annual health Survey, and Level of Coverage, Districts of Rajasthan 2010

(Districts arranged in ascending order of CRS estimate of CDR)

Districts	CRS, 2010	AHS, 2010-11	Estimated level of Coverage (%)	Implied Number of Deaths Not Reported
Barmer	3.2	6.4	49.7	4089
Bharatpur	3.4	6	56.2	2573
Dausa	3.6	6.6	55.2	3802
Dhaulpur	3.6	5.9	61.7	2988
Nagaur	3.9	6.5	60.5	5077
Dungarpur	4.0	6.5	61.0	2115
Karauli	4.1	6.2	65.4	1500
Jaisalmer	4.2	6.7	63.0	1031
Jalore	4.3	7.4	58.5	2653
Sawai Madhopur	4.8	7.4	65.3	1952
Bran	5.0	6.8	74.2	1507
Bundi	5.1	7.8	65.4	3132
Banswara	5.1	7.7	66.5	2521
Bikaner	5.2	6.4	81.4	1135
Jhunjhunu	5.3	5.9	89.0	1209
Alwar	5.3	5.9	90.6	1134
Jhalawar	5.4	7.8	69.2	2743
Pali	5.4	6.8	79.9	1681
Ganganagar	5.4	6.3	86.3	2111
Jaipur	5.6	5.9	95.1	521
Chittaurgarh	5.6	5.7	98.8	74
Kota	5.8	5.7	101.1	0
Jodhpur	5.9	6.3	93.2	1316
Sirohi	6.0	6.9	87.7	2619
Sikar	6.0	6.1	99.0	368
Hanumangarh	6.1	6.3	97.1	312
Tonk	6.3	7.6	83.3	1439
Churu	6.4	6.3	101.9	0
Bhilwara	6.5	7.5	86.3	1517
Rajsamand	7.3	8.7	83.9	2102
Ajmer	8.2	6.4	127.5	0
Udaipur	9.5	8.2	115.5	0

Source: Registrar General, India; reports of the Civil Registration System and the Annual Health Survey, 2010-11

Overall, reporting of deaths for civil registration in Kerala appears to be fairly complete at the state level as well as in most districts; only two districts show notable departure from the state average. In contrast, it appears that reporting of deaths under CRS is of very poor quality in Rajasthan. This is true overall for the state, and the level of coverage is very low – less than two thirds, in a number of districts. Odisha presents a similar

picture; reporting of deaths under CRS is poor in the state and particularly so in quite a few districts. For a few districts in each state, the CDR based on civil registration is higher than expected. Perhaps this is because these districts with substantial hospital facilities draw patients from other districts and the deaths of non-residents also get registered in these. This is but a conjecture and needs to be verified from other evidence.

Chapter 4

DEATH STATISTICS: INFANT MORTALITY RATE

The Civil Registration System tabulates and publishes numbers of infant deaths as well as infant mortality rate implied by these. Note that the infant mortality rate is the ratio of infant deaths to live births during the year and thus depends on both the number of deaths and the number of births. Errors in any one of these affect the rate unless the degree of under-enumeration is about the same in both. The CRS estimates of infant mortality rate at the state level are quite low - much lower than the SRS estimates, in Odisha and Rajasthan (Table 4.1). In Kerala, the level of infant mortality is quite low and the difference in estimates is small.

Table 4.1: Estimates of the Infant Mortality Rate (IMR) from the Civil Registration System and the Sample Registration System

State	2009			2010		
	CRS	SRS	Percent Reporting	CRS	SRS	Percent Reporting
Odisha	29	65	45			
Rajasthan	-	-		5	55	9
Kerala	9	12	75			

Source: Registrar General, India; reports of the Civil Registration System and the Sample Registration System, various years.

Given the low level of IMR in Kerala, we do not present the analysis of assessment of reporting at the district level. In the case of Odisha, a glance at the estimates of IMR for districts makes it

apparent that for most of the districts, the CRS estimates are very low (Fig. 4.1); many districts (nine) show values below 20 per thousand which clearly indicates gross under-reporting of infant deaths. For Odisha, characterized by a relatively high level of infant mortality within India (the SRS estimate for 2010 is 65), these rates are too low to be of any credibility. For districts of Odisha, it is possible to compare the CRS estimates with the AHS estimates. For a large number of districts, the gap is wide. Given that the AHS estimates are closer to the SRS estimate for the state, one could treat these as reasonably correct and compute the coverage rate as:

$$\text{Coverage rate} = 100 * (\text{AHS rate} - \text{CRS rate}) / \text{AHS rate}.$$

This is in accordance with the practice of the Civil Registration System to estimate the level of coverage.

The coverage of infant deaths is very low (well below 50 percent) in 17 districts of Odisha (Table 4.2). In only a few districts, i.e. Nabarangpur, Rayagada, and Malkangiri, the CRS estimates are slightly higher than the AHS estimates. Allowing for sampling error in the AHS (for most districts, the 95 % confidence interval is IMR +/- 10 points), some of these do show over-estimation in the CRS probably

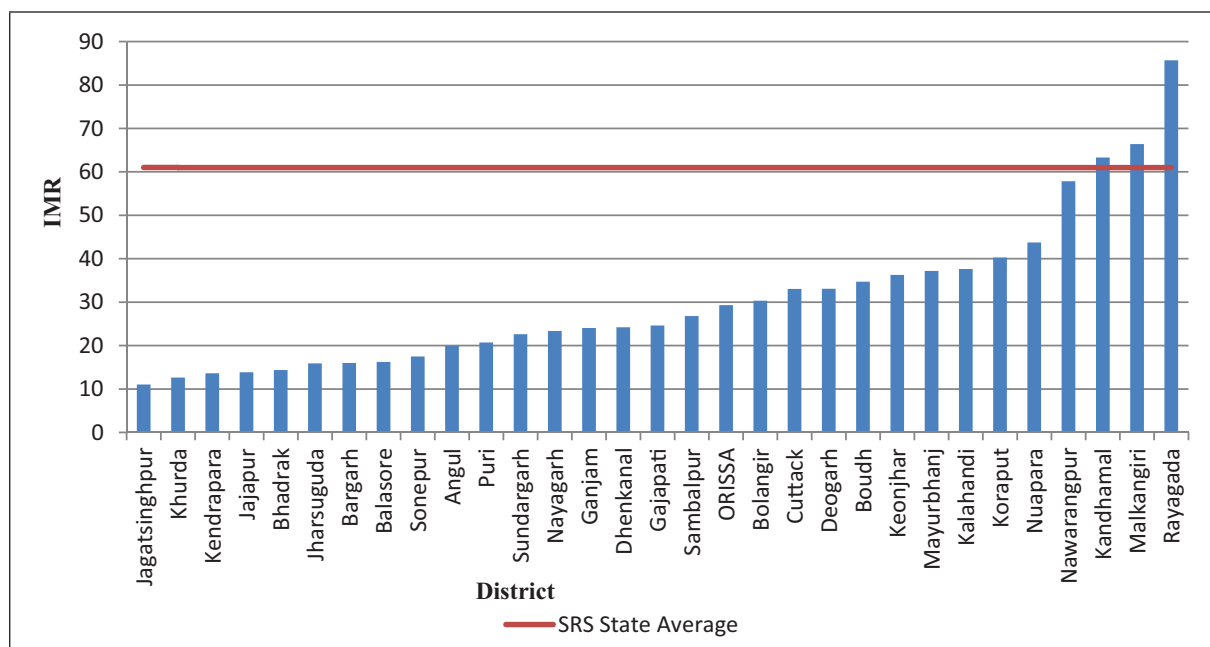
for the reason mentioned above for CDR. estimate of the CDR was also higher than the
Incidentally, in all the three districts, the CRS AHS estimate (see Table 3.3).

