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# On Estimating Fertility and Mortality Rates: A Field Experience

## Introduction

A sample household survey to estimate fertility, mortality and contraceptive prevalence rates was undertaken in 1986 in two community development blocks of Tamil Nadu State in India. The survey covered over 4000 households per block. In this survey, births and deaths that occurred in the sample households since January 1984 were enumerated by following certain strategies. Further, the events enumerated in the survey were matched with other sources of births and deaths, and the unmatched events were field-verified for conformation. The analysis of the data showed some interesting findings on the question of ^estimation of fertility and mortality rates. This paper discusses the strategies employed in the survey and the lessons learned, so that the experience will be useful for those who undertake such demographic estimation surveys.

## Background about the Survey

In Athoor block of Dindigul Anna district (Tamil Nadu), a number of family planning action programmes were undertaken by the Gandhigram Institute of Rural Health and Family Welfare Trust, Gandhigram since early 1960s (Gandhigram Institute of Rural Health and Family Welfare Trust, Gandhigram, 1988; Pisharoti *et* a/,,1971). Surveys conducted between 1960 and 1980 showed that Crude Birth Rate (CBR) in the block had declined from 43.1 in 1959 to 23.7 in 1980 (Rajaretnam, 1988). The CBR obtained for this block for 1980 was lower than that of All India (34.6), Tamil Nadu (29.4) and even Kerala (27.0) for their rural areas in 1980 (Registrar General, India, 1984). However, the contraceptive prevalence rate (CPR) estimated for this block was only 28.7 percent in 1980 (Rajaretnam, 1988). If we go by the expectation of demographers, one would expect higher use rates to reach this low level of fertility. Under the circumstances, a sample household survey to estimate birth, death and contraceptive prevalence rates was launched in 1986 in Athoor block as part of a bigger survey on the "Study of Determinants of Fertility in Athoor Block." The survey also covered a neighbouring block, namely, Batlagundu, that served as control block[1] for the evaluation of fertility decline in Athoor block.

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**The Design of the Survey**

With the assumption that the CBR for each of these two blocks might not be below 20 per 1000 population in 1985, it was estimated that a minimum sample of about 4200 households per block was required to estimate birth rate for these blocks. This sample represented approximately one-seventh of the population of Athoor block and one-fifth of the population of Batlagundu block.

A stratified-cluster-systematic sampling procedure was adopted for the selection of households. For this purpose, all the villages in each block were stratified into 5 strata; stratum 1 all town panchayat villages, stratum 2 all other villages with population above 2000, stratum 3 all villages with population 1000 to 2000, stratum 4 all villages with population 500 to 1000 and stratum 5 all villages with population below 500. Secondly, in stratum 1, the villages were divided into wards and one-third of the wards were selected systematically, and in strata 2 and 3, one-third of the villages were selected systematically. In the selected villages/wards of these three strata, a household-listing was made and each village/ward was divided into a number of clusters of households of equal size. From these clusters, three-sevenths of the clusters in Athoor block and three-fifths in Batlagundu block were selected systematically as the ultimate sample units. In strata 4 and 5, as the villages were small sized, one-seventh of the villages in Athoor block and one-fifth in Batlagundu block were selected systematically as the ultimate sample units.

*jin* the selected sample units (clusters in strata 1 to 3 and villages in strata 4 and 5), a complete survey of the households was made eliciting information on selected demographic and socioeconomic characteristics of the households and individual members, and also on births and deaths that occurred since January 1, 1984. The survey was conducted during April to August, 1986. In all, 4065 households in Athoor block and 4046 in Batlagundu block were covered in the survey.[3]

**Strategies Adopted for Detection of Births and Deaths**

With a view to obtaining correct and complete coverage of births and deaths, certain specific strategies were adopted in the household survey. With regard to births, the respondents (any adult member in the household available at the time of survey) were asked as to whether any birth had occurred in the household (for usual residents, irrespective of place of occurrence) during the last three years. The reference period 3 years was chosen so as to ensure coverage of all events that occurred since January 1,1984 up to the date of survey in mid-1986. Further, all the respondents were invariably asked as to whether there occurred any birth during the reference period and the child not surviving. Attention was paid to demarcate live births from still births. Furthermore, for the purpose of assessing the most probable date of birth, a conversion chart (from Tamil months and dates to English months and dates) was used. Apart from these, all ever married women below age 50 in the household (or any other knowledgeable person in the household on their behalf) were asked of the date of birth of their last live born child, if they had ever given birth to a child. If the interval between the birth of this child and the date of survey was below 3 years, particulars were collected in respect of the previous live birth, if any.

