XI. MORTALITY DATA COLLECTIONS: A REVIEW OF INTEGRATED MULTIPURPOSE HOUSEHOLD SURVEYS AND MULTI-ROUND DEMOGRAPHIC SURVEYS*

A. Adlakha** and M. Nizamuddin***

The need to study levels, changes and differentials in mortality has been increasingly realized by public health administrators and policy makers since the Second World War. This renewed interest in mortality studies has arisen from the realization that effective measures to reduce mortality can best be taken in the light of adequate knowledge about the health risks in existence, from a need to assess the efficacy of intervention programmes and from recent concern about a possible deceleration in the rate of mortality decline in some regions.

Many aspects of mortality remain unexplored or unexplained for the majority of populations in developing countries. There are several reasons for this, from lack of trained manpower to collect, analyse and interpret mortality data to the inadequacies and complexities of methodologies for collecting and analysing such data. On the whole, the inadequacy of data, whether due to unavailability or unreliability, seems to be the major problem in the developing countries.

The traditional sources of mortality data have been civil registration systems and population censuses. The combination of a complete civil registration system and periodic reliable censuses provides much of the information needed for basic mortality studies. However, the problems of incompleteness, delays in aggregating the data and biases introduced by the registrars at the local level in reporting events make the civil registration system of little immediate value in many developing countries. Household sample surveys thus represent, in many countries, the most practicable response to the growing need for data on a variety of subjects. Especially during the past 30 years, several developing countries have resorted to household sample surveys for obtaining information on a number of topics, including fertility, mortality and migration. It has been argued that a household survey is the most flexible data collection method available to national statistical institutions.1

The methodology of household sample surveys in terms of basic concepts, field procedures and sampling techniques has expanded and improved considerably over the years. Various types of surveys covering a range of subjects and spanning different periods can produce needed data for planning and evaluating development programmes.

Multi-subject or multi-purpose surveys cover a wide range of subjects, such as income and expenditures, health and nutrition, employment and vital events. Great flexibility can be exercised in the selection of subject matter or sample size. The National Sample Survey in India, the Pesquisa Nacional por Amostra de Domicilios in Brazil and the National Integrated Sample Survey Programme in Kenya, described in the next section, are good examples of multi-subject household survey programmes. Special-purpose surveys, on the other hand, are designed to cover a single subject or to examine a single issue, although they may sometimes be implemented as part of an ongoing national survey programme. Both types of survey can be retrospective, prospective or a combination of both; and there are variations within each type which make the sample survey approach to data collection flexible enough to cover almost any subject for any given length of time. For mortality estimation, it is useful to distinguish between two distinct survey approaches, the multi-round or prospective survey, whereby an enumerated sample population is followed for a period of time with the continuous or periodic recording of vital events, and the single-round retrospective survey, whereby a sample population is interviewed once only, with the recording of vital events during some prior period such as the year or two years preceding the survey. Although, in theory, either approach can be used in single- or multi-purpose surveys (and both can be used in the same survey), in practice, the multi-round approach has rarely been used except in single-purpose demographic surveys.

Section A of this chapter describes the multi-purpose survey approach, illustrated by three examples, with a discussion of how successful the surveys seem to have been in collecting mortality information. Section B then describes the basic features of the multi-round survey approach, illustrated by two examples, and goes on to examine the reliability of mortality information collected in this way and to compare the efficacy of the approach with that of single-round surveys. The final section draws some general conclusions about the suitability of the available method-
ologies to provide the types of mortality information required.

