ENUMERATION CHARACTERISTICS RELATED TO THE COVERAGE OF INFANT DEATHS IN THE MULTIPURPOSE SURVEY OF SAUDI ARABIA

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The death of an infant is one of the most tragic experiences that can happen to any family in any culture. Because of the emotional aftermath that accompanies an infant death, the enumeration of these events is an extremely difficult and delicate task. As a result, infant deaths are usually underestimated.

In an effort to determine the attributes that were associated with the reporting and coverage of infant deaths in a longitudinal survey in Saudi Arabia, [1] [2] [3] selected deomographic characteristics of the mother and child, including residence and places of delivery and death, were studied. Before discussing the results it is necessary to describe the survey vehicle. The Multipurpose Survey of Saudi Arabia began in October 1976. The design is based on the dual estimation method developed by Chandrasekar and Deming. The general principle underlying this method is that two statistically independent data collection systems are used to record the number of vital events that have occurred in a specific population during a particular time period. The results obtained from the two systems are matched and the manner in which each event was recorded is classified into three groups: (1) events recorded by both enumeration systems, (2) events recorded by one system only, and (3) events recorded by the other enumeration system only. The total number of events is determined by adding the three groups. Moreover, the number of events missed by both systems can be estimated by applying a simple probability formula and adding the result to the former sum to get the toal number of events that probably occurred in the area during the specified time period.

In the Arabian survey the enumeration system used is patterned after the Turkish method. [6] With this model, one system is based on a monthly household enumeration and the other on a semi-annual enumeration. The sample size of the survey was 58,000, and was designed to provide estimates for three demographic areas: "Rural areas", "Metropolitan areas" and "Other urban areas".

The evaluation of infant death coverage was carried out using over 200 deaths that occurred during the 1977 survey year. Enumeration coverage was determined by compiling the number of infant deaths by the three casefinding classifications and computing the total number of events that probably occurred for each of the characteristics studied. Coverage rates were then computed by enumeration method and specific attribute.

Characteristics selected to differentiate infant death coverage included the age, literacy status and residence of the mother; the sex and age of the infant at death; the place of death and place of delivery and birth order of the child.

An analysis of the variance of the various rates was made to determine the attributes significantly associated with the coverage of an infant death.

This same basic analytical approach was used in a similar longitudinal survey in Liberia, West Africa. [5] Wherever possible and appropriate, the results of the two surveys are compared.

Coverage by Residence, Age of Mother and Sex of Child

When comparing the coverage of infant deaths by the residence of the mother it was found that coverage decreased as urbanization increased. Infant death coverage in the rural areas was, on the average, 98 percent, in the smaller urban areas it reduced to 88 percent and in the six largest metropolitan areas of the Kingdom, it dropped to 56 percent.

These variations in coverage by residence were consistent for each individual enumeration system. This same high rural and low urban coverage differential was noted in the Liberian study.

Regarding coverage for both systems by the age of the mother and the sex of the child, no significant differences were noted for any age group or for either sex. This is in slight contrast to the Liberian experience where infant death coverage for both systems was lower for mothers aged 25-29 years. In this latter study however, no apparent reason could be given for this isolated result.

Concerning coverage for each individual system by child's sex and mother's age, neither enumeration system demonstrated coverage differentials by sex, however, the monthly enumerators recorded significantly higher coverage rates for mothers aged 25-29 years. Again, like the Liberian experience, no pattern accompanied this result.

Coverage by Age of Child

When comparing coverage by age of child, coverage rates increased directly with the survival period of the infant. Children dying during the neonatal period (less than 1 month), were covered significantly less than those surviving 1 through 5 months or 6 through 11 months. No significant difference was obtained between the latter two age groups. The coverage rates for post-neonatal deaths were over 10 percent higher than for neonatal deaths. These differentials were consistent in the rural, metropolitan and other urban areas. Compared with the Liberian study, the same low neonatal/high post-neonatal coverage differential was observed.

In regard to coverage for each individual system by age of child, the monthly enumerators were chiefly responsible for the large age variations observed. Coverage differentials for the monthly enumerator ranged from an average 68 percent for the neonatal period to nearly complete coverage for children surviving 6 to 11 months. Although a similar trend in coverage by age was noted for the semiannual enumerators inconsistencies were apparent and significance was not obtained.

Coverage by Birth Order of Child

Coverage of infant deaths by birth order displayed no significant or consistent pattern. This held true in all three locations, with mothers of all ages and, for all combinations of orders. Moreover, this result was obtained for each individual enumeration system.

The general lack of pattern between birth order and infant mortality is consistent with the Liberian experience.

Coverage by Place of Death

Whether the death occurred at home or in a medical facility made little apparent difference in the coverage of infant mortality. This result was consistent in all locations, for mothers of all ages and, regardless of which enumeration system recorded the event. Although most of the deaths occurred at home, and these were missed slightly more than those in a medical facility, no consistent trend was apparent.

