

S. Irudaya Rajan* P. Mohanachandran Nair**

Is the IMR in Kerala as Low as 12? Beginning an Exploration

A S of 1997 provisional estimates, Kerala's infant mortality rate (IMR) was estimated as 12 as per the Sample Registration System (SRS) provided by the Registrar General of India, Ministry of Home Affairs, Government of India, New Delhi. The rates are 11 and 15 for rural and urban areas respectively (*Sample Registration System Bulletin*, 32(3): October 1998, page 1). The IMR was estimated to be 14 for both males and females as per the SRS in 1996. Using the above statistics, many social scientists and organizations assess the health situation and quality of life of Indian population. For instance, Population Foundation of India, New Delhi, in its recently released publication titled. *State of India's Population* presents most recent information on the levels of fertility, mortality and reproductive health and combining them into indices such as *Human Development Index* (HDI). *Gender Related Health Index* (GHI) and *Reproductive Health Index* (RHI) (Population Foundation of India, 1998).

The HDI has been computed by giving equal weights to three component indexes: expectation of life at birth, adult literacy rate and per capita State Domestic Product. The index for Kerala is 63 as of 1995, the highest among major states and the lowest is reported for Bihar. GHI uses the same variables as HDI and attempts to capture the achievements in narrowing gender differentials through the same set of capabilities. As of 1995, the index for Kerala is 89, the highest among major states and the lowest is reported for Madhya Pradesh. The RHI developed by the Population Foundation of India, takes into account the following variables: Total fertility rate, Perinatal mortality rate, Educational level, type of medical attention at birth, birth order, teenage pregnancies measured by age specific fertility rate of women aged 15-19 and contraceptive protection

*Centre for Development Studies. Thiruvananthapuram.

**Department of Demography. University of Kerala. Thiruvananthapuram.

TABLE 1 : INFANT MORTALITY BY DIFFERENT COMPONENTS, KERALA, 1971-1996

<i>Year</i>	<i>PMR</i>	<i>SBR</i>	<i>OWM</i>	<i>OWOM</i>	<i>NMR</i>	<i>PNMR</i>	<i>IMR</i>
1971	41.5	17.5	24.0	13.5	37.5	20.5	58
1972	49.3	26.4	22.9	13.8	36.7	26.3	63
1973	43.6	24.7	18.9	11.6	30.5	26.5	57
1974	37.2	18.1	19.1	12.4	31.5	22.5	54
1975	42.5	18.6	23.9	10.1	34.0	20.0	54
1976	39.0	17.9	21.1	12.8	33.9	22.1	56
1977	27.1	12.3	14.8	13.3	28.1	18.9	47
1978	34.0	16.7	17.3	9.5	26.8	15.2	42
1979	22.5	2.4	20.1	9.7	29.8	12.9	43
1980	22.7	7.6	15.1	14.6	29.7	10.5	40
1981	28.6	11.3	17.3	8.4	25.7	11.7	37
1982	22.1	5.7	16.4	5.3	21.7	8.7	30
1983	20.6	3.4	17.2	5.8	23.0	10.0	33
1984	22.9	8.1	14.8	6.2	21.0	7.7	29
1985	24.3	8.4	15.9	6.2	22.1	9.2	31
1986	23.0	10.3	12.7	6.4	19.1	8.3	27
1987	24.9	11.1	13.8	5.5	19.3	8.6	28
1988	25.4	11.8	13.6	4.4	18.0	9.7	28
1989	25.3	14.3	10.0	4.0	14.0	7.0	21
1990	25.7	16.6	9.1	2.9	12.0	3.3	15
1991	18.0	9.2	8.8	2.5	11.3	5.1	16
1992	18.9	10.1	8.8	2.1	10.9	5.8	17
1993	16.8	8.2	8.6	1.4	10.0	3.3	13
1994	20.5	9.8	10.7	1.9	12.6	3.2	16
1995	n.a	n.a	n.a	n.a	n.a	n.a	15
1996	n.a	n.a	n.a	n.a	n.a	n.a	14
1997	n.a	n.a	n.a	n.a	n.a	n.a	12