A. MULTI-PURPOSE HOUSEHOLD SURVEY PROGRAMMES

Multi-purpose household survey programmes represent an attempt to co-ordinate the collection of the socio-economic information required for planning purposes. Although the programmes in existence exhibit substantial diversity, their common features generally include: (a) a nationally representative master sample, generally with built-in subsamples to be used for certain purposes; (b) the creation and training of a permanent staff of interviewers; (c) the conducting of surveys on certain topics at regular intervals; and (d) the conducting of surveys to cover special topics from time to time during the existence of the programme. For the purposes of collecting mortality information, such multi-purpose programmes offer a number of advantages over the single-purpose survey. First, the interviewers are regularly employed in survey work, thus being experienced and needing only specific training. Secondly, the survey cost is reduced since many start-up costs, such as sampling and household identification, are spread over a number of surveys. Thirdly, the inclusion of a mortality (or demographic) study in an integrated survey programme reduces the bureaucratic problems often encountered. Fourthly, and perhaps most important, the other elements of the survey programme can provide a wealth of socio-economic background information about the population being studied, in some ways comparable to one of the advantages offered by the multi-round survey approach, although it should be noted that the ways in which subsamples are drawn from the master sample often complicate the transfer of information between surveys. The possible organizational disadvantages of the multi-purpose approach are that the interviewers may come to regard the work as routine, not putting much effort into it, and that the population of the master sample areas may become resistant to repeated surveying. A further disadvantage specific to mortality studies is that the single-round retrospective survey approach is generally used, and this approach has certain practical disadvantages.

The single-round retrospective survey approach can only collect direct mortality information in the form of deaths occurring to household members or relatives over some specified period. Usually, a household member is asked about deaths in the household over the preceding 12 or 24 months, and is asked to give the age, sex and date of death of each deceased. Widespread experience has shown that such information is deficient not only in coverage (deaths may be omitted for single-person households, as a result of a household disintegrating because of the death of a member, as a result of reference period error or as a result of intentional concealment) but with respect to such details as age. Coverage is often particularly poor for deaths of infants and young children. Fortunately for

Kenya

Kenya is one of the few countries of Africa that has had considerable experience with a multi-purpose household survey programme. The Central Bureau of Statistics first launched the National Integrated Sample Survey Programme during 1975, to run to 1979. Under this programme, a series of socio-economic and demographic surveys were conducted using a common sample covering 95 per cent of the country's population. The primary objective of the sample frame was to ensure that all the surveys conducted under the programme should yield reliable estimates on population changes and information on labour force characteristics, the agricultural sector and other socio-economic variables. The sample was designed to provide
representative results for seven of the eight provinces of Kenya; the eighth province, a sparsely populated and backward area of north-eastern Kenya, was excluded from the frame. Surveys conducted under the programme have covered income, expenditure, employment, nutrition, rural land use and wealth, as well as demographic topics. The two surveys with important components for the study of mortality are the 1977 National Demographic Survey and the Kenya Fertility Survey, 1977/78, part of the World Fertility Survey programme. The former survey was conducted in the entire primary sample, covering about 50,000 households, whereas the latter was conducted in one of the six blocks into which each primary sampling unit was divided and covered about 8,000 women aged 15-49. The fertility survey differed in execution from standard survey rounds in that specially recruited and trained female interviewers were used instead of the regular teams of the National Integrated Sample Survey Programme.

The National Demographic Survey collected information relevant only to the application of indirect mortality estimation procedures, specifically concerning survival of children (by sex), parents and first spouses. No direct information was collected about household deaths. The Kenya Fertility Survey only collected information about child mortality in the form of maternity histories, obtaining the date of birth and, if applicable, the date of death of each child reported by the women surveyed.

Blacker* analysed data on mortality collected in these two surveys and compared the results with the previous two population censuses, in 1962 and 1969. The indirect estimates of infant and child mortality derived from the proportions of children dying, by age of the mother, obtained from these four different sources, indicate clear and consistent evidence of a substantial decline during the period covered by the data, a trend further supported by the results of the 1979 population census. These results also broadly corroborate the direct estimates of infant mortality obtained from the Kenya Fertility Survey birth histories. It may be mentioned in passing, however, that the results of both the National Demographic Survey and the Kenya Fertility Survey indicated somewhat lower child mortality than did the censuses. The evidence on the trends and levels in adult mortality from the various surveys is neither consistent nor reliable,7 and it appears that the indirect approaches to the estimation of adult mortality are less satisfactory than those available for estimating child mortality.