A similar strategy was followed in respect of deaths. The respondents were asked as to whether any death had occurred in their households during the last three years, and if occurred, its date of death and age at death for each of such occurrences, and details were recorded. It was instructed to the investigators to ascertain age at death in days for all neonatal deaths, in days or months for all other deaths below age 5, and in months or years for all other deaths. Specific attention was paid to compare the death particulars with the birth particulars in the interview schedule so as to ensure correct and complete recording of infant and child deaths at least those occurred among the recorded live births.

**Matching of Births and Deaths**

Though a comprehensive procedure was followed in the survey to detect births and deaths, a strategy to match the events recorded in the survey with that registered in other sources, was adopted. In the study area, many agencies were registering births and deaths occurring in the villages. They were the Registrar of births and deaths (under Civil Registration System), the male and female Health Workers of the Primary Health Centres, and the Community Nutrition Workers of the Tamil Nadu Integrated Nutrition project (which was functioning at the time of survey). During field investigation, it was found that the births and deaths recorded in the civil register of births and deaths were mostly the events reported by the Health Workers, and additional events recorded were negligible. With respect to community nutrition workers, some workers had maintained the births and deaths register satisfactorily and others not.

Considering the merits and demerits of the various sources, it was decided to use both the Births and Deaths (B & D) register and Maternal and Child Health (MCH) register of the Female Health Worker only, though there were deficiencies in these registers as well. In the Births and Deaths register, the events were registered with respect to the place of occurrence of the events and not to the usual place of residence of the parents. This problem was more for births than for deaths. The MCH register, if maintained properly, is expected to provide information on these cases as antenatal registration starts during the early stage of pregnancy of the mother and if at all the mother goes outside the village for delivery (either to her mother's home or to any Health Institution), it was usually only at the later stage of her pregnancy. Further, this register helps to determine the most probable date of birth and to detect infant deaths especially early neonatal deaths which are likely to be missed in the retrospective surveys.

One serious error noticed in the Births and Deaths register of the female Health Worker was the misreporting of date of occurrence of the events. It was found that in the register of some workers, a number of births and deaths were recorded as occurred during a short period of about 5 to 10 days and then no recording of events for about 2 to 3 months. Verification showed that, irrespective of date of occurrence of these events, the workers had stated a date falling just before their date of visit to that area. This was done by them as notifier of births and deaths occurring in their area (to the Civil Registrar) to avoid penalty for late notification of the events. Similarly, in the MCH register also there were entries of registration of antenatal cases but very few entries of the various MCH services provided to them. Further, in respect of many cases registered long before, there were no entries of even the date of delivery.

Considering all these limitations, it was decided to list all births and deaths registered as occurred between mid-1983 and mid-1986 in the births and deaths register and all antenatal cases registered in the MCH register who were expected to have delivered the baby during the above mentioned period. Later, a fresh list of the events was prepared village-wise combining the two sources but avoiding repetition of events. However, the events for which particulars did not match satisfactorily were treated as two events in the fresh list. It is to be noted that the listing was made for the whole of the selected villages, whereas the survey covered only a part of the village in strata 1 to 3, and, of course, the whole village in strata 4 and 5.

The list thus prepared was then taken to the field for spot verification and also to decide whether the events had occurred within the sample cluster range or beyond. The events verified and confirmed as occurred during the reference period and within the cluster ranges were listed separately. This list was then matched with the list of events obtained in the survey. The events which did not match between the sources were listed source-wise and were again taken to the field for confirmation. It is to be noted that during the second round of field verification, many cases matched with the survey events which were otherwise recorded differently in the registers of the Health Worker. However, these events were treated as matched events for the purpose of analysis.

Though matching was successful for most villages, it was not attempted for the 4 big-sized villages (each having over 10 thousand population), because of the absence of rlear address of the events (with street name and house number) in the registers. For another village in Athoor block, no proper births and death^ register or MCH register was maintained by the Health Worker. For all these villages, a revisit to the selected households was made and a fresh enquiry on the occurrence of births and deaths during the reference period was made. This visit was also utilized to re-affirm the events already recorded in the survey.