Sources: Compiled by the authors from the various issues of Sample Registration System and Bulletins:

PMR refers to Peri-natal Mortality Rate and defined as number of still births and infant deaths of less than 7 days during the year divided by number of live births and still births during the year multiplied by 1000; SBR refers to Still Birth Rate and defined as number of still births during the year divided by number of live births and still births during the year multiplied by 1000; OWM refers to One Week Mortality (0-7 days mortality) and defined as number of infant deaths of less than one week during the year divided by number of live births during the year multiplied by 1000;

OWOM refers to One Week to One Month Mortality (7-28 days mortality) and defined as number of infant deaths of more than one week and less than a month during the year divided by number of live births during the year multiplied by 1000; NMR refers to Neonatal Mortality Rate (0-28 days mortality) and defined as number of infant deaths of less than a month during the year divided by number of live births during the year multiplied by 1000; PNMR refers to Post Neonatal Mortality Rate (28 days to 1 year) and defined as number of infant deaths of more than a month and less than a year during the year divided by number of live births during the year multiplied by 1000; IMR refers to Infant Mortality Rate and defined as number of infant deaths during the year divided by number of live births during the year multiplied by 1000.

rate due to sterilization. The Index for Kerala is 80 as of 1995, the highest among major states and the lowest is reported for Uttar Pradesh (Population Foundation of India, 1998). Though the above three indices rank Kerala as the number one state, the last runner for each index varies considerably; HDI for Bihar, GHI for Madhya Pradesh and RHI for Uttar Pradesh. Even the Physical Quality of Life index also ranks Kerala as the number one state in India (MaliniKarkal and IrudayaRajan, 1991). Remember, all these indices heavily depend on infant mortality rate, peri-natal mortality rate and expectation of life at birth.

How reliable are the SRS estimates of Infant mortality, peri-natal mortality, neo-natal and post neo-natal mortality for Kerala? The SRS provides annual series on indicators of mortality and fertility. The annual series data on IMR provided by the SRS from 1971 to 1996 are presented in Table 1. Some quick observations can be made. Firstly, lot of fluctuations and inconsistencies in the IMR estimates are noticed throughout the last 25 years. The 1971 SRS reported the IMR for Kerala as 58 whereas the 1972 SRS states the IMR as 63. On an average, the IMR for Kerala for the period 1971-76 was 57 per thousand live births. We can also notice a tremendous decline of 9 points in IMR between 1976-77 (56 in 1976 and 47 in 1977). During 1977-80, the IMR for Kerala was 43, a decline of 14 points compared to 1971-76 period. However, during the 1980s and 1990s, IMR values declined further to reach a level of 32 between 1980-85, 24 between 1986-90 and 15 between 1991-96. Between 1986-90 and 1991-96, a decline of 9 points were noticed.

The contribution of post neo-natal mortality (28 days to 365 days) to the decline of IMR is highest compared to the neo-natal mortality (0-28 days). During 1971-76, 60 percent of infant deaths occurred within a month whereas the proportion has gone up to 75 during 1991-96. The proportion of children died after one month to one year has come down from 40 in 1971-76 to 25 in 1991-96.

If we decompose the one month infant mortality into two components such as 0-7 days and 7-28 days, it reveals an interesting scenario of health situation of Kerala. Among the one month mortality among children in Kerala, 64 percent of them died within one week during 1971-76 and this proportion has gone up to 85 percent in the recent years. In other words, during 1991-96, 64 percent of children died within one week. Simply, it means, out of 14 children died in Kerala within one year, 10 of them died within one week! Thus the infant mortality in Kerala is basically a one-week mortality not an one-year mortality.