**India**

India introduced the National Sample Survey in 1950. It is a large-scale programme covering all the geographical area of India, comprising a series of socio-economic surveys. Although the National Sample Survey was primarily designed to obtain data on economic indicators, such as employment, income and expenditures, some rounds have been devoted to data on fertility, mortality and migration. The second round of 1950 was used to collect a small amount of data on fertility with the objective of studying fertility levels and trends. Later, realizing the limitations of the vital registration system and the questionable reliability of the estimates of demographic variables derived from it, the National Sample Survey included a fertility section in the subsequent rounds until 1953. In the seventh round in 1954, a revised and more detailed section on demographic data was used to collect information on the births, marriages and deaths in the 12 months preceding the survey and on illness in the sample households. The Survey has since continued to devote some survey rounds to obtaining demographic data. Some methodological variations were introduced in different rounds, although the major approach has remained the single-round retrospective survey.

A distinctive feature of the Survey is that its sample units are arranged in the form of an interpenetrating network of subsamples, each of which is surveyed and/or processed in different but comparable operational units. This technique was introduced three decades ago, by P. C. Mahalanobis of the Indian Statistical Institute. The technique provides two or more independent, but equally valid, estimates of each variable under study (and also of any derived functions, such as vital rates). Thus, the design of the sub-sample network can be used to examine the differences arising from two or more sources of error, such as two or more interviewers or types of questionnaires.

In the fourteenth round of the National Sample Survey (July 1958-June 1959), the Government of India accorded very high priority to the collection of information for estimating current birth and death rates. Consequently, a separate schedule was developed specifically for the study of fertility and mortality, covering population, births and deaths; the sex, age at death, date of death, place of death and relationship of the deceased to the head of the household were collected for each reported death of a household member over the 24 months preceding the survey. The household roster also included background information on the parent(s) of the children who died during the period. The special schedule was administered in each and every household of the selected geographical area. Each state was divided into a number of strata; and from each rural stratum, two independent subsamples of six villages were drawn systematically. In addition to the separate schedules, the survey design was also modified. The survey year was divided into six subrounds, each of two months' duration; and the same two investigators worked in a particular stratum during the entire survey period. By this method, the independent and interpenetrating subsamples were obtained for each of the six subrounds. In the first two subrounds, detailed demographic information for each member of the sample household was collected, while in the subsequent subrounds, only summary information on a household basis was obtained; the block of information relating to births and deaths was the same.
in all the subrounds. Information on deaths in single-
member households was sought from neighbors and
responsible persons in the village, as well as from
every tenth household surveyed. The reference period
for births and deaths was extended to two years in this
round, so that in the final estimation of birth and death
rates, the data relating to a shorter period, such as the
preceding year, could be used while the information
relating to a longer interval would be available for an
assessment of the effect of recall lapse and timing bias.  

In the fifteenth round (July 1959-June 1960), data on
births and deaths were obtained from the same set of
sample villages. The reference period was again the
two years preceding the interview date, so what was
"last year" in the fourteenth round became the "year
before last" in the fifteenth. A detailed analysis of data
on births and deaths obtained from these two survey
rounds provides some measure of relative under-
reporting of vital events, as one passes from the last
to the year before last.

Infant mortality and age-specific death rates were
calculated from the two interpenetrating subsamples in
any given round for both the year before the survey
and the year preceding that. The reporting of deaths in
the National Sample Survey was found to suffer a
higher degree of "recall lapse" than the reporting of
births; 9 and the mortality rates calculated from the
Survey, when compared with those of the Sample Reg-
istration System, appear to be too low. 10 Thus, the
National Sample Survey programme, though it has
been able to produce timely and useful data on many
socio-economic variables, has produced less than satis-
factory information on mortality, a common failing
of the retrospective methodology used.