Table 4.2: Estimates of the IMR from the Civil Registration System and the Annual Health Survey, Districts, Odisha
(Districts arranged in ascending order of CRS estimate of IMR)

Districts	CRS 2009	AHS 2010-11	Percent Reporting	Implied Number of Infant Deaths Not Reported
Jagatsinghapur	11	56	20.0	132
Khordha	13	76	17.0	396
Kendrapara	14	64	21.0	238
Bargarh	14	66	22.0	273
Jajapur	14	53	26.0	323
Balangir	16	100	16.0	824
Jharsuguda	16	51	31.0	110
Baleshwar	16	49	33.0	445
Sonapur	17	54	32.0	122
Anugul	20	50	40.0	274
Puri	21	80	26.0	316
Nayagarh	23	67	35.0	209
Sundargarh	23	55	41.0	490
Dhenkanal	24	76	32.0	293
Ganjam	24	61	39.0	933
Gajapati	25	65	38.0	151
Sambalpur	27	56	48.0	296
Baudh	30	64	47.0	116
Cuttack	33	63	53.0	733
Debagarh	33	58	57.0	64
Bhadrak	35	55	63.0	130
Kendujhar	36	58	63.0	428
Mayurbhanj	37	53	70.0	515
Kalahandi	38	59	64.0	427
Koraput	40	56	72.0	329
Nuapada	44	56	78.0	328
Nabarangapur	58	54	107.0	0
Kandhamal	63	88	72.0	0
Malkangiri	66	55	121.0	0
Rayagada	86	65	132.0	0

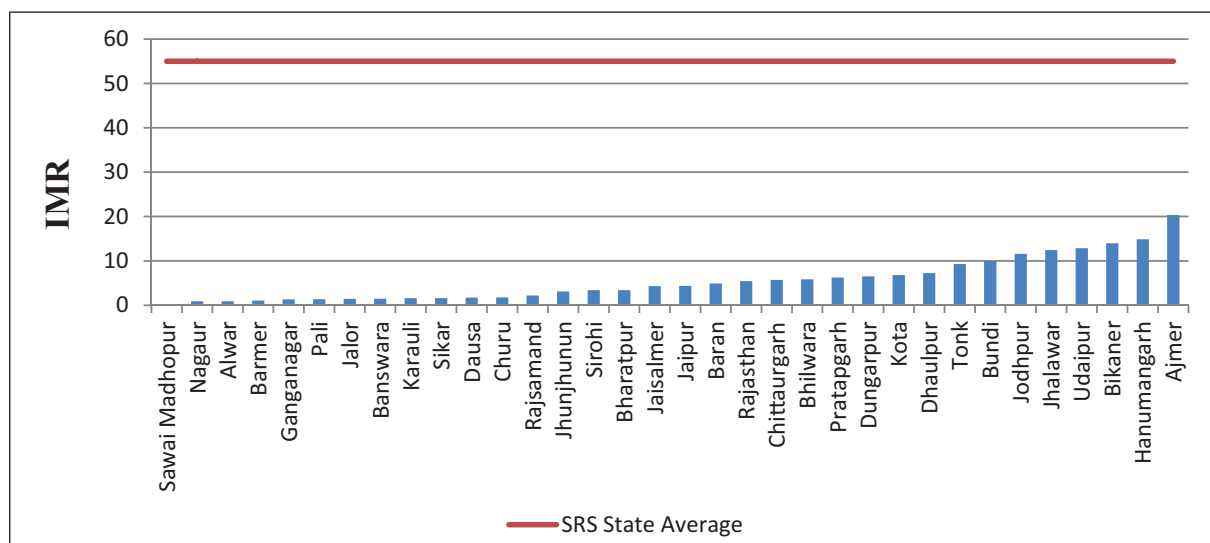
Source: Registrar General, India; reports of the Civil Registration System and the Annual Health Survey, 2010-11

Fig. 4.1: Estimated IMR by Districts of Odisha



Source: Registrar General, India; reports of the Civil Registration System and the Sample Registration System, various years.

Fig. 4.2: Estimated IMR by Districts of Rajasthan



Source: Registrar General, India; reports of the Civil Registration System and the Sample Registration System, various years.

Table 4.3: Estimates of the IMR from the Civil Registration System and the Annual Health Survey by Districts in Rajasthan

(Districts arranged in ascending order of CRS estimate of IMR)

Districts	AHS 2010-11	CRS 2009	Percent Reporting	Implied Number of Infant Deaths Not Reported
Kota	36	7	18.9	403
Tonk	51	9	18.2	241
Jhunjhunu	54	3	5.7	151

Districts	AHS 2010-11	CRS 2009	Percent Reporting	Implied Number of Infant Deaths Not Reported
Jodhpur	54	12	21.5	876
Bikaner	54	14	25.8	542
Hanumangarh	54	15	27.5	397
Pali	55	1	2.5	66
Churu	55	2	3.2	120
Bharatpur	55	3	6.2	182
Jaipur	55	4	7.9	766
Sikar	56	2	2.8	137
Dausa	57	2	3	60
Ajmer	57	20	35.7	784
Jaisalmer	58	4	7.4	77
Nagaur	59	1	1.5	71
Alwar	59	1	1.5	85
Ganganagar	60	1	2.2	54
Banswara	62	1	2.3	58
Sirohi	62	3	5.5	95
Baran	62	5	7.9	133
Chittaurgarh	62	6	9.2	150
Udaipur	62	13	20.8	792
Dhaulpur	63	7	11.5	174
Rajsamand	65	2	3.4	69
Bundi	65	10	15.3	173
Jhalawar	65	12	19.1	299
Sawai Madhopur	67	0	0	0
Dungarpur	67	7	9.7	170
Karauli	68	2	2.3	49
Bhilwara	68	6	8.6	335
Barmer	72	1	1.4	53
Jalor	79	1	1.8	77

Source: Registrar General, India; reports of the Civil Registration System and the Annual Health Survey, 2010-11

The picture for Rajasthan is even worse; for most of the districts of Rajasthan, the CRS estimates of infant mortality rate are even lower than those for Odisha districts (Table 4.3). Further, as many as 25 districts show the IMR below 10 per thousand, a level seen in highly developed countries. Moreover, in one district (Sawai Madhopur) no infant deaths were recorded by the CRS at all. On the other hand, the AHS estimates for the districts are in the

range 36 to 79 and closer to the SRS estimate for the state (55). The coverage level is below 50 percent in all the districts, and less than 10 percent in as many as 22 districts of Rajasthan. Clearly, the CRS estimates of infant mortality for Rajasthan are totally unacceptable.

The Civil Registration System is expected to record still births also. A pregnancy outcome that is not a live birth but has occurred after

28 weeks of gestation is called a ‘still birth’ and recording still births is mandatory in civil registration. Still births are also recorded in the Sample Registration System. A comparison of the rates from these two sources shows that at the state level the picture is mixed. In Odisha, the CRS estimate is higher than the SRS estimate whereas in Kerala, the SRS estimate is higher (Table 4.4); for Rajasthan, the CRS rates could not be obtained. Given that identification of still births is not easy even in the SRS since many still births are not widely known and could get wrongly classified as miscarriages or abortions or even as live births, the observed discrepancies between the sources do not appear large. Inter-district differences do exist, but it is not clear if these are due to differences in reporting or true differences. The variations are quite wide in Odisha (Table 4.5 and Fig. 4.4), pointing towards reporting errors but in Kerala (Table 4.4 and Fig. 4.5), the level being small, one cannot draw such an inference.

Table 4.4: Estimates of the Still Birth Rate (SBR) from the Civil Registration System and the Sample Registration System, Kerala, Odisha and Rajasthan

State	CRS 2009	SRS 2009	Percent Reporting
Rajasthan	--	6	--
Odisha	15.6	11	141.8
Kerala	5.4	8	67.5

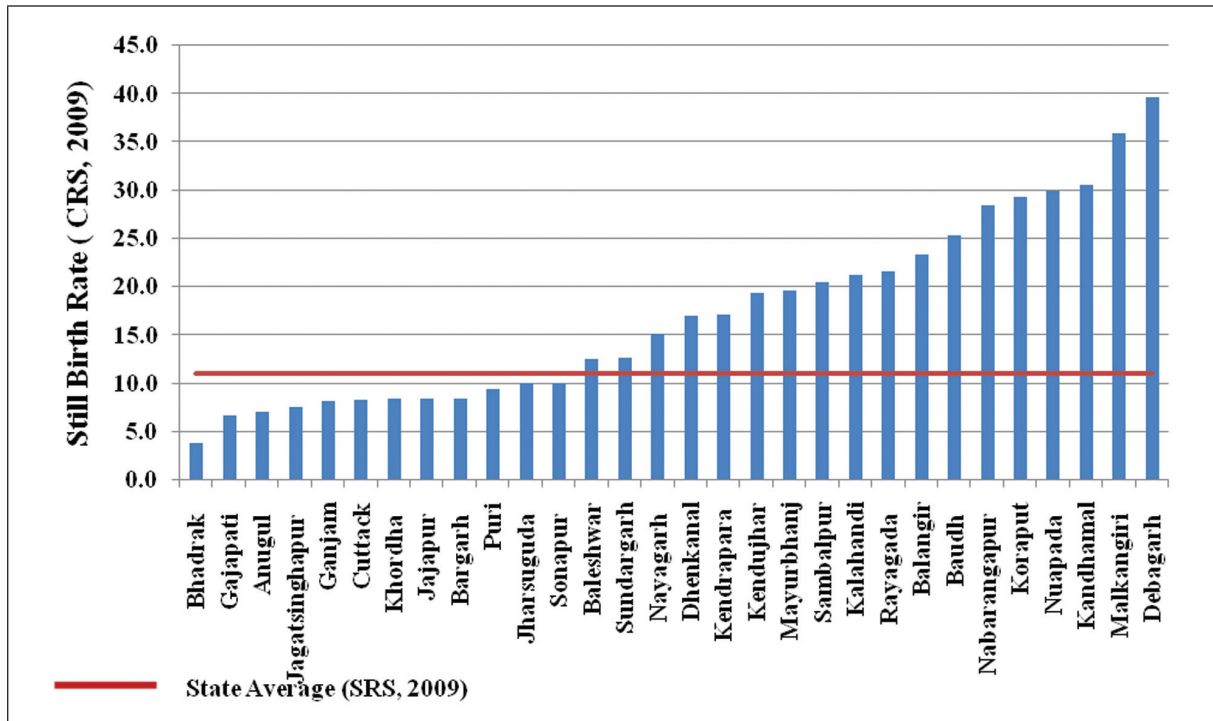
Source: Registrar General, India; reports of the Civil Registration System and the Sample Registration System, various years.