Against the above information, let us analyze the perinatal and still birth rate for Kerala. During 1971-76, the perinatal mortality (one week mortality + still birth rate) was around 42 and it declined to 20 during 1991-96. However, the still birth rate has declined from 21 to 10 during the same period under investigation. Between 1971-76 and 1991-96, the highest percentage decline was noticed among the post neo-natal mortality (83), followed by 7-28 days mortality (66). However, the percentage decline was almost 55 for perinatal mortality, still birth and one week mortality rate in Kerala.

It means the efficient health programmes exist in Kerala only to save the children, if they survive at least one week. The still birth rate, peri-natal mortality and one week mortality rates are extremely high as compared to the Infant mortality rate.

In this context, the IMR estimates made for the Kerala using the 1991 census data reveals, surprisingly, different story. The Registrar General of India, Government of India, has estimated the IMR for Kerala as 42 per thousand live births (Registrar General of India, 1998) whereas as our own estimates puts the IMR as 37 (Irudaya Rajan and Mohanachandran, 1997, 1998). The infant and child mortality estimates are derived using south model life table and Mort Pak LITE (United Nations, 1983). Our estimates are also extensively used to analyse the sex ratio at birth in the States and Union Territories of India for 1991 in the beginning of 1997 as the 'official' estimates were not available in a published form from the Registrar General of India, New Delhi (Sudha and Irudaya Rajan, 1998). We have also applied various indirect methods to estimate the IMR for Kerala using the 1991 census data. The lowest estimate arrived for Kerala is 29 (see Table 2 for details). We also provide IMR estimates for Kerala from various studies carried out in Kerala in Table 3. Recently, the NFHS estimates are adjusted by a study carried out at the International Institute for Population Sciences, Bombay (Pandey *et al.*, 1998). The adjusted IMR estimates are presented in Table 4. The official estimates for Kerala by sex and districts are presented in Tables 5 and 6 for the two census periods 1981 to 1991 to study the decline over a period of time.

This brief note has two objectives: Firstly, to explore the possible reasons of high still birth rate and peri-natal mortality in Kerala; secondly, why the SRS underestimates the IMR as low as 15? In the process, we also assess the reasons for high infant mortality rate.

TABLE 2 : INFANT MORTALITY ESTIMATES BY DIFFERENT METHODS

		<i>QI</i>		
		<i>Total</i>	<i>Male</i>	<i>Female</i>
	Total	29		
PATHAK Method	Rural	31		
	Urban	22		
	Total	44	47	40
BRASS	Rural	46	49	43
	Urban	31	38	23
	Total	45	48	41
TRUSSEL	Rural	46	51	44
	Urban	32	39	30
TRUSSEL (revised) RGI	Total	37	36	38
	Rural	38	38	39
	Urban	30	29	34
	Total	42	45	41

Except the RGI estimates, other estimates are made by the authors.

TABLE 3 : INFANT MORTALITY ESTIMATES FOR KERALA: VARIOUS SOURCES

<i>Author</i>	<i>Reference Period</i>	<i>IMR</i>
Registrar General of India	1981 Census	54
Registrar General of India	1991 Census	42
TRUSSEL (revised)	1991 Census	37
World Bank Fertility Survey (1980)	1970-75	59
	1975-80	46
Kerala Fertility Survey (1991)	1980-85	44
	1985-90	26
National Family Health Survey	1990-93	24
	1985-90	38
Pandey <i>et al.</i>	1992-93	28

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Number 11. International Institute for Population Sciences, Bombay and East West Centre Program on Population, USA.

TABLE 4 : ADJUSTED NMR, PNMR AND IMR FOR KERALA. NFHS

<i>Period</i>	<i>NMR</i>	<i>PNMR</i>	<i>IMR</i>
1981	29.0	10.0	39.0
1984	25.0	9.0	34.0
1987	22.0	9.0	31.0
1990	20.0	8.0	28.0

Source: Pandey. A. *et al.* 1998. *Infant and Child Mortality in India*. National Family Health Survey Subject Reports. Number 11. International Institute for Population Sciences. Bombay and East West Centre Program on Population. USA.