**Results of Matching of Events**

The outcome of the matching of the events is presented in Table 1, and some indices worked out based on this table are given in Table 2. The total number of births detected in the survey for the period from January 1,1984 to December 31,1985 was 921 in Athoor block and 948 in Batlagundu block. The number of births confirmed as correct after matching and field verification was 907 in Athoor block and 941 in Batlagundu block. Similarly, the number of deaths detected in the survey were 355 and 411, and the number confirmed as correct was 371 and 407, respectively, for Athoor and Batlagundu blocks.

Taking the confirmed events as the base, the gross coverage of events in the survey worked out to 101 percent for births both in Athoor and Batlagundu blocks and also for deaths in Batlagundu block. The coverage of deaths in Athoor block was only about 96 percent. The low coverage of deaths in Athoor block may be due to the beginning experience of the field investigators who started the field work first in Athoor block. However, the coverage of births was the same in both the blocks, because, possibly, detection of birth events is easier than that of death events. The gross coverage of births and deaths was more or less the same for the villages matching done and for the villages resurvey made, barring coverage of deaths in Athoor block for the villages matching done. That is, by and large, both matching and resurvey strategies yielded almost the same result.

TABLE 1 : MATCHING OF BIRTHS AND DEATHS, ATHOOR AND B ATLAGUNDU BLOCKS

| *SI.* | *Particulars No.* | *Ref. to SI. No.* | *Births* | | *Deaths* | |
|---|---|---|---|---|---|---|
| | | | *Athoor* | *B'gundu* | *Athoor* | *B'gundu* |
| A: Survey events | | | | | | |
| 1 | Total events as per survey | NA | 921 | 948 | 355 | 411 |
| 2 | Events for villages matching done | 1 | 659 | 753 | 233 | 323 |
| 3 | Events for villages resurvey made | 1 | 262 | 195 | 122 | 88 |
| B : Listing of events from registers @ | | | | | | |
| 4 | As per ANC register | NA | 1663 | 1003 | NA | NA |
| 5 | As per births and deaths register | NA | 1352 | 787 | 420 | 374 |
| 6 | Total events as per registers * | 4&5 | 1970 | 1147 | 420 | 374 |
| C: Held verification of listed events | | | | | | |
| 7 | Events found correct | 6 | 1369 | 785 | 349 | 325 |
| 8 | Events occurred in sample area | 7 | 470 | 528 | 127 | 186 |
| 9 | Events occurred in non-sample area | 7 | 899 | 257 | 222 | 139 |
| D: Matching of events between survey and registers | | | | | | |
| 10 | Events matched | 2&7 | 440 | 504 | 99 | 158 |
| 11 | Events found in survey only | 2&7 | 219 | 249 | 134 | 165 |
| 12 | Events found in register only | 2&7 | 30 | 24 | 28 | 28 |
| 13 | Total events unmatched | 11&12 | 249 | 273 | 162 | 193 |
| E: Field verification of unmatched events | | | | | | |
| 14 | Survey events found correct | 11 | 175 | 255 | 110 | 128 |
| 15 | Register events found correct | 12 | 29 | 19 | 26 | 25 |
| 16 | New events detected during verification | NA | 5 | 3 | 16 | 6 |
| F: Resurvey and verification | | | | | | |
| 17 | Number of events found correct | 3 | 255 | 190 | 115 | 84 |
| 18 | New events detected during verification | 3 | 3 | 0 | 5 | 6 |
| G: Confirmed events | | | | | | |
| 19 | For villages matching done | 10 & 14-16 | 649 | 751 | 251 | 317 |
| 20 | For villages re-survey made | 17&18 | 258 | 190 | 120 | 90 |
| 21 | Total confirmed events | 19&20 | 907 | 941 | 371 | 407 |

@ For the sample villages as a whole.
* ANC register and Births and Deaths register of Health Worker.
NA—Not applicable; ANC—Antenatal care; B & D—Births and deaths.