Brazil

Brazil, like many other countries in Latin America,
had a vital registration system since the beginning
of this century, although the statistics produced by this
system have, in general, been deficient. However, the
quality of data-gathering and analysis seems to have
improved since the Government officially assigned the
task of processing and publication of vital statistics to
the Fundação Instituto Brasileiro de Geografia e
Estadística (FIBGE) in 1971. 11

Apart from the efforts to improve the vital registra-
tion system, a series of annual national household sur-
vey programmes, Pesquisa Nacional por Amostra de
Domicílos, was initiated in 1967. The series was pri-
marily designed to measure employment trends. In
1970, the programme was expanded to cover other
socio-economic and demographic topics which could
be varied from round to round. Although the surveys
were national in coverage, the sample was designed
with the explicit objective of producing regional esti-
mates. Since 1970, these surveys have included sever-
al questions that could generate data for the indirect
estimation of child mortality using techniques pro-
posed by Brass and his colleagues. 12 In addition to
basic information on age and sex, the rounds of the
lected information on children ever born and children
surviving; the 1977 round also collected information
on survival of mother, but no other information re-
levant to the estimation of adult mortality has been col-
clected. During the period 1974-1975, no survey was
undertaken by the Pesquisa Nacional because a large-
scale survey, the Estudo Nacional da Despesa Famí-
liar, was conducted by FIBGE during that period. The
main purpose of the survey was to collect data on
household expenditures and nutrition, but it also col-
lected more extensive information on mortality than
the rounds of the Pesquisa Nacional, covering children
ever born and children surviving by sex, and deaths in
the household during the preceding 12 months. How-
ever, due to the fact that the major emphasis of the
Estudo Nacional da Despesa Familiar was on collect-
ing information on household expenditures and nutri-
tion, and also because the demographic questions
were placed at the end of the questionnaire, the quality
of the mortality data appears to have suffered. Nev-
evertheless, both of these surveys have been able to gen-
erate demographic data suited for the application of a
number of the indirect estimation techniques currently
available.

As mentioned earlier, all surveys in the Pesquisa
Nacional por Amostra de Domicílos were designed to
produce both national and regional estimates. The
sample design used was a multi-stage probability sam-
ple, with households as the ultimate sampling units.
Because the surveys were multi-purpose in nature, the
interviewers were instructed to administer the ques-
tionnaires to the head of household or, in his or her
absence, to any other household member who could
provide the required information. As a result, data on
children ever born and children surviving to women in
the household were not generally provided by the
women themselves.

The child survival data from the two surveys dis-
cussed above have been used by the United States
National Academy of Sciences 13 to estimate levels and
trends of child mortality in Brazil. Results indicate
that, in general, child mortality in Brazil had been
declining, although at the regional level the estimates
do not show consistent patterns of decline across sur-
veys, and the Pesquisa Nacional surveys seem to be
yielding lower levels of child mortality than the esti-
mates from the Estudo Nacional da Despesa Familiar
and the censuses. Furthermore, the National Academ-
y of Sciences analysis of urban/rural child mortality
differentials based on census data indicated practically
no differentials for Brazil as a whole, whereas the esti-
mates obtained from the sample surveys suggest that
urban/rural differentials in childhood mortality do
exist. In summary, it may be said that although the
child mortality estimates by region, derived from the
series of Pesquisa Nacional surveys, have proved use-
ful as indicators of levels and trends of mortality in
Brazil, they have not been consistent enough to be
terely unambiguous. The estimates of female adult
mortality obtained from information on survival of mother from the 1977 survey proved to be much less satisfactory, indicating an unacceptably rapid mortality decline over time.

Conclusions concerning multi-purpose household surveys for mortality estimation

Integrated household survey programmes have been instituted primarily for the collection of socio-economic data; and, as such, they have often been used to generate needed data on demographic parameters, including mortality. All the programmes herein described, excluding the Pesquisa Nacional por Amostra de Domicípios, have accorded prominence to demographic data collection either by earmarking it to separate rounds or by using a separate schedule (as in India) for demographic data. As a result, numerous sets of demographic data from different rounds are available and provide an opportunity to study levels, trends and differentials of mortality, as well as the potential to link the information on diverse topics from successive rounds. This review, however, also finds several problems. To date, these programmes have generated only limited data on mortality. Most analyses have been limited to the estimation of levels and trends of child mortality, providing little information on adult mortality or mortality differentials. The latter deficiency has arisen in part from the fact that the surveys did not collect detailed information for the study of differentials, but also, in many instances, the data collected have not been fully analysed.