Let us discuss the basic structure of the SRS system in Kerala. The SRS in Kerala is being implemented through two different agencies; rural areas are covered by the Directorate of Economics and Statistics whereas urban areas are by the Directorate of Census Operations. The investigator appointed for this purpose visits the sample unit

TABLE 5 : INFANT MORTALITY BY DISTRICTS OF KERALA: OFFICIAL ESTIMATES

District	1981	1991	Decline	1981	1991	Decline	1981	1991	Decline
	Total	Total		Male	Male		Female	Female	
Thiruvananthapuram	52	38	27	45	36	20	59	40	32
Kollam	46	25	46	58	27	53	32	22	31
Pathanamthitta	38	27	29	46	26	43	29	27	7
Alappuzha	38	25	34	46	27	41	29	22	24
K-ottayam	59	36	39	64	37	42	52	34	35
Idukki	103	62	40	115	65	43	91	60	34
Ernakulam	40	32	20	49	34	31	62	31	50
Thrissur	52	29	44	60	30	50	44	27	39
Palakkad	64	31	52	77	34	56	50	29	42
Malappuram	49	35	29	57	33	42	41	37	10
Kozhikode	54	37	31	54	39	28	53	35	34
Kannur	45	34	24	53	40	25	36	30	17
Wayanad	108	54	50	134	72	46	81	36	56
Kassargod	45	34	24	53	32	40	36	36	0
KERALA	54	42	22	61	45	26	48	41	15

Sources: India, Registrar General of India. 1997. District Level Estimates of Fertility and Child Mortality for 1991 and their Interrelations with Other Variables. Occasional Paper No 1 of 1997. Controller of Publications, New Delhi.

TABLE 6 : INFANT MORTALITY BY DISTRICTS OF KERALA: OFFICIAL ESTIMATES BY SEX

District	1981	1981	Differ	1991	1991	Decline
	Male	Female		Male	Female	
Thiruvananthapuram	45	59	-14	36	40	-4
Kollam	58	32	26	27	22	5
Pathanamthitta	46	29	17	26	27	- 1
Alappuzha	46	29	17	27	22	5
Kottayam	64	52	12	37	34	3
Idukki	115	91	24	65	60	5
Ernakulam	49	62	- 13	34	31	3
Thrissur	60	44	16	30	27	3
Palakkad	77	50	27	34	29	5
Malappuram	57	41	16	33	37	-4
Kozhikode	54	53	1	39	35	4
Kannur	53	36	17	40	30	10
Wayanad	134	81	53	72	36	36
Kassargod	53	36	17	32	36	-4
KERALA	61	48	13	45	41	4

Sources: India, Registrar General of India. 1997. District Level Estimates of Fertility and Child Mortality for 1991 and their Interrelations with Other Variables. Occasional Paper No 1 of 1997. Controller of Publications, New Delhi.

once in six months. However, he/she is supported by a local enumerator (mostly the retired government servants with nominal remuneration) to collect the birth, death and other relevant information for every month. If the events do not tally between the local enumerator and the investigator, spot checks are made. Sample units are replaced once in ten years.

According to the published information, the rural SRS is conducted among 150 sample units covering approximately 150-200 hundred households with a population size varying between 1500 to 2000 in each sample unit. The urban SRS is conducted as per the rules of the rural SRS, but the sample units are limited to 100. In 1994, the SRS is implemented in 250 sample units covering 327,000 persons in the sample. If we use the above information and also the information on birth and infant mortality and still birth rates, the following facts are available from the SRS.

During the year 1994, only 5690 births had occurred among the 250 sample units in Kerala. Among them, 91 died before they celebrated their first birthday. Even if we assume one infant death in every sample unit, 159 sample units reported no infant death in 1994.