TABLE 2 : PERCENT COVERAGE OF EVENTS IN THE SURVEY AND REGISTERS, ATHOOR AND BATLAGUNDU BLOCKS

| *Index* | | *Table 1** | | *Births* | | *Deaths* | |
|---|---|---|---|---|---|---|---|
| | | *NR* | *DR* | *Athoor* | *B'gundu* | *Athoor* | *B'gundu* |
| A. | Gross coverage of events in the survey | | | | | | |
| 1 | For all villages | 1 | 21 | 101.5 | 100.7 | 95.7 | 101.0 |
| 2 | For villages matching done | 2 | 19 | 101.5 | 100.3 | 92.8 | 101.9 |
| 3 | For villages resurvey made | 3 | 20 | 101.6 | 102.6 | 101.7 | 97.8 |
| B: | Net correct coverage of events in the survey | | | | | | |
| 1 | For all villages | 10+14+17 | 21 | 95.9 | 97.7 | 87.3 | 90.9 |
| 2 | For villages matching done | 10+14 | 19 | 94.8 | 97.1 | 83.3 | 90.2 |
| 3 | For villages resurvey made | 17 | 20 | 98.8 | 100.0 | 95.8 | 93.3 |
| C: | Events deleted after matching/ resurvey | | | | | | |
| 1 | For all villages | 1-10-14-17 | 1 | 5.5 | 3.1 | 8.7 | 10.0 |
| 2 | For villages matching done | 2-10-14 | 2 | 6.7 | 3.2 | 10.3 | 11.5 |
| 3 | For villages resurvey made | 3-17 | 3 | 2.7 | 2.6 | 5.7 | 4.5 |
| D | Events added after matching/ resurvey | | | | | | |
| 1 | For all villages | 15+16+18 | 1 | 4.0 | 2.3 | 13.2 | 9.0 |
| 2 | For villages matching done | 15+16 | 2 | 5.2 | 2.9 | 18.0 | 9.6 |
| 3 | For villages resurvey made | 18 | 3 | 1.1 | 0.0 | 4.1 | 6.8 |
| E: | Coverage of events in registers | | | | | | |
| 1 | Events matched between survey and registers | 10 | 2 | 66.8 | 66.9 | 42.5 | 48.9 |
| 2 | Coverage' of events in any of the registers | 10 + 15 | 19 | 72.3 | 69.6 | 49.8 | 57.7 |

* Refer to the serial numbers in Table 1.
NR— Numerator, DR— Denominator.

Taking again the confirmed events as the base, the net correct coverage of births in the survey was 96 percent in Athoor block and 98 percent in Batlagundu block, and of deaths was 87 percent and 91 percent, respectively. This shows that almost all the births in the sample area were correctly netted in the survey, but the correct coverage of deaths was around 90 percent only. The extent of births wrongly recorded in the survey was 5.5 percent

in Athoor block and 3.1 percent in Batlagundu block. The corresponding figures in respect of deaths were 8.7 percent and 10.0 percent, respectively. The proportion of additional births detected due to verification was 4 percent in Athoor block and 2.3 percent in Batlagundu block. The corresponding figures in respect of deaths were 13.2 percent and 9.0 percent, respectively. That means, the number of events added and the number deleted due to verification were not only very small but also almost the same, except for a marginal higher number of deaths detected due to verification in Athoor block. Further, the number of events added and the number deleted were almost the same for the villages matching done and for the villages resurvey made.

The major reason for deletion of events was reference period error (75 to 85 percent of such cases). Other reasons included visitor births, still births, etc.

In general, the result of matching of events between survey and other sources showed that the survey was almost complete for the detection of births, but a little low for the detection of deaths. This indicates that enquiry of deaths should be made more carefully than of births. Further, the experience shows that if the survey is well designed and conducted, it is possible to cover correctly almost all births and deaths without any extra burden of matching almost all births and deaths without any extra burden of matching or resurvey. Our field experience shows that either matching or resurvey process is almost equal to another fresh survey.

**An Evaluation of the Registers of Health Workers**

About two-thirds of births and below a half of deaths matched between the survey and the registers of female health workers. The coverage of births in the Births and Deaths register or in MCH register (based on ANC cases) of the Health Workers was 72.3 percent in Athoor block and 69.6 percent in Batlagundu block. The corresponding figures for the coverage of deaths were 49.8 percent and 57.7 percent in Athoor and Batlagundu blocks, respectively (see Table 2). This is a clear indication of the poor maintenance of the registers by the health workers.