On an overall basis, this limited review indicates that multi-purpose household survey programmes, because of their flexibility in sample designs and the availability of field infrastructure, funds and staff on a continuing basis, can be used to generate cost-effective and timely data for estimating mortality as well as for other demographic parameters and may fill many of the existing data gaps in these areas.

B. MULTI-ROUND DEMOGRAPHIC SURVEYS

Multi-round demographic surveys are generally single purpose, although the single purpose generally includes fertility and migration as well as mortality. The multi-round survey, as its name implies, involves repeated visits to the same sample of households. This approach was devised to minimize the deficiencies in coverage exhibited by single-round retrospective surveys in which questions are asked about events that have occurred in a fixed reference period (usually one or two years prior to the survey). The multi-round survey approach is described in detail in the literature. Although variations exist, the multi-round survey usually consists of an initial round at which the characteristics of the sample population are recorded, followed by two or more subsequent rounds which update the household listings, using changes in household composition to prompt inquiry about vital events since the previous round. The multi-round survey approach, in essence, uses a combination of retrospective and prospective approaches for the collection of data on occurrence of events.

The most distinctive feature of the multi-round survey is that it uses a reference period bounded by the visit to the household at the previous round, whereas the single-round retrospective survey uses a reference period bounded by a date or length of time, a much vaguer delimiter. Thus, instead of asking the respondent whether a death has occurred in the previous 12 or 18 months, the interviewer asks about each person listed in the previous round, i.e., whether that person is still residing in the household, has migrated or has died. The recall of events is bounded by the previous interview; thus, errors of dating and of erroneous inclusion of deaths are minimized.

During the past two decades, several local and national multi-round inquiries have been carried out in Africa, Asia and Latin America. An inventory of large-scale surveys since 1960 was compiled by the World Fertility Survey. Of 175 surveys studied, 26 per cent were multi-round surveys. Cantrelle describes the evolution of the approach in francophone countries of Africa. An inventory that he prepared lists 23 distinct regional and national inquiries that had been carried out by 1974 in Africa. In the 1960s the Centro Latinoamericano de Demografía (CELADE) independently developed and tested the multi-round survey. Two experimental surveys were carried out: one in the State of Guanabara, Brazil, in 1960/61; and another in Cauquenes, Chile, in 1964-1966. The results from these experiments were found to be satisfactory. Encouraged with the results of these experiments, a multi-round demographic survey was carried out the first time in Honduras in 1970-1972. Surveys analogous to Honduras were followed in Panama in 1974/75 and in Peru in 1974-1976.

A brief description of the survey in Honduras and a multi-round survey undertaken in Iran in 1973-1976 are given below as examples of multi-round surveys in general, followed by a discussion of the relative merits for mortality studies of the multi-round and the single-round approaches.