Among the 91 died before one year, 61 died in a week or 72 died in a month. There were 56 still births reported in the SRS units in 1994. Using the 91 infant deaths among 5690 births, the SRS provides estimates for Kerala as a whole. As the infant mortality is becoming a rare event in Kerala, is the SRS sample size enough to provide estimates for Kerala? This is a serious question to be discussed by the SRS unit in Kerala.

There are weaknesses and limitation in the SRS. According to Seal and Talwar (1998), SRS has not paid adequate attention on the sample size to provide acceptable estimates of various demographic characteristics and also the fixation of the sample areas over a long period of time lead to biased estimates. The limitation of the SRS is also felt with the growing need of meaningful planning at district and panchayat levels.

Mari Bhat (1998) analysed the trends in infant and child mortality. The analysis reveals strange patterns. While the post neo-natal mortality has registered a steady downward trend since 1972, neonatal mortality rates have shown a sharp increase from 70 to 80 per 1000 between 1973 and 1977 and a steady fall after 1978. If we probe further near the event of birth, the early neo-natal mortality rate (mortality in the first week of life) shows a strange pattern. From a level of 33 per 1000 in 1973 it rose sharply to 49 per 1000 in 1976. The increase was followed by a sharp decline until 1985 and a slow fall since then. But even in 1993-94, the reported levels of early neo-natal mortality are higher than those reported in 1971-73 (Mari Bhat, 1998).

The suggested trend of the still birth ratio is even more enigmatic. It remains unchanged at 17.5 per 1000 livebirths until 1976, and then began a sharp fall to 8 per 1000 in 1982; then the ratio began to climb and reached 13 per 1000 in 1988. Since then it has steadily fallen to reach 9 per 1000 in 1994. Thus, if one were to believe the SRS story during the last 25 years, still birth ratio has declined by about 100 percent

while there has been no perceptible change in the mortality risk of the period immediately following the birth (Mari Bhat, 1998). It appears quite likely that the SRS trends are influenced by the conceptual problems in distinguishing still birth from an infant birth (Mari Bhat, 1998).

TABLE 7 : INFANT MORTALITY RATE, ONE-WEEK MORTALITY RATE AND STILL BIRTH RATE FOR INDIA AND MAJOR STATES. 1994

	Total	IMR Rural	Urban	Total	OWM Rural	Urban	Total	SBR Rural	Urban
INDIA	74	80	52	34	36	24	9	7	15
Andhra Pradesh	65	69	52	38	40	31	10	9	14
Assam	78	78	76	36	35	47	10	9	20
Bihar	67	68	61	31	32	25	4	3	18
Gujarat	64	70	51	33	37	24	10	3	26
Haryana	70	70	68	32	33	26	12	13	11
Karnataka	67	73	50	33	38	21	15	11	24
Kerala	16	16	14	11	11	10	10	9	12
Madhya Pradesh	98	105	57	41	44	22	11	10	16
Maharashtra	55	68	38	28	33	20	13	13	12
Orissa	103	108	65	49	51	28	15	14	22
Punjab	53	59	36	18	21	9	14	13	16
Rajasthan	84	87	62	39	40	28	8	6	20
Tamil Nadu	59	64	48	34	35	30	11	11	12
Uttar Pradesh	88	91	65	36	38	26	5	4	11
West Bengal	62	64	52	28	30	18	14	13	21

Source: Registrar General of India. New Delhi. Sample Registration System: Fertility and Mortality Indicators. 1994. Government of India Press, Delhi.

Notes: SBR refers to Still Birth Rate and defined as number of still births during the year divided by number of live births and still births during the year multiplied by 1000.

OWM refers to One Week Mortality (0-7 days mortality) and defined as number of infant deaths of less than one week during the year divided by number of live births during the year multiplied by 1000.

IMR refers to Infant Mortality Rate and defined as number of infant deaths during the year divided by number of live births during the year multiplied by 1000.