**Estimates of Fertility and Mortality Rates**

The CBR estimated for the calendar years 1984 and 85 combined was 25.4 in Athoor block and 25.8 in Batlagundu block (see Table 3). This shows that the CBR of Batlagundu block was a little higher than that of Athoor block. However, when the rate was worked out for 1984 and 1985 separately, an erratic picture was obtained. For Athoor block, the CBR was as high as 27.4 in 1984 and as low as 23.5 in 1985; a 4 point decline in one year. At the same time, for Batlagundu block, the CBR was 25.2 in 1984 and 26.4 in 1985, 1.2 point increase in one year. It is to be noted that this difference was noticed even before the field verification of the unmatched events and the investigators were specifically instructed to re-ascertain the year of occurrence of all the events more accurately especially for the events that were recorded as occurred at the beginning and at the end of the calendar years. Despite this careful attempt, differences persisted even after matching and field verification. Further, during 1984-85, the CBR declined in Athoor block while it increased in Batlagundu block.

TABLE 3 : THE NUMBER OF CONFIRMED BIRTHS AND DEATHS, AND CBR, CDR AND IMR FOR ATHOOR AND BATLAGUNDU BLOCKS, 1984-85

| *Particulars* | *Athoor* | | | *Batlagund* .. | | |
|---|---|---|---|---|---|---|
| | 1984 | 1985 | 1984-85 | 1984 | 1985 | 1984-85 |
| A: Population | | | | | | |
| At survey (mid-1986) | NA | NA | 18006 | NA | NA | 18473 |
| Mid-period (estt.*) | 17689 | 17847 | 17768 | 18126 | 18299 | 18212 |
| B: Births & Deaths @ | | | | | | |
| Live births | 484 | 429 | 904 | 457 | 484 | 941 |
| Deaths | 199 | 170 | 369 | 189 | 219 | 408 |
| Infant deaths | 39 | 35 | 74 | 45 | 60 | 105 |
| C: Rate/1000 | | | | | | |
| Grade birth rate | 27.4 | 23.5 | 25.4 | 25.2 | 26.4 | 25.8 |
| Grade death rate | 11.2 | 9.5 | 10.4 | 10.4 | 12.0 | 11.2 |
| Infant mortality rate | 80.6 | 83.3 | 81.9 | 98.5 | 124.0 | 111.6 |

* Estimated based on the 1971-81 growth rate.
@ Some figures differ from Table 1, note 6 for explanation.

A quarter-year-wise distribution of confirmed births is given in Table 4. The data showed that within each quarter, the between-blocks-variation in the proportion of events was very low; the maximum absolute difference was 3.5 percentage points. On the other hand, within blocks, there were marginal to substantial variations in the proportion, and the variation was higher in Athoor block than in Batlagundu block and also for the year 1985 than for the year 1984. For example, the maximum difference in the proportions in Athoor block were 7 percentage points in 1984 and 15 percentage points in 1985, and in Batlagundu block were 3 and 9 percentage points, respectively. If the variation is to be attributed to the conduct of the survey, then one would expect higher variation in 1984 than in 1985, because the 1985 events are recent events which are expected to have been covered more reliably and hence smoothly distributed, than the 1984 events which are relatively past events. Further, the proportion of births recorded as occurred in the beginning and in the ending quarters of both the years was lower than that of the adjoining quarters, reflecting misreporting of year of occurrence of the events might be minimum. However, the births occurred during January-March was substantially lower in 1985 than in 1984 and the pattern was the same in both the blocks. These indicate the absence of any systematic error in recording the year of occurrence of the events in the survey. Hence, misreporting of year of birth in the survey is less likely.

Again, even the year-wise rate is equal to or higher than the rate obtained for the same area before 5 years (i.e. in 1980). For Athoor block, the estimated CBR for 1980 was 23.7, whereas the rate for the individual years 1984 and 1985 are equal to or even higher (by up to 4 points) than the 1980 figure. For Batlagundu block, the CBR estimated for 1969 was 33.8 which was slightly higher than that of Athoor block for that period (see Table 5). During

1984-85 also, the CBR of Batlangundu block was a little over Athoor block. An analysis of the crude death rate also reflected a similar pattern. However, the IMR for Athoor block was 93 for 1980 as against 82 for 1984-85, is of acceptable trend.