Table 4.5: Estimates of the Still Birth Rate (SBR) from the Civil Registration System, Districts of Kerala and Odisha, 2009
(Districts arranged in ascending order of Still Birth Rate)

District	SBR	District	SBR
Kollam	2.3	Bhadrak	3.8
Pathanamthitta	2.4	Gajapati	6.7
Idukki	2.5	Anugul	7.0
Palakkad	3.5	Jagatsinghpur	7.6
Ernakulam	4.2	Ganjam	8.2
Alappuzha	4.2	Cuttak	8.3
Kasaragod	4.4	Khorda	8.4
Malappuram	4.7	Jjapur	8.4
Thrissur	5.7	Baragarh	8.5
Kannur	6.6	Puri	9.5
Kottayam	6.8	Jharsuguda	10.0
Wyanad	7.4	Sonapur	10.1
Thiruvananthapuram	7.6	Baleshwar	12.6
Kozhikkode	8.7	Sundargarh	12.7
		Nayagarh	15.2
		Dhenkanal	17.0
		Kendrapara	17.1
		Kendujhar	19.4
		Mayurbhanj	19.7
		Sambalpur	20.5
		Kalahandi	21.3
		Rayagarh	21.6
		Balangir	23.4
		Baudh	25.3
		Nabrangpur	28.5
		Koraput	29.3
		Nuapada	29.9
		Kandhamal	30.5
		Malakangir	36.0
		Debagarh	39.7

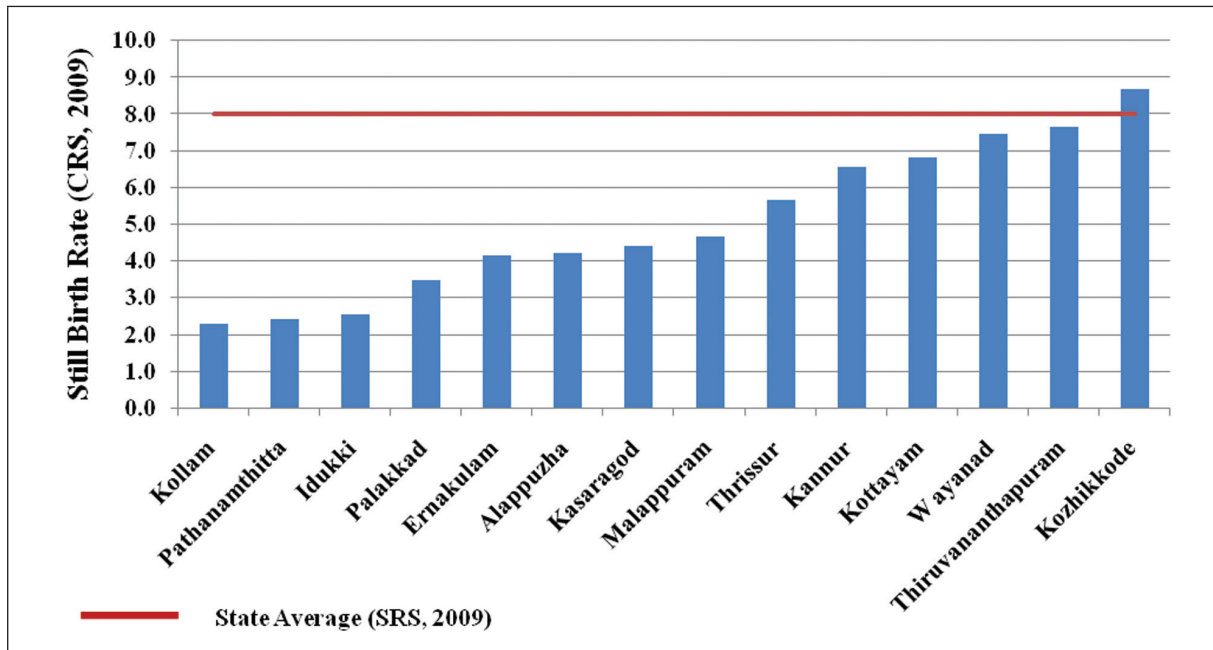
Source: Registrar General, India; reports of the Civil Registration System

Fig. 4.4: Estimated Still Birth Rate by Districts of Odisha



Source: same as in Table 4.5

Fig. 4.5: Estimated Still Birth Rate by Districts of Kerala



Source: same as in Table 4.5

Chapter 5

SEX RATIO AT BIRTH AND DEATH

Sex ratios at births and deaths are traditionally considered as two important measures to examine the quality of data in any population. Typically, it is found that female births and deaths often go unregistered and as such sex ratio analysis provides information on the sex bias in registration of births and deaths. This analysis also considers that the normal sex ratio at birth has a safe range and sex ratio at death will invariably be in favour of females. However, with the recent changes in sex ratio at birth in India and a few other countries in South and Southeast Asia, the interpretation of sex ratio for examining the quality of data should be taken cautiously. However, we present the data in order to get some overview of the quality of CRS information on births and deaths.

SEX RATIO AT BIRTH (SRB)

Table 5.1 presents the estimated sex ratio at birth (SRB) in the selected three states; the sex ratio is expressed here as females per 1000 males as is the convention in India. The table also compares the CRS sex ratio with the SRS and AHS data wherever possible. It is observed that reporting of female births in Rajasthan is quite low. The estimated SRB for Rajasthan by SRS and AHS is more or less the same, but CRS-estimated SRB is very low compared to other sources. In the case of Odisha, the AHS has recorded much lower SRB compared to SRS.

The CRS- recorded SRB falls between SRS and AHS values. Kerala has shown good reporting of female births under CRS although it is slightly lower than the SRS -registered SRB.

Table 5.1: Estimated CRS Sex Ratio at Birth and percentage reporting for Kerala, Odisha and Rajasthan, (Female/Male)

State	CRS (2009)	SRS (2007-09)	Ratio of CRS to SRS (in %)	AHS (2010-11)	Ratio of CRS to AHS (in %)
Rajasthan*	839	875	95.9	878	95.6
Odisha	923	941	98.1	905	102.0
Kerala	942	968	97.3	---	---

(sex ratio is expressed as females per 1000 males)

Note: *CRS data for Rajasthan pertains to the year 2010

Source: Registrar General, India; reports of the Civil Registration System, Reports of the Sample Registration System for various years and the Annual Health Survey, 2010-11

Table 5.2 presents the sex ratio at birth from CRS and AHS across districts of Rajasthan. The table also provides the percentage difference between CRS sex ratio and AHS sex ratio. It is observed that estimated sex ratio at birth by CRS is significantly lower in most of the districts of Rajasthan than AHS figures. This implies that female births are relatively more under-registered than male births in most districts of Rajasthan. The comparison to AHS shows high level of under-reporting of female births in the districts of Bhilwara, Churu, Sikar etc. At the other extreme, there are a few districts (Rajsamand, Jhalawar and Jaisalmer) showing higher SRB in

CRS compared to AHS. In any case, a majority of the districts have sex ratio below the normal sex ratio (952) as per both CRS and AHS data. Due to this, it is difficult to precisely estimate the under registration of female births across districts.