Even if one accepts the IMR provided for Kerala by SRS is correct, still birth rates and peri-natal mortality rates are extremely high. According to the 1994 SRS, Kerala's IMR was 16, the lowest among major states in India. The next lowest IMR was reported for Punjab with 53, at least 3 times higher than Kerala's values or Kerala's IMR was lower by 37 points than Punjab (Table 7). However, the one week mortality rates for Kerala and Punjab were 11 and 18 respectively. In other words, in one week mortality, Kerala could lead Punjab only by 7 points compared to the lead it had for IMR (37 points). However, Kerala loses its first rank as well as *outlier* status in still birth rate. According to the 1994 SRS, Bihar, Rajasthan, Uttar Pradesh have lower still birth rate

than Kerala. In fact, Kerala is above the All India average. Andhra Pradesh, Assam, Gujarat have the same values as of Kerala. To reduce the still birth rate, Kerala has failed compared to other states (Table 7). Other studies carried out in Kerala such as World Bank Fertility Survey (1980), Kerala Fertility Survey (1991) and National Family Health Survey (1992-93) also reveal a tremendous decline in post neo-natal mortality compared to neo-natal mortality (Table 8). As stated earlier, Kerala's health programme could save the children only if they survive at least one week. Kerala's still birth rate and one-week mortality rate indicate a serious draw back on the MCH (Maternal and Child Health) programme, particularly the M. Otherwise, another paradox, for Kerala: Low IMR, high Still birth and one-week mortality. Exceptional compared to many countries which have experienced low infant mortality throughout the world.

TABLE 8 : NMR, PNMR AND IMR FOR KERALA FROM DIFFERENT SURVEYS

<i>Period</i>	<i>NMR</i>	<i>PNMR</i>	<i>IMR</i>
WORLD BANK FERTILITY SURVEY (1980)			
1975-80	41.0	5.0	46.0
1970-75	50.0	9.0	59.0
1965-70	52.0	16.0	68.0
1960-65	62.0	21.0	83.0
Before 1960	73.0	34.0	107.0
KERALA FERTILITY SURVEY (1990)			
1985-89	16.0	10.0	26.0
1980-85	26.0	18.0	44.0
1975-80	28.0	18.0	46.0
1970-75	24.0	26.0	50.0
Before 1970	50.0	26.0	76.0
NATIONAL FAMILY HEALTH SURVEY (1992-93)			
1988-92	15.5	8.2	23.8
1982-88	28.0	9.4	37.5
1978-82	27.6	12.5	40.1

As stated, almost 95% of women delivered their babies in public and private medical institutions as of 1994 in Kerala and another 3% of women delivered their babies at home under the supervision of the qualified medical practitioners. Other studies conducted in Kerala also support the above information (Zachariah *et al.*, 1999). However, this percentages were 33 and 30 respectively in 1971 (Table 9). We have also some suspicion about the still birth and one-week mortality rate in this context. As most of the maternal and child care institutions are called 'baby friendly' in Kerala, some deaths occurred immediately after the birth are probably classified as 'still birth' by the medical practitioners purposively. Because in 'baby friendly' institution, babies cannot die and they blame the mother's health and other related factors for still births. In a seminar organised in 1996, it was pointed out that the increasing proportion of still births was

due to wrong reporting of early infant deaths as still births (Irudaya Rajan and Mishra, 1997). Added to this, SRS may be capturing the number of births occurred in Kerala more accurately and the infants deaths are captured not that accurately. However, Mari Bhat (1996) argues that the SRS had significantly underestimate the intercensal growth in population as it was under counting births than deaths. For instance, in some of the households in Kerala, their infant dead children are buried within the home. Children died within a year are not given importance in the SRS.