TABLE 4: DISTRIBUTION OF THE CONFIRMED BIRTHS BY QUARTER-YEAR INTERVALS, ATHOOR AND BATLAGUNDU BLOCKS

| *Year and Quarter interval* | *Athoor* | | *Batlagundu* | | *% diff. (Athoor-B'gundu)* |
|---|---|---|---|---|---|
| | *Number* | *% age* | *Number* | *% age* | |
| 1984 | | | | | |
| Jan-Mar | 122 | 25.2 | 115 | 25.3 | -0.1 |
| Apr-Jun | 142 | 29.3 | 121 | 26.7 | 2.6 |
| Jul-Sep | 111 | 23.0 | 111 | 24.4 | -1.4 |
| Oct-Dec | 109 | 22.5 | 107 | 23.6 | -1.1 |
| Total | 484 | 100.0 | 454 | 100.0 | NA |
| 1985 | | | | | |
| Jan-Mar | 74 | 17.6 | 103 | 21.1 | -3.5 |
| Apr-Jun | 136 | 32.4 | 148 | 30.4 | 2.0 |
| Jul-Sep | 109 | 26.0 | 130 | 26.7 | -0.7 |
| Oct-Dec | 101 | 24.0 | 106 | 21.8 | 2.2 |
| Total | 420 | 100.0 | 487 | 100.0 | NA |
| 1984-85 | 904 | NA | 941 | NA | NA |

TABLE 5 : CBR, CDR AND IMR FOR ATHOOR AND FROM 1964 TO 1985 BATLAGUNDU BLOCKS, FOR SELECT YEARS

| *Year* | *Crude birth rate* | | *Crude death rate* | | *Infant mortality rate* | |
|---|---|---|---|---|---|---|
| | *Athoor* | *B'gundu* | *Athoor* | *B'gundu* | *Athoor* | *B'gundu* |
| 1964 | 35.5 | - | - | - | 120.0* | _ |
| 1969 | - | 33.8 | - | 14.1 | - | 76.0 |
| 1971 | 31.3 | - | 16.9 | - | - | - |
| 1980 | 23.7 | - | 9.3 | - | 93.0 | - |
| 1984-85 | 25.6@ | 25.7@ | 10.4 | 11.2 | 82.0 | 112.0 |

* For the period 1964-69.

@ The CBR given in this table is slightly different from that given in Table 3 due to some further correction of events at a later stage.

SOURCE: Rajaretnam (1988) and Rajaretnam *et al.* (1988).

The CBR estimated for both Athoor and Batlagundu blocks for 1984-85 combined, relative to each other, is of acceptable level if we go by the proximate determinants of fertility in these blocks. For example, for both the blocks, the 1986 survey gave almost a similar age-sex-marital status distribution, almost an equal singulate mean age at marriage for females (19.8 for Athoor block and 20.3 for Batlagundu block), same mean age at marriage for females whose marriage duration was below 3 years (18.5 years), same duration of post partum amenorrhoea (10 months) and a very close contraceptive prevalence rate (Athoor block 34.2 percent and Batlagundu block 31.2 percent) (Rajaretnam *et al.*, 1988). But, the fertility and mortality rates for individual years showed marginal to substantial differences on either direction. Hence, in the absence of any deliberate evidence of survey problems, the difference in the birth and death rates between the years can be attributed to a large extent to fluctuations in the occurrence of events in the study areas.

**Discussion and Conclusion**

A sample household survey to estimate demographic rates was undertaken in 1986 in two community development blocks, namely, Athoor and Batlagundu, in Tamil Nadu state of India. The survey was designed to estimate fertility rates, besides mortality and contraceptive prevalence rates. With a view to obtaining reliable estimates of the rates, specific strategies were followed in the detection of events. The strategies included a detailed enquiry regarding occurrence of births and deaths during the reference period 1984-85, a matching of the survey events with that of the Births and Deaths register and MCH register of the female health worker, and a field verification of the unmatched events. A re-survey was made in respect of big-sized villages where matching strategy could not be adopted.

The matching of events showed that the survey was almost correct and complete for the detection of births. With regard to deaths, the coverage was slightly low. The gross coverage of events in the survey (survey events to confirmed events) was about 101 percent for births and about 96 to 101 percent for deaths. However, the net correct detection of events in the survey (correctly detected survey events to total confirmed events) was 96 to 98 percent for births and 87 to 91 percent for deaths. The figures were almost the same for the villages matching done and for the villages re-survey made. The marginal difference in the gross and net coverage of events was mainly due to reference period error in the survey events.

The experience shows that it is possible and also feasible to cover correctly and completely almost all births and deaths that occurred at least in the recent past through retrospective enquiries. However, the findings indicate that more care is needed in the detection of death events especially of neonatal and infant deaths. Our field experience shows that either matching or resurvey process is almost equal to another survey in terms of labour, time and cost. On the other hand, if the original survey itself is well planned and executed, taking into consideration of the various issues, it is possible to obtain demographic estimates more reliably.