Table 5.2: Sex Ratio at Birth Estimated from the CRS and the AHS in Rajasthan

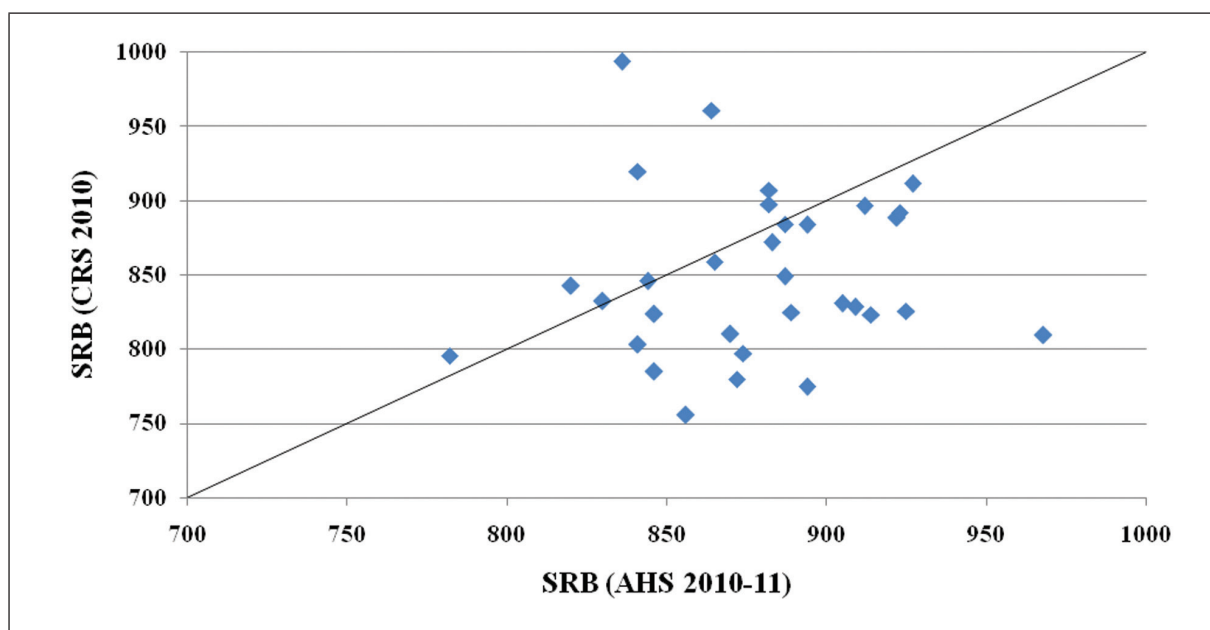
District	SRB_AHS	SRB_CRS	Ratio of CRS to AHS (in %)
Sawai Madhopur	782	796	101.8
Dhaulpur	820	843	102.8
Karauli	830	832	100.3
Rajsamand	836	994	118.9
Dausa	841	803	95.5
Jaisalmer	841	920	109.4
Nagaur	844	846	100.2
Kota	846	785	92.8
Jaipur	846	824	97.4
Sikar	856	756	88.3
Jhalawar	864	961	111.2
Bharatpur	865	859	99.3
Udaipur	870	810	93.1
Dungarpur	872	780	89.4
Hanumangarh	874	797	91.2
Alwar	882	898	101.8
Jalor	882	907	102.8
Pali	883	872	98.8

District	SRB_AHS	SRB_CRS	Ratio of CRS to AHS (in %)
Ajmer	887	849	95.7
Sirohi	887	884	99.7
Ganganagar	889	825	92.8
Churu	894	775	86.7
Bundi	894	884	98.9
Bikaner	905	831	91.8
Jodhpur	909	829	91.2
Chittaurgarh	912	896	98.3
Jhunjhunun	914	823	90.1
Barmer	922	889	96.4
Baran	923	892	96.7
Tonk	925	826	89.3
Banswara	927	912	98.3
Bhilwara	968	810	83.6

Source: Registrar General, India; reports of the Civil Registration System, and the Annual Health Survey, 2010-11

Fig. 5.1 presents the scatter plot of CRS and AHS sex ratio at birth across districts of Rajasthan. It is clear that even the association between these two data sources is weak with many outliers. However, majority of the observations fall below the diagonal indicating that in Rajasthan CRS under-reporting of female births in CRS is greater than in AHS.

Fig. 5.1: Comparison of Sex Ratio at Birth based on CRS and AHS for Rajasthan



Source: same as in Table 5.2

Table 5.3 presents the Sex Ratio at Birth (SRB) by CRS and AHS across districts in Odisha. Interestingly, the reporting of female births appears to be in tune with the AHS estimate in most districts of Odisha. The SRB from CRS in many districts is above AHS estimates. There are five districts with sex ratio reported in CRS being five percentage points above the AHS estimates. An identical picture emerges from the scatter plot of divergence between SRB of CRS and AHS presented in Fig. 5.2. Not only that the most points in the scatter plots are above the diagonal but the deviation from the line is also comparatively narrow than observed in the case of Rajasthan. Interestingly, the reporting of overall births is found to be better in Rajasthan than in Odisha, while the sex reporting appears to be better in Odisha.

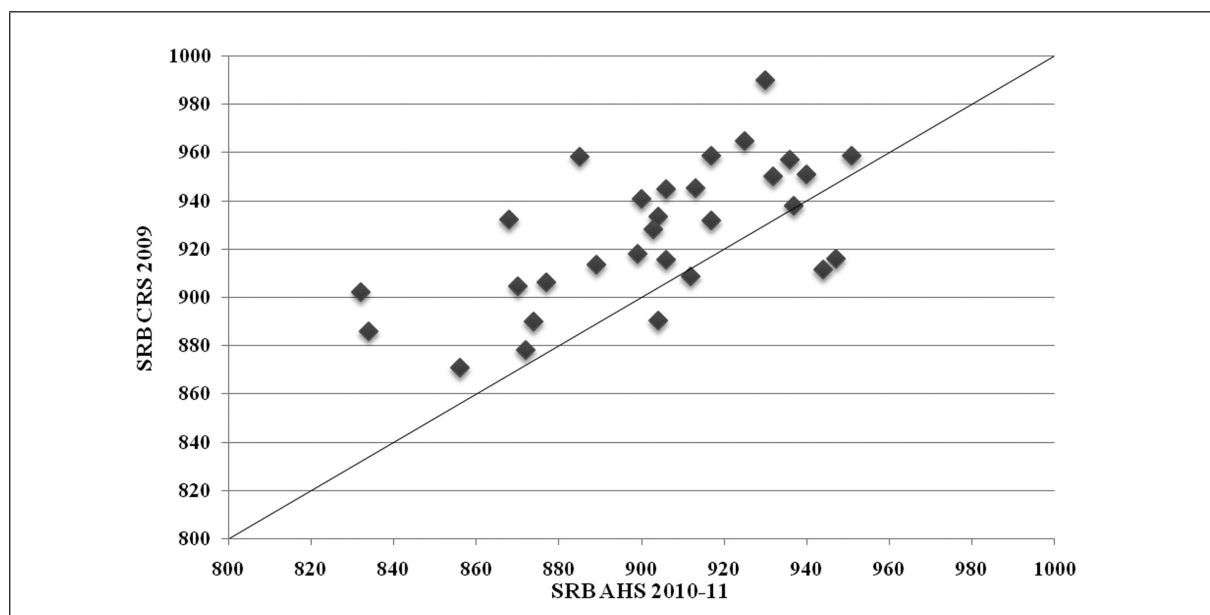
Table 5.3: Sex Ratio at Birth Estimated from the CRS and the AHS in Odisha

Districts	SRB_AHS (2010-11)	SRB_CRS (2009)	Ratio of CRS to AHS (in %)
Nayagarh	832	902	108.5
Anugul	834	886	106.2
Dhenkanal	856	871	101.7

Districts	SRB_AHS (2010-11)	SRB_CRS (2009)	Ratio of CRS to AHS (in %)
Bargarh	868	932	107.4
Jharsuguda	870	905	104
Ganjam	872	878	100.7
Bhadrak	874	890	101.8
Sambalpur	877	906	103.4
Kandhamal	885	958	108.3
Debagarh	889	914	102.8
Kendrapara	899	918	102.1
Sundargarh	900	941	104.5
Jajapur	903	928	102.8
Khordha	904	890	98.5
Kalahandi	904	934	103.3
Puri	906	916	101.1
Rayagada	906	945	104.3
Gajapati	912	909	99.7
Koraput	913	946	103.6
Baleshwar	917	932	101.6
Sonapur	917	959	104.5
Baudh	925	965	104.3
Nuapada	930	990	106.5
Malkangiri	932	950	102
Mayurbhanj	936	957	102.3
Kendujhar	937	938	100.1
Balangir	940	951	101.2
Cuttack	944	912	96.6
Jagatsinghapur	947	916	96.7
Nabarangapur	951	959	100.8

Source: Registrar General, India; reports of the Civil Registration System, and the Annual Health Survey, 2010-11

Fig. 5.2: Comparison of Sex Ratio at Birth based on CRS and AHS for Odisha, (Female/Male)