Honduras National Demographic Survey, 1970-1972

The Honduras National Demographic Survey of 1970-1972, conducted by the Director General de Estadística y Censos (DGEC), with technical assistance from CELADE, was the first national implementation of the multi-round survey methodology tested by CELADE in experimental surveys in the State of Guanabara, Brazil, in 1960/61; and in Cauquenes, Chile, in 1964-1966. The objectives of the survey were to obtain estimates of fertility, mortality and migration for the country as a whole and for urban and rural areas. The survey included some 98 per cent of the national population, the very sparsely populated and poorly developed area in the eastern part of the country being excluded because of its inaccessibility. A stratified cluster sample was drawn with the objective
of obtaining a study population of about 35,000 people; in all, 134 clusters were surveyed. Four survey rounds were conducted, the first between December 1970 and March 1971, the second from April 1971 to July 1971, the third between September 1971 and December 1971, and the fourth between July and October 1972. The intervals between rounds were thus between 6 and 10 months, the interval between the third and fourth rounds being longer than originally intended as a result of financial constraints. Four teams, each consisting of a supervisor and two interviewers, carried out the field-work, with the teams being rotated to avoid the same team always visiting a given sample area. The first round collected baseline information on the initial population, covering household characteristics; the age, sex and marital status of each member; the pregnancy status for each female aged from 12 to 50 years; and the date of interview. Subsequent rounds collected information on changes affecting the population, covering the arrival of immigrants (with origin), departure of emigrants (with destination), births, deaths, pregnancy status and marital status; in all cases, the round by which the change had occurred and the date of the change were recorded. At each round after the first, the information from the previous round or rounds was available to the interviewer. By collecting the dates of changes, it was possible at the analysis stage to compute rates on the basis of the true person-years lived by the survey population, taking account of entry and exit. Over the survey period, there were a total of 51,855 entries, made up of the 34,444 persons first enumerated, 2,520 births and 14,891 immigrants; when classified by exit, 33,688 of the 51,855 persons registered remained in the population at the last round, 725 had died and 17,442 had emigrated.

The results of the survey indicated a crude death rate of 14.2 per 1,000 population and an infant mortality rate of 117 per 1,000 live births; comparable figures calculated from the vital registration system were 8 and 37, respectively, indicating that the multi-round survey approach represented a major improvement over the conventional statistics. Rather marked mortality differentials by urban/rural residence and socio-economic group were also found, the crude death rate for urban centres (8.2) being less than half that for the western region (19.7), and the corresponding infant mortality rates being 85 and 133, respectively.

The mortality estimates derived from the multi-round survey can be evaluated by a number of indirect techniques, since the fourth survey round included an additional questionnaire collecting information on children ever born and children surviving, survival of parents and survival of first spouse. The internal consistency check of the age distribution of the population against the age distribution of deaths suggests some underrecording of adult deaths, of the order of 10 to 15 per cent, although the discrepancy could arise from sampling error, given the small number of deaths. The indirect estimates of child mortality indicated a somewhat higher level of child mortality than that obtained by the survey, though the difference was only some 5-10 per cent. Thus, in general, the multi-round survey seems to have recorded deaths adequately, though a somewhat larger sample would have been advantageous.

Population Growth Survey in Iran, 1973-1976

The Population Growth Survey in Iran was carried out by the Statistical Centre of Iran with advice from a United Nations technical advisor.

Detailed descriptions of the survey organization, methodology and results have been given by the Statistical Centre and by Tamrazian. The Population Growth Survey was a multi-round follow-up survey which covered a nationally representative population of about 100,000 persons. The sample design was a 1/300 self-weighted sample of city districts (in urban areas) and dehestans (in rural areas). This choice of a self-weighted sample greatly eased data processing and analysis. An initial baseline survey of the population was taken in October 1973. The baseline survey obtained name, relationship to head of household, residential status, sex and date of birth or age, duration of residence, orphanhood status, marital status, births and deaths that occurred in the household during the previous 12 months; and for females below age 50, pregnancy status. After this initial baseline survey, households were visited six additional times at six-month intervals to determine births, deaths and moves in or out of the household during the interval between rounds. The interview technique was that of follow-up: the interviewer asked the respondent about the status of each person recorded at the previous round as living in the household; that is, whether he/she was still living there or had moved out or died. The respondent was then asked about any births or other additions to the household that might have occurred during the interval.

The interviewing was carried out by a permanent interviewing staff. In order to enhance quality, no interviewer visited the same sample unit more than once. Nevertheless, in order to ensure the quality of the survey operation, control checks were carried out after the third, fifth and seventh rounds. After each of these rounds, in a subsample of the survey areas, field supervisors duplicated the interviews and matched the results of these interviews against the originals. The Chandraskaran and Deming approach was then used to estimate the number of events that were missed by the original interview and correction factors were calculated which were applied to the recorded births and deaths. These completion checks indicated that 5.5 per cent of births and 9 per cent of deaths were missed by the interviewing procedure. The adjustments are incorporated in the published results.