Adding to the high still birth and one-week mortality, another very disturbing factor also emerges among children in Kerala: low birth weight. As of today, on an average, Kerala women produce only two babies and one expects them to be more healthy. However, earlier as well as recent studies indicate that the proportion of low birth weight babies is on the increase (Kurup, 1997; Radhakrishnan, 1998). Let us review the two recent studies. The WHO has specified less than 2 kg as very low birth weight and less than 2.5 kg as low birth weight. According to Kurup's (1997) study the average birth weight is on the decline based on two hospitals study conducted in Thiruvananthapuram. For instance, according to the first hospital records, the average birth weight has declined from 2.81 kg in 1987-88 to 2.65 kg in 1992-93 and according to the second hospital records, the values are 2.85 kg and 2.73 kg respectively during the same period. If we adopt the WHO definition, the low birth weight babies are 22.5 per cent and 17 per cent in one hospital during 1987-88 and 1992-93. Kurup argues for the proper nutritional care for pregnant women. The ante-natal care (ANC) visits and reproductive health services among pregnant women before delivery are extremely high in Kerala. Observations in a recent study (Mishra, Roy and Irudaya Rajan, 1998) using the National Family Health Survey are worth mentioning at this point of debate. According to the NFHS, 97 percent of women received ante natal care in Kerala; and almost half of them at least made 3 visits for antenatal care. However, 90 percent of them delivered their babies in medical institutions (50 percent of them in private nursing homes and 40 percent of them in public hospitals). Unfortunately, *more the number of ANC visits, more the chances of caesarean*. The caesarean deliveries are extremely high. Given the excellent ANC, one would not expect the low birth weight babies in Kerala. In a seminar at Thiruvananthapuram, one medical doctor noted that the State is fast becoming spirituous (8.1 liters of alcohol consumption per person per year) and it may be one of the reasons for low birth weight babies. In the context of widespread consumption of alcoholic beverages, food availability on the plate of the mother is at its minimum (Irudaya Rajan and Mishra, 1997). In 1995, among 13420 deliveries conducted in Sree Avitam Tirunal Hospital, Thiruvananthapuram, 27 percent of them are low birth weight babies (Radhakrishnan, 1998).

One more implication of the fertility transition to be noted in this context. The effective reproductive span (difference between the first and last child) of Kerala's women has come down from 12 years in 1970s to five years in 1990s. It indirectly indicates that Kerala women are going for second child so quickly at the cost of reducing

TABLE 9 : MEDICAL ATTENTION AT BIRTH FOR KERALA, 1971-94

	<i>Medical Attention at</i>		<i>Birth</i>
	<i>I</i>	<i>M</i>	<i>U + 0</i>
1971	32.7	29.9	37.4
1972	31.1	19.9	49.9
1973	33.0	21.1	45.9
1974	35.5	21.1	43.4
1975	35.5	22.1	42.4
1976	38.4	20.9	40.7
1977	41.6	18.4	40.0
1978	46.2	17.1	36.7
1979	48.6	17.4	33.9
1980	49.3	15.6	35.1
1981	52.7	16.9	30.4
1982	53.6	17.0	29.4
1983	61.5	12.8	25.7
1984	72.8	9.3	17.9
1985	77.2	7.8	15.0
1986	78.1	7.9	14.0
1987	79.0	8.4	12.6
1989	84.9	6.2	8.9
1991	91.5	5.0	3.6
1992	91.9	5.2	2.9
1993	92.3	5.5	2.2
1994	95.2	2.9	1.9

Notes: Compiled by the authors from the various issues of Sample Registration System and Bulletins. I refers to the births delivered in both private and public institutions; M refers to the births delivered at home attended by qualified medical practitioners; U+0 refer to the births delivered at home attended by unqualified medical practitioners and others at home.