Source: same as in Table 5.3

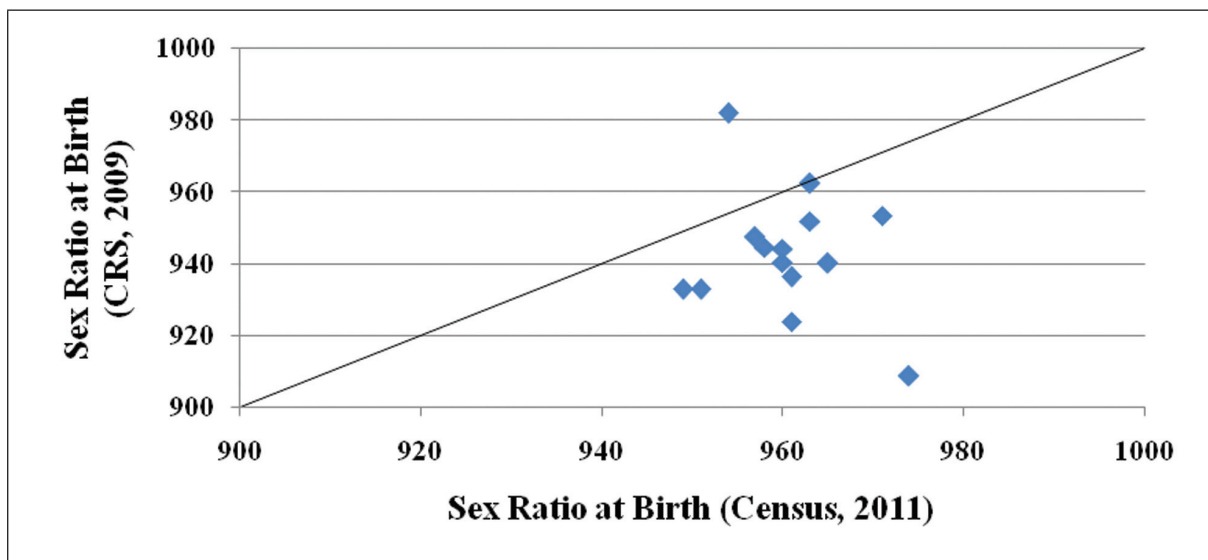
Table 5.4 presents the district level estimates of Sex ratio at Birth in Kerala. However, Kerala does not have surveys to estimate SRB from different sources. Recently, an indirect estimate of SRB from the data available on 0-6 age group population in the year 2011 census was brought out (Sathayanarayana and Kumar 2012). The same is used for comparison of SRB across districts of Kerala. It appears that the reporting of sex ratio at birth (SRB) is good in CRS for Kerala as the percentage variation is not very high. However, most districts show low SRB in comparison to the indirect estimates. Figure 5.3 presents the scatter plot of divergence between CRS based and census based SRB across districts of Kerala. Most districts fall below the diagonal indicating that SRB reported in CRS is lower than the census based SRB. A high level of under-reporting of female births is observed in Thiruvananthapuram district. In other districts

the underreporting of female births is found to be marginal.

Table 5.4 Estimated SRB from CRS and Census across districts of Kerala (Female/Male)

District	SRB_CRS	SRB_Census -2011	Ratio of CRS to Census (in %)
Thiruvananthapuram	909	974	93.3
Kasaragod	924	961	96.2
Palakkad	936	961	97.4
Kollam	940	965	97.5
Kottayam	940	960	98
Alappuzha	933	951	98.1
Pathanamthitta	954	971	98.2
Thrissur	933	949	98.3
W ayanad	944	960	98.4
Malappuram	945	958	98.6
Kozhikkode	952	963	98.9
Ernakulam	947	957	99
Kannur	963	963	100
Idukki	982	954	103

Fig. 5.3: Comparison of Sex Ratio at Birth based on CRS and Census for Kerala



Source: same as in Table 5.4

SEX RATIO AT DEATH (SRD)

Unlike in the case of sex ratio at birth, it is difficult to predict a safe range for the

SRD. But as deaths are expected to be higher among males than females in any population, the SRD will be in favour of females. A very

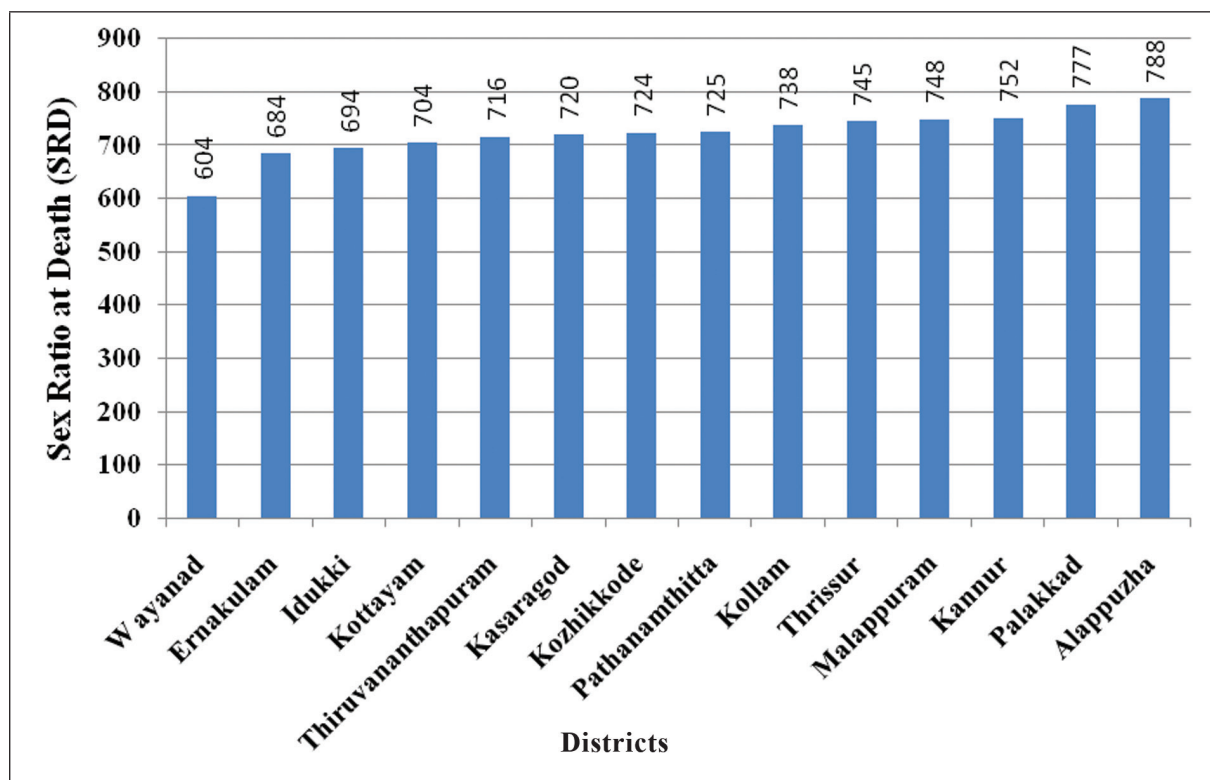
low SRD (ratio of female deaths for male deaths), perhaps, indicates under-registration of female deaths. The sex wise number of deaths was obtained only for two states Kerala and Odisha.

districts in Kerala. The district of Wayanad appears to have very low SRD possibly due to under-reporting of female deaths. In all other districts in Kerala SRD is close to or above the 700 mark.

Figures 5.4 and 5.5 present the Sex Ratio at Death (SRD) across districts of Kerala and Orissa respectively. There are no data sources available to compare the quality of CRS sex ratio at death at the district level. In Kerala, SRD (female deaths per 1000 male deaths) is below 800 for all the districts. The ratio of crude death rate available from SRS puts the SRD at 818 for the state. There appears to be some under registration of female deaths in some