Comparable information from the Liberian survey was not available.

Coverage by Place of Delivery

Since the highest infant death rates occur within minutes or hours after delivery, an analysis was made of the coverage differentials of infant deaths by the place where the birth occurred; the results, like place of death, indicated that no significant coverage differentials were associated with whether the infant was delivered at home or in a medical facility. This result was consistent regardless of the location of the residence, age of mother, or the enumeration system recording the event.

Liberian data for this attribute were not available.

Coverage by Literacy Status of Mother

In comparing coverage variation by whether the mother of the infant was literate no significant difference in the reporting of an infant death was observed. This was consistent for both enumeration systems, for each system individually, for mothers of all ages, or, for residence in a rural, metropolitan or other urban area.

Infant death coverage rates by literacy of the mother was not studied in Liberia.

Summary and Conclusions

The variation in enumeration coverage rates of infant deaths in the Multipurpose Survey of Saudi Arabia was not a completely random phenomenon; rather, it was associated with the mother's residence, survival period of the child and the enumeration system recording the event. Since many of these same associations have been independently replicated in Liberia, the results may not be considered statistical curiosities peculiar to a select region.

The fact that the chance of missing an infant death increases directly with the size of the community, emphasizes the critical need for enforcing rigid enumeration control procedures and for developing more thorough respondent education and conditioning programs in the urban centers.

From a demographic viewpoint, though infant mortality rates are traditionally higher in the rural areas, event coverage is also higher. This raises the question of how much of the well known rural/urban rate differential can be attributed to the rigors of rural living and how much is merely an artifact of survey execution.

A similar situation exists with the consistent undercoverage of infant deaths by age of child. The shorter the survival period, the greater the chance of missing the death. How much of the variation in infant mortality rates by age can be attributed to the trauma of birth and how much to the enumerator's failure to visit the household or to the respondent's reluctance to report the event is difficult to evaluate. Until these factors are determined the "true" neonatal and post-neonatal mortality rates remain a question. Moreover, since most infant deaths occur shortly after delivery, the missing of the death implies the missing of the accompanying birth. This suggests that both events are underestimated.

These survey reporting and execution problems are not insoluble. All can be corrected as long as they are recognized beforehand. The case-finding of infant deaths will always be difficult. This study indicated several significantly important attributes associated with the undercoverage that must be considered before accurate estimation of this unpleasant event is realized. Hopefully, additional analytical data will become available from other surveys so that similar problems, currently unrecognized, may be corrected.

REFERENCES

1. Aba Btain, Abdul Rahman and Rumford, John: The Integrated Longitudinal Survey. A New Approach to an Old Problem. Proceedings of the 41st Session, Dec. 5-15, 1977, New Delhi. Bulletin of the International Statistical Institute. Vol. 47: 1-4, 1977.

2. Chandrasekar, C. and Deming, W.E.: On a Method of Estimating Birth and Death Rates and the Extent of Registration. J. Am. Stat. Assoc. 44. 101-105, March 1949.

3. Rashid, Ali; Casady, Robert: Methods and Preliminary Estimates from the Saudi Arabian Multipurpose Survey, Proceedings of the 41st Session, December 5-15, 1977, New Delhi. Bulletin of the International Statistical Institute, Vol. 47: 422-425, 1977.

4. Rashid, Ali; Rumford, John: The Multipurpose Survey of Saudi Arabia - An Experiment in Compression. Proceeding of the American Statistical Association: 705-708, 1976.

5. Rumford, John C.: Factors that Affect Case-finding in the Liberian Fertility Survey. Health Service Reports, Vol. 87, No. 3: 247-261, March 1972.

6. Rumford, J.C.; Heperkan, Y. and Fincancioglu, N.: The Principles and Preliminary Results of the Turkish Demographic Survey, Public Health Rep. 83: 573-582, July 1968.

Table 1. - Average Percentage of Infant Death Covered by Residence of Mother

Residence of Mother	Saudi Arabia	Liberia
Rural	98	87*
Urban, Metropolitan	56*	NA
Urban, Other	88*	80

NA Not Available

* Significantly different at the .05 level or greater using the F ratio

Table 2. - Average Percentage of Infant Death Covered by Age of Mother and Sex of Child

Age of Mother	Saudi Arabia		Liberia	
	Male	Female	Male	Female
19 years and under	90	98	88	86
20 to 24 years	96	94	86	93
25 to 29 years	94	99	70*	69*
30 years and over	93	87	85	89

* Significantly different at the .05 level or greater using the F ration

Table 3. - Average Percentage of Infant Death Covered by Age of Child

Age of Child	Saudi Arabia	Liberia
Neonatal [1/]	90*	81*
Post-neonatal	99	89

[1/] Children surviving less than 1 month

* Significantly different at the .05 level or greater using the F ratio