TABLE 10 : INCIDENCE OF LOW BIRTH WEIGHT BABIES IN SREE AVITAM TIRUNAL HOSPITAL, THIRUVANANTHAPURUM

	<i>Total Deliveries</i>	<i>% of LBW babies</i>
1990	12756	25
1991	12837	20
1992	12089	19
1993	12117	20
1994	12072	27
1995	13420	27

Source: Radhakrishnan. T. 1998. Socio-economic and Demographic Factors Associated with Birth Weight:

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birth intervals and probably producing more still births and low birth weight babies (Mishra and Irudaya Rajan, 1997).

To add to our argument, we would like to state one more point. The SRS (supposed to provide reliable estimates of fertility and mortality) marital status structure shows lower proportion of married women than the National Family Health Survey and the 1991 census. For instance, the proportion of women married in the age group 25-29 in SRS is 78.8. lower than NFHS (82.9) and Census (83.5). The proportion of married among the reproductive age group 15-49 is 67.8 for SRS, 69.6 for NFHS and 70.67 for Census.

We have questioned the SRS IMR estimate of 15 and in our opinion, the SRS underestimates the IMR. Our estimates place the IMR for Kerala as 37. However, in our opinion, the IMR in Kerala is likely to be between 25 to 30. To support the above statement, we carried out a regression analysis based on 19 countries of the world which have IMR below 25 around 1993-1995. The regression line was fitted using IMR as dependent variable and one-week mortality, neo-natal mortality and still birth rate as independent variables. The regression equation is:

$$\text{IMR} = -1.6738 + 0.7856 \text{ OWM} + 0.392 \text{ NMR} + 1.1472 \text{ SBR}$$

$R^2 = 0.6952$ (F-test = 1.4052, significant at both 5% and 1% level). By putting the independent variables for Kerala for 1990 (OWM = 9.1, NMR = 12, SBR = 16.6) from SRS as the period refers to the 1991 census estimate, we get an IMR of 29. As we are aware of the annual fluctuations of SRS estimates, we have also taken an average of 1989-91 values and the IMR is 26.

We also add one more point at this stage. Various surveys carried out in Kerala have shown IMR figures as equal to SRS until the end of 1980s. The IMR estimate for 1975-79 is almost identical from all the three sources: 46 from the Kerala Fertility Survey, 46 from the World Bank Fertility Survey and 48 from the Sample Registration System. This is also true for the period 1985-89. In 1985-89, Kerala Fertility Survey IMR estimate was 26 and the SRS estimate was 27. The SRS and NFHS IMR could not match at all. The IMR was 23.8 as per NFHS and the SRS was 19.4 for the same period. The standard error for the IMR in the NFHS was given as 4.059. It means IMR varies from 15.67 to 31.889 ($\pm 2\text{SE}$). Thus the SRS is unable to provide reliable estimates of IMR in Kerala, specially after 1990. The NFHS Kerala report also made this point: The infant and child mortality levels in Kerala have reached such low levels that precise measurement of their level and differential required either survey with extremely large sample size or registration system that captures virtually all deaths (pp. 128-129).

More than above, our estimates are well supported by the available indicators of Kerala: 5 years of effective reproductive span, 27 percent low birth weight babies, still birth-rate of 10 and one week infant mortality of 11 per thousand live births. This is a beginning of a new debate of low infant mortality and high still birth rate in Kerala. New innovative and inter-disciplinary research are required to unearth the reasons behind this paradox too.

To conclude, the Registrar General of India initiated a sample registration of births and deaths in India on a full scale during 1969-70, to provide a reliable estimates of fertility and mortality in the absence of dependable vital rates from the civil registration system, it is high time, Kerala state should take a lead in abandoning the SRS and strengthen the civil registration system.

Acknowledgements

Earlier version of this paper was presented at two seminars in Thiruvananthapuram: One at the Centre for Development Studies and another at the Department of Demography. Comments from the participants are gratefully acknowledged. However, we are grateful specially to Dr. K. C. Zachariah, Dr. K. Navaneetham of CDS and Dr. P. S. Nair and Dr. K. Krishnakumari of the Department of Demography. Comments from the referee of this journal are greatly appreciated.

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