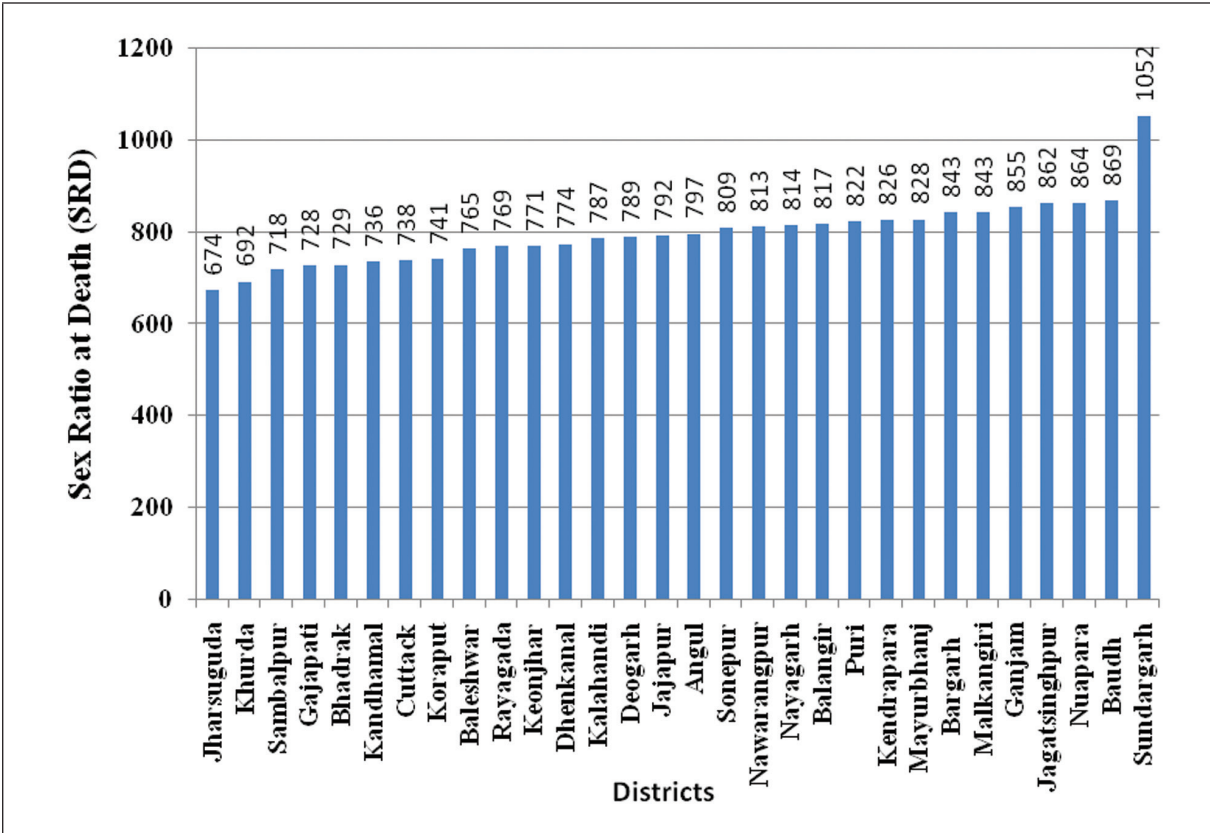
In Odisha, SRD is above the 800 mark for around 14 districts. The SRD estimated from the crude death rate in Odisha is 860. But there are also aberrations with SRD in the district of Sundargarh where the reported/estimated SRD is 1052. Thus although the overall reporting of deaths is not very good in Odisha, the sex wise reporting appears to be good. It indicates that even among those limited deaths reported in CRS there is no apparent sex bias.

Fig. 5.4: Estimated CRS Sex Ratio at Death (SRD) for Kerala, 2009, (Female/Male)



Source: Registrar General, India; reports of the Civil Registration System.

Fig. 5.5: Estimated CRS Sex Ratio at Death (SRD) for Odisha, 2011, (Female/Male)



Source: Registrar General, India; reports of the Civil Registration System.

Overall, the analysis on sex ratio at birth and death presents some interesting observations. Although in the past the sex ratio at birth was a good measure to understand the quality of births and deaths data, in regard to the recent period, it may involve issues beyond quality of data. Unlike in the past, the true sex ratio may not necessarily be close to the *normal* level due to sex selection taking place in the country. Therefore, the CRS sex ratio at birth may be a reflection of both current sex ratio at birth as well as the under registration of female births. It is found that the SRB is better in Odisha

as compared to Rajasthan although in the case of birth registration Rajasthan was better off. Kerala has nearly universal birth registration and as such the SRB is also fairly good. The data on sex ratio at death for both Kerala and Odisha also has given nearly the same result. The sex ratio at death for Odisha appears to be good. Perhaps, as the overall death registration is poor in the state, it is indicative of the lack of sex bias in whatever registration of deaths is done. In the case of Kerala, there appears to be some amount of under registration of female deaths at least in a few districts.

Chapter 6

ADJUSTMENT OF MORTALITY DATA

The analysis of mortality in the previous chapters has revealed two important points. First, under registration of mortality is taking place mostly in the case of infant deaths. Second, as can be seen from the sex ratio of death data, registration of female deaths also appears to be lower. The crude death rate from CRS, therefore, needs to be adjusted at two levels. A method has been suggested for adjusting crude death rate from CRS taking into consideration the two errors, i.e. under registration of infant deaths and female deaths.

ADJUSTMENT OF CDR USING IMR

Given that the reporting of infant deaths is extremely low in some states, particularly in Odisha and Rajasthan, one needs to see if this, by itself affects the Civil Registration System estimate of the Crude Death Rate in these states. This issue is relevant since a large proportion of deaths in India, especially in less developed regions, is due to infant mortality. Any deficit in recording infant deaths would clearly have a non-negligible effect on the overall crude death rate. In order to examine this, the crude death rates were corrected by imputing the AHS estimate of infant mortality. The procedure is straight forward.

Let CDR1 and IMR1 be the reported CDR and IMR respectively from the CRS and IMR0 be

the correct IMR (this could be the AHS estimate when available and treated as reliable). Further, let CBR be the estimate of the crude birth rate; this could be taken from the AHS if available or from the census (indirect estimate obtained by reverse survival) or from the CRS itself assuming that the reporting of births is not very poor (at least not as poor as for deaths). The correction factor is given by

$$CF = CBR * (IMR0 - IMR1)/1000,$$

and the corrected CDR will be given by

$$CDR1 + CF$$

Such an exercise was carried out for districts of both Odisha and Rajasthan based on the available data. CBR for this exercise was taken from the indirect estimate based on the 2011 census (Kumar and Sathyanarayana, 2012). It is observed that for most districts in Odisha, the correction is less than one point. In Rajasthan (which showed a very poor reporting of infant deaths compared to Odisha), the correction is substantial, i.e. in the range of 1-2 points for most districts. In many cases, the corrected values of the CDR come close to the AHS estimates indicating that in these districts the reporting of adult deaths is fairly complete (Tables 6.1 and 6.2). However, in some districts

the corrected values also fall much below the AHS estimate; in these districts the reporting of adult deaths is also poor. In regard to the few districts in which the CRS estimate was greater than the AHS estimate (possible explanation of which has been noted in an earlier chapter), the gap widens; see, for example, Ajmer and Udaipur in Rajasthan. But overall, the correction for severe under-reporting brings the CDR closer to the AHS estimates.

Overall, reporting of deaths is poorer than that of births, and reporting of infant deaths is particularly poor. We must note here that registration of the death of an adult may

be felt to be necessary by many households as this has implications for property and succession. For settling succession of an individual and for mutation of records of land and other property ownership after the death of a person, with or without court procedures for succession, death certificates are insisted upon. Clearly, in case of the death of an adult who owns some property, reporting is a 'felt need'. Though registering of a death is required by law, whether the person is an infant or an adult, the felt need is what matters for most, and such a need is seldom felt for infant deaths. This perhaps explains why reporting of infant deaths is so poor.

Table 6.1: Corrected CRS Estimates of Crude Death Rates for Districts of Odisha

District	CRS-CDR	Adjusted infant deaths	Correction Factor	Adjusted CDR	AHS-CDR 2010-11	Difference 1	Difference 2
Angul	6.7	633	0.6	7.3	7.3	0.6	0.0
Balasore	7.0	614	0.6	7.6	10.5	3.5	2.9
Bargarh	5.1	1212	1.2	6.3	7.1	2	0.8
Bhadrak	6.0	294	0.3	6.3	10.1	4.1	3.8
Bolangir	5.4	1277	1.3	6.7	10.6	5.2	3.9
Boudh	4.3	564	0.6	4.9	8.3	4	3.4
Cuttack	8.4	606	0.6	9.0	6.9	-1.5	-2.1
Deogarh	6.9	425	0.4	7.3	8.6	1.7	1.3
Dhenkanal	6.0	874	0.9	6.9	10.9	4.9	4.0
Gajapati	6.8	824	0.8	7.6	7.8	1	0.2
Ganjam	7.0	681	0.7	7.7	8.4	1.4	0.7
Jagatsinghpur	5.4	666	0.7	6.1	7.2	1.8	1.1
Jajapur	5.0	718	0.7	5.7	7.8	2.8	2.1
Jharsuguda	7.5	679	0.7	8.2	8.4	0.9	0.2
Kalahandi	6.3	288	0.3	6.6	6.7	0.4	0.1
Kandhamal	7.8	533	0.5	8.3	8.9	1.1	0.6
Kendrapara	5.7	845	0.8	6.5	9.2	3.5	2.7
Keonjhar	7.1	418	0.4	7.5	9.4	2.3	1.9
Khurda	5.6	1317	1.3	6.9	8.4	2.8	1.5
Koraput	7.7	275	0.3	8.0	8	0.3	0.0
Malkangiri	8.8	-256	-0.3	8.5	7	-1.8	-1.5
Mayurbhanj	7.3	314	0.3	7.6	9	1.7	1.4
Nawarangpur	8.2	-86	-0.1	8.1	7.7	-0.5	-0.4
Nayagarh	6.6	660	0.7	7.3	9.3	2.7	2.0
Nuapara	7.9	269	0.3	8.2	7.3	-0.6	-0.9
Puri	5.3	714	0.7	6.0	8.8	3.5	2.8