For the period 1973-1976, the Population Growth Survey showed a crude death rate of 11.5 per 1,000 population and an infant mortality rate of 105 per 1,000 live births. Life expectancy at birth was approximately 57 years for both males and females, the lack of a sex
differential being one of the interesting findings from the survey. Large urban/rural differentials in mortality were also indicated by the survey; the crude death rate varied from 14 per 1,000 in rural areas to 8 in urban areas, and the infant mortality rate from 126 in the rural areas to 62 among urban populations.

The existence of questions on orphanhood status and household births and deaths in the baseline surveys give the possibility of producing comparative mortality estimates based on retrospective techniques. Unfortunately, tabulations based on these questions have not been published.

Advantages of multi-round surveys

The major advantage of the multi-round approach over the simple retrospective reference period approach is that it reduces the burden placed on the respondent's memory. Rather than having to recall births and deaths and try to place them in a timeframe, the respondent merely has to update the list of household members; and since the reference period is bounded by the date of the first interview, there are fewer errors of either inclusion or exclusion of deaths due to faulty dating of the event. In addition, it is more difficult for a respondent intentionally to conceal the occurrence of a death because the interviewer asks about each person who was present at the previous round, one by one.

The multi-round approach has no marked advantage over the single-round retrospective survey in the reporting of "double" events occurring to the same person between rounds, such as a baby who is born and dies or an immigrant who dies. In these cases, the approach relies upon retrospective questioning and is thus as prone to incomplete reporting of deaths as any other retrospective method, although the measurement of early infant mortality may be improved if information on the pregnancy status of each woman of childbearing age is obtained in each round and the outcome of the pregnancy is investigated in subsequent rounds. For example, Cantrelle reports that estimates of infant mortality in the Sine Saloum Survey in Senegal were much higher when information on pregnancy outcome was used to supplement reports of infant deaths.

In general, empirical findings bear out this theoretical advantage of multi-round surveys, although the necessary data for such comparisons are available for very few surveys. However, several multi-round inquiries in Africa provide two sets of estimates of annual death rates: (a) estimates from the initial or baseline survey based on retrospective information on deaths in the 12 months before the survey; and (b) estimates based on the information on deaths from the follow-up rounds after the baseline survey. Tabutin compares results of the two approaches for selected countries in terms of crude death rates and infant mortality (see tables XI.1 and XI.2); the multi-round survey gives higher rates in every case except for the crude death rate in Morocco. The higher death rates obtained from the multi-round survey than the single-round retrospective survey approach at least suggest that the former approach provides a better coverage of deaths than the latter. Similarly, in an analysis of data collected in the multi-round survey of Morocco in the period 1961-1963, it was found that a survey with two rounds completely eliminated the inclusion of out-of-scope deaths and considerably minimized the underenumeration of deaths.

Although the multi-round approach has clear advantages over the single-round collection of recent deaths, its advantages over estimates of mortality derived indirectly from data obtained in single-round retrospective surveys are less clear. The final rounds of the multi-round surveys carried out by CELADE in Honduras, Panama and Peru included retrospective questionnaires for obtaining suitable data for indirect estimation. Arretx provides results on child mortality and adult mortality using indirect estimation techniques based on child survival, parental survival and spouse

<table>
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<tr>
<th>Country</th>
<th>Period</th>
<th>Multi-round approach</th>
<th>Retrospective reference period approach</th>
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<td>13.8</td>
<td>11.9</td>
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<td>Algeria</td>
<td>1969-1971</td>
<td>16.2</td>
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<td>Senegal</td>
<td>1970/71</td>
<td>22.0</td>
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<table>
<thead>
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<th>Country</th>
<th>Infant mortality rate</th>
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<td>Tunisia</td>
<td>135</td>
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Source: See table XI.1.
survival, and compares them with the results from the follow-up approach, with results shown in tables XI.3 and XI.4.