We found that, instead of asking "any event (e.g. birth) had occurred in the household during. . . (reference period). . . or not?," the question "when did you (the ever married woman) have the last delivery/birth?" will substantially improve detection of births and child

deaths. For, in the former case, the respondent may say, without recollecting the past and the reference period, "no" and after this answer there is not much to ask further, and/or not much change the respondent will make from his/her earlier statement. But, on the other hand, in the latter case, at the first instance itself, we are giving an opportunity to the respondent to recollect the past and to come out with the "yes" answer if at all she had had a birth in the past. Once, the "yes" answer is received, then the investigator can probe further and determine whether it was a live birth and if so whether it had occurred during the reference period. This question will also help to detect infant and child deaths as well. Further, with this question, is possible to detect correctly and completely almost all events occurred not only during the last one year period but also during a longer reference period probably up to 3 or 5 years. In the latter case, we may have to extend the question as "when did you have the last but one delivery/birth?," and so on. More probe questions may be put (as discussed under strategies) for ensuring correct and complete coverage of events. It is to be noted that it was not possible to analyze the relative coverage of events due to these methods because it was not pre-planned and also the questions were not treated mutually exclusive. But its importance was felt during the field survey.

The findings of the survey showed that the CBR estimated for Athoor Block for 1984-85 combined (25.6) was higher by about 2 points than the previous survey conducted 5 years before (23.7 in 1980). For 1984 and 1985 separately also, the rates were equal to or higher ^ than the 1980 estimate, but between 1984 and 1985, there were large differences in the rates. Whereas the rate declined by about 4 points in Athoor block during 1984-85, the rate increased by more than one point in Datlagundu block during the same period. As misreport-ing of year of birth is less likely in the survey, the differences observed in the rates between 1984 and 1985 are to a large extent attributable to fluctuations in the occurrence of events. The CBR for Tamil Nadu for both rural and urban areas based on sample registration system also showed a sudden drop in the rate during 1984-85; it was 28.0 for 1984 and 24.7 for 1985 (Registrar General, India, 1987). Whether it is incidental or real, these findings suggest that demographic estimates should not be limited to only one year reference period, especially when the survey is based on a limited sample size. Perhaps, a three-year reference period may be appropriate if we go by the difficulties in obtaining reliable information about past events through retrospective enquiries and the fluctuations in the occurrence of events over period.

As regards maintenance of records in the rural health services system, the female health workers are mainly responsible for the care of expectant mothers and young children in a limited area of about 5000 population. The fact that about 30 percent of births and over 50 percent of deaths have not even come to the knowledge of Female Health Workers (i.e. not recorded in any of their registers), raises doubts about the credibility of their record maintenance and service delivery.

On the whole, the findings tend to suggest that demographic estimation surveys should be carefully planned and properly executed. Poorly designed and conducted surveys may produce unreliable demographic estimates which might be due to the poor coverage of events rather than due to the real change in the rates in the area. Further, demographic estimates particularly, fertility and mortality rates for small areas based on limited sample size should

not be confined to only one year reference period and it should cover a longer period preferably 3 years.

**Notes**

1. Batlagundu block was selected for comparison purposes because it was not only adjacent to Athoor block but also showed the highest literacy rate among all the adjacent blocks of Athoor block.
2. The required sample households *(N)* was estimated as:

$$N = (t^2 * p * q) / (d^2 * h)$$

where *t* is the confidence limit factor (here 1.96 at 95% level); *p* is the probability of occurrence of the event (here 20 births per 1000 population per year); *q* = 1 -*p; d* is the degree of accuracy desired (here 10 percent of '/>'); *h* is the average household size (here 4.5 for each block).

3. For a detailed discussion of the sampling design and findings of the survey, see Rajaretnam *et al* (1988).
4. The Tamil Nadu Births and Deaths Registration Rules do not specify any penalty for late notification of events. But it was told that the local Births and Deaths Registrars were charging penalty from the health workers if the events were reported later than the prescribed period of 14 days for births and 7 days for deaths, possibly to adjust the penalty payable by the families.
5. Determination of 'sample cluster range' was easy because the selected households were clusters of consecutive households and were assigned serial numbers in a systematic manner from left to right based on the direction of the main entrance of the houses.
6. Some figures in Tables 3 to 5 differ slightly from Tables 1 and 2, due to further correction of events at a later stage.

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