District	CRS-CDR	Adjusted infant deaths	Correction Factor	Adjusted CDR	AHS-CDR 2010-11	Difference 1	Difference 2
Rayagada	9.4	-435	-0.4	9.0	8.5	-0.9	-0.5
Sambalpur	9.5	644	0.6	10.1	9.6	0.1	-0.5
Sonepur	5.6	525	0.5	6.1	7.7	2.1	1.6
Sundargarh	6.8	624	0.6	7.4	7.2	0.4	-0.2
Total	6.8	601	0.6	7.4	8.4	1.6	1.0

*: Correction made for poor registration of infant deaths; see text.

Difference1 = AHS CDR – CRS CDR; Difference2 = AHS CDR – Adjusted CRS CDR

Table 6.2: Corrected CRS Estimates of Crude Death Rates for Districts of Rajasthan

Districts	CDR-CRS	Adjusted Infant deaths	Correction Factor	Adjusted CDR	CDR-AHS	Difference 1	Difference 2
Ajmer	8.2	887	0.9	9.1	6.4	-1.8	-2.7
Alwar	5.3	1522	1.5	6.8	5.9	0.6	-0.9
Banswara	5.1	1938	1.9	7.0	7.7	2.6	0.7
Baran	3.2	1416	1.4	4.6	6.4	3.2	1.8
Barmer	3.4	2342	2.3	5.7	6	2.6	0.3
Bharatpur	6.5	1450	1.4	7.9	7.5	1	-0.4
Bhilwara	5.2	1592	1.6	6.8	6.4	1.2	-0.4
Bikaner	5.0	1125	1.1	6.1	6.8	1.8	0.7
Bundi	5.1	1299	1.3	6.4	7.8	2.7	1.4
Chittaurgarh	5.6	1306	1.3	6.9	5.7	0.1	-1.2
Churu	6.4	1278	1.3	7.7	6.3	-0.1	-1.4
Dausa	3.6	1465	1.5	5.1	6.6	3	1.5
Dhaulpur	3.6	1706	1.7	5.3	5.9	2.3	0.6
Dungarpur	4.0	1869	1.9	5.9	6.5	2.5	0.6
Ganganagar	5.4	1174	1.2	6.6	6.3	0.9	-0.3
Hanumangarh	6.1	814	0.8	6.9	6.3	0.2	-0.6
Jaipur	5.6	1164	1.2	6.8	5.9	0.3	-0.9
Jaisalmer	4.2	1778	1.8	6.0	6.7	2.5	0.7
Jalor	4.3	2289	2.3	6.6	7.4	3.1	0.8
Jhalawar	5.4	1272	1.3	6.7	7.8	2.4	1.1
Jhunjhunun	5.3	1059	1.1	6.4	5.9	0.6	-0.5
Jodhpur	5.9	1136	1.1	7.0	6.3	0.4	-0.7
Karauli	4.1	1833	1.8	5.9	6.2	2.1	0.3
Kota	5.8	616	0.6	6.4	5.7	-0.1	-0.7
Nagaur	3.9	1435	1.4	5.3	6.5	2.6	1.2
Pali	5.4	1309	1.3	6.7	6.8	1.4	0.1
Rajsamand	7.3	-187	1.6	9.0	8.7	1.4	-0.3
Sawai Madhopur	4.8	1608	1.7	6.0	7.4	2.6	1.4
Sikar	6.0	1695	1.2	7.7	6.1	0.1	-1.6
Sirohi	6.0	1214	1.7	7.0	6.9	0.9	-0.1
Tonk	6.3	1653	1.0	7.7	7.6	1.3	-0.1
Udaipur	9.5	1006	1.4	10.9	8.2	-1.3	-2.7
Rajasthan	5.4	1390	1.4	6.8	6.7	1.3	-0.1

*: Correction made for poor registration of infant deaths; see text.

Difference1 = AHS CDR – CRS CDR

Difference2 = AHS CDR – Adjusted CRS CDR

ADJUSTMENT OF CDR FOR UNDER REGISTRATION OF FEMALE DEATHS

As infant mortality irrespective of sex is already adjusted using the above method, the adjustment in the case of female under registration is limited to non-infant deaths. The following corrective method has been adopted for this purpose.

Step I: Estimate number of deaths for males and females using SRS death rates for the state.

Step II: Estimate number of infant deaths for males and females using the estimated number of births and IMR for the state using SRS data.

Step III: Estimate non-infant deaths for males and females separately by subtracting infant deaths from the total deaths.

Step IV: Estimate the sex ratio of non-infant deaths (Female/Male)

Step V: Adjust the female non-infant deaths across the districts from CRS assuming the same ratio of non-infant deaths for the state as estimated from SRS.

$$AFNID = (MNID * SRNID)$$

Where AFNID is the adjusted number of female non-infant deaths

MNID is the number of male non-infant deaths
SRNID is the sex ratio (Female/Male) of non-infant deaths from SRS

Step VI: Estimate CDR by adding adjusted non-infant deaths and adjusted infant deaths (as shown in Tables 6.1 and 6.2)

This adjustment is to be made only for those districts with sex ratio less than the SRS sex ratio.

The adjustment is done for districts of Odisha and presented in table 6.3.

Table 6.3: Corrected CRS Estimates of Crude Death Rates for Districts of Odisha

District	Non-Infant Deaths from CRS		Adjusted Female Non-infant deaths	Adjusted Non-infant deaths	Adjusted infant deaths (From Table 6.1) Col (6)	Adjusted CDR	AHS-CDR 2010-11	CRS-CDR	Difference 1	Difference 2
	Male	Female								
	1	2	3=(1)*SRNID (0.824)	4=(1)+(3)	5	6= (4)+(5)/Popn	7	8	9	10
Angul	5134	4095	4232	9366	633	8.2	7.3	6.7	0.6	-0.9
Balasore	6487	4920	5347	11834	614	5.7	10.5	7	3.5	4.8
Bargarh	4637	3893	3822	8459	1212	6.6	7.1	5.1	2	0.5
Bhadrak	3685	2665	3037	6722	294	4.9	10.1	6	4.1	5.2
Bolangir	5650	4584	4657	10307	1277	7.6	10.6	5.4	5.2	3.0
Boudh	1195	1013	985	2180	564	6.3	8.3	4.3	4	2.0
Cuttack	11934	8908	9837	21771	606	9.1	6.9	8.4	-1.5	-2.2
Deogarh	1159	892	955	2114	425	8.6	8.6	6.9	1.7	0.0

District	Non-Infant Deaths from CRS		Adjusted Female Non-infant deaths	Adjusted Non-infant deaths	Adjusted infant deaths (From Table 6.1) Col (6)	Adjusted CDR	AHS-CDR 2010-11	CRS-CDR	Difference 1	Difference 2
	Male	Female								
Dhenkanal	4074	3093	3358	7432	874	7.3	10.9	6	4.9	3.6
Gajapati	2060	1482	1698	3758	824	8.4	7.8	6.8	1	-0.6
Ganjam	12653	10776	10429	23082	681	6.8	8.4	7	1.4	1.6
Jagatsinghpur	3473	3004	2863	6336	666	6.3	7.2	5.4	1.8	0.9
Jajapur	4929	3865	4063	8992	718	5.6	7.8	5	2.8	2.2
Jharsuguda	2256	1510	1859	4115	679	8.5	8.4	7.5	0.9	-0.1
Kalahandi	4765	3763	3928	8693	288	6.5	6.7	6.3	0.4	0.2
Kandhamal	2686	1940	2214	4900	533	8.6	8.9	7.8	1.1	0.3
Kendrapara	4621	3764	3809	8430	845	6.7	9.2	5.7	3.5	2.5
Keonjhar	7469	5694	6156	13625	418	8.4	9.4	7.1	2.3	1.0
Khurda	6675	4597	5502	12177	1317	6.2	8.4	5.6	2.8	2.2
Koraput	5278	3881	4350	9628	275	8.0	8	7.7	0.3	0.0
Malkangiri	2115	1782	1743	3858	-256	7.4	7	8.8	-1.8	-0.4
Mayurbhanj	10479	8670	8637	19116	314	7.7	9	7.3	1.7	1.3
Nawarangpur	4287	3564	3534	7821	-86	7.6	7.7	8.2	-0.5	0.1
Nayagarh	3132	2483	2582	5714	660	7.0	9.3	6.6	2.7	2.3
Nuapara	2257	1974	1860	4117	269	7.4	7.3	7.9	-0.6	-0.1
Puri	5100	4169	4204	9304	714	6.2	8.8	5.3	3.5	2.6
Rayagada	4246	3245	3500	7746	-435	9.3	8.5	9.4	-0.9	-0.8
Sambalpur	5372	3860	4428	9800	644	10.5	9.6	9.5	0.1	-0.9
Sonepur	1860	1495	1533	3393	525	6.3	7.7	5.6	2.1	1.4
Sundargarh	6556	7027	5404	11960	624	6.8	7.2	6.8	0.4	0.4
Total	146224	116608	120524	266748	601	6.3	8.4	6.8	1.6	2.1

*: Correction made for poor registration of infant deaths and female non-infant deaths; see text.
Difference1 = AHS CDR – CRS CDR; Difference2 = AHS CDR – Adjusted CRS CDR

Overall, the adjusted CDR for under registration of infant deaths as well as female non-infant deaths provides a much better estimate of CDR in a district though the difference is quite wide in some districts while narrow in others. The adjustment of CDR for poor registration of infant and female non-infant deaths revealed that for many of the districts in Odisha, the corrected CDR is very close to the AHS estimates, and for some of the districts,

difference is in the range of 1-2 points from the AHS estimate of CDR. However, for some districts, the corrected estimates are above the AHS estimates. As in the case of infant deaths, poor registration of female non-infant deaths is also evident. Under registration is possible in the case of reporting female deaths too because generally property is owned by males and obtaining death certificates is necessary in such cases for succession of property.

Chapter 7

DIRECTIONS FOR FURTHER RESEARCH

This study has been undertaken to assess the level of civil registration and to examine how well the information from the Civil Registration System (CRS) can be used to update the National Population Register. As a first step, an analysis of the available data from civil registration was carried out. This is based on published reports at the national level as well as district-wise reports from three states, namely, Kerala, Rajasthan, and Odisha. Kerala was chosen as a state with a high level of completeness; on the other hand, Odisha and Rajasthan were chosen for their low level of reporting.

First, at the national level, the level of completeness is higher for births than for deaths. The level is much lower in case of infant deaths. Note that completeness is assessed by the Civil Registration System by comparing the number of events (birth, death, infant deaths) registered with the number estimated based on the corresponding rates given by the Sample Registration System (SRS). Over time, there has been improvement in the level of completeness, and this has been impressive since 2005. There are notable variations across states; some states have long had a high level of registration, more so of births than of deaths. But a few states have shown remarkable rise in the level of registration in the recent

years. This is particularly true for the states of Madhya Pradesh, Rajasthan, Uttar Pradesh, and Bihar. It appears that the introduction of the Janani Suraksha Yojana has raised the level of registration. As incentive payments are made under the scheme, it is likely that the events do get registered. The impact is evident in states identified as high focus for the scheme. At this stage, the explanation is speculative and needs to be confirmed with some field studies and detailed analysis of the data.

The analysis of data for the three states reveals clearly different patterns. Kerala has long had a high level of registration, both for births and deaths. However, for infant deaths, the level is a bit lower even in Kerala. Odisha seems to have improved the level since some years. It is noteworthy that Odisha has shown a fairly decent coverage in spite of the relatively low level of literacy and inaccessibility due to the hilly nature of parts of the state. On the other hand, though Rajasthan was lagging behind for long, it has made good progress since 2005. In all the states, the level of completeness is higher for births than deaths. Further, for infant deaths, coverage continues to be extremely poor.

Overall, it may be concluded that in the recent years, the level of registration has been high for both births and deaths in districts of

the three states. In Kerala, the coverage seems to be near universal but in Rajasthan and Odisha, while the level of birth registration has reached 90 percent, registration of deaths is just around 80 percent. Assessments of coverage using the census based estimate or the AHS estimate as the standard, have yielded similar results. There is a clear, secular improvement after 2005 but these states are yet to reach the level of Kerala, and seem to have lagged behind by about two decades. Further, noticeable variations are seen across districts. For example, in regard to registration of births, districts of Rajasthan fare slightly better than those of Odisha; some districts in Rajasthan do show 100 percent completeness in reporting of births. However, it is likely that women from some districts go to a place in another district that has good institutional facilities and the births get registered in the district where the delivery takes place rather than in the district of usual residence. At the same time, it is also possible that there are true differences in the level of coverage. States such as Rajasthan and Odisha are large, and socioeconomic as well as physiographic features differ substantially across districts. Broadly, districts with higher level of development show greater completeness though no one-to-one relationship is seen.

Certain constraints in making the assessment need to be acknowledged here. First, there is no 'gold standard' as such for comparison at the district level. As mentioned initially, the CRS uses the SRS estimates for estimating the level of completeness, the SRS estimates are from a sample, as the system is based on a sample of villages/clusters within the state, and hence are subject to sampling error. The errors are relatively small and hence

there is some justification for using the SRS estimates as the 'gold standard'. But the SRS estimates are available only at the state level (and for some large divisions within states) and not for districts. For the CBR, we have used the indirect estimate from the 2011 census. The census being a complete enumeration, there is no question of sampling error. However, the indirect estimate uses the enumerated population at ages 0-6 and there can be errors of omission and misreporting of age. In the case of CDR and the IMR, the estimates from the AHS are used for Odisha and Rajasthan (the AHS was not conducted in Kerala) and are subject to sampling error. In view of this, no inference about the level of coverage could be drawn in case of small differences between the CRS estimates and the census based estimates of CBR and the AHS estimates of the CDR and IMR. Further, as noted earlier, the reporting of vital events is on *de facto* basis, and hence, births and deaths occurring in institutions outside the district of usual residence get reported in the district of occurrence. Some large deviations between the CRS and other estimates could be on account of this, but there is no way to correct this. For the same reason, coverage levels separately for rural and urban areas would be misleading. It would be useful to be able to classify events by place of usual residence as well, but in the present system, the CRS tabulations do not have a provision to classify events by place of usual residence.

The preliminary assessment and discussions with experts in the field suggest lines for further research. A number of explanations are offered for the probability of registration of an event. First, registration is more important for a birth than a death since a birth certificate is asked

for at the time of school enrolment and most couples are aware of this requirement. These days, almost all parents including illiterates wish to educate their children, and this presumably induces many to register births of their children. Of course, birth registration is far from universal in many states and quite low in some, notably in Bihar, but has shown a rise and is approaching near completeness in quite a few states. Further, the introduction of the Janani Suraksha Yojana seems to have made an impact since deliveries do get covered for services and benefits and this helps registration. However, there is a need to see whether this has indeed happened. The reason for the poor registration of infant deaths is because issues of property are not involved, and no need is therefore seen by parents for the registration of deaths during early childhood. To some extent this would apply to registration of adult deaths from poor families since many poor persons may not have property to be inherited. Similarly, many women do not own property, at least not in their name, and there may not be a felt need for registration.

Certain other factors also plausibly play a role in registration. First, the level of coverage may depend on the type of agency entrusted with registration. One needs to see if greater involvement of the health department, both health personnel and institutions, would ensure more complete coverage. The density of institutions and personnel (as measured by personnel or institutions per 100000 population) is a potentially important factor. Grassroots level personnel including the Accredited Social

Health Activist (ASHA) and anganwadi workers can play a vital role as informants of events, and training them in this task could be helpful. Further, engaging Panchayat Raj institutions in the registration process, either in registration of events or in promoting registration, might enhance the level. A rise in female literacy is expected to ensure better registration. In the case of registration of deaths, burial or cremation places and personnel engaged in these could be key informants. Besides, there could be institutional links between these places and the registration system.

In order to explore whether some of these factors do, in fact, explain the level of registration, it is desirable to analyze the civil registration statistics in details. This calls for collecting detailed records of civil registration. As the parts of the individual records are confidential, one may not be able to access the entire record files as such. But detailed tabulations can be analyzed. Further, in order to examine factors that induce households to register events, an exploratory study in selected localities can be carried out. This will be a combination of group and in-depth interviews of adult members of households from the selected localities. Further, registrars of events as well as health functionaries such as Auxiliary-Nurse-Midwife (female health worker or ANM), ASHA, and Panchayat officials could be interviewed. Health institutions are expected to register events occurring in the institutions and the concerned functionaries should also be interviewed. The methodology for such investigations needs to be developed.

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