In two of the three comparisons, the estimates of mortality from the follow-up approach are lower than those obtained by the use of indirect methods. Although the two sets of estimates refer to somewhat different periods, it would appear that the multi-round approach resulted in an underestimation of mortality.

**Analysis of mortality differentials**

In one respect, the multi-round survey approach is better suited for studying differentials of mortality than any single-round survey approach, with or without indirect techniques, since information can be obtained about all household members, so that background characteristics of a person who subsequently dies, such as age, education or income, can in many cases be obtained from the persons themselves prior to death, rather than from proxy reports from others after the death. It is unfortunate that most multi-round surveys, because of concern for keeping costs manageable and the questionnaire brief, have used relatively small samples and have not collected much information on socio-economic characteristics, thus losing an excellent opportunity to study differential mortality risks.

The study of differentials by indirect procedures, although possible as demonstrated by the series of studies of child mortality in Latin America carried out by CELADE on the basis of the 1970 round of censuses, suffers from some inherent problems. Most indirect estimates are based on measures of the cumulative experience of a particular age cohort, spread over a long exposure period, while information on characteristics for classification usually pertains to the time of the survey. This discrepancy between the time references for characteristics and for mortality estimates creates difficulty for a valid study of differentials, especially when characteristics are not unchanging.

**Simplicity of analysis**

The initial analysis of mortality data collected from a multi-round survey is relatively straightforward, with conventional mortality measures being computed.

### Table XI.3. Comparison of Levels of Childhood Mortality in Terms of Probability of Dying from Birth to Age x, Estimated from Data Collected in Multi-round and Retrospective Surveys in Honduras, Panama and Peru

<table>
<thead>
<tr>
<th>Age</th>
<th>Probability of dying, q(x)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Honduras</td>
</tr>
<tr>
<td></td>
<td>Multi-round survey</td>
</tr>
<tr>
<td>2</td>
<td>0.148</td>
</tr>
<tr>
<td>3</td>
<td>0.167</td>
</tr>
<tr>
<td>5</td>
<td>0.182</td>
</tr>
</tbody>
</table>


### Table XI.4. Death Rates by Five Year Age Groups Derived from Information Collected in Multi-round and Retrospective Surveys, Honduras, Panama and Peru

<table>
<thead>
<tr>
<th>Age group</th>
<th>Honduras</th>
<th>Panama</th>
<th>Peru</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Multi-round survey</td>
<td>Retrospective survey</td>
<td>Multi-round survey</td>
</tr>
<tr>
<td>5-9</td>
<td>0.0048</td>
<td>0.0037</td>
<td>0.0010</td>
</tr>
<tr>
<td>10-14</td>
<td>0.0030</td>
<td>0.0027</td>
<td>0.0005</td>
</tr>
<tr>
<td>15-19</td>
<td>0.0024</td>
<td>0.0046</td>
<td>0.0011</td>
</tr>
<tr>
<td>20-24</td>
<td>0.0028</td>
<td>0.0063</td>
<td>0.0010</td>
</tr>
<tr>
<td>25-29</td>
<td>0.0056</td>
<td>0.0065</td>
<td>0.0017</td>
</tr>
<tr>
<td>30-34</td>
<td>0.0044</td>
<td>0.0068</td>
<td>0.0024</td>
</tr>
<tr>
<td>35-39</td>
<td>0.0064</td>
<td>0.0076</td>
<td>0.0014</td>
</tr>
<tr>
<td>40-44</td>
<td>0.0045</td>
<td>0.0091</td>
<td>0.0046</td>
</tr>
<tr>
<td>45-49</td>
<td>0.0085</td>
<td>0.0115</td>
<td>0.0055</td>
</tr>
<tr>
<td>50-54</td>
<td>0.0153</td>
<td>0.0154</td>
<td>0.0043</td>
</tr>
<tr>
<td>55-59</td>
<td>0.0165</td>
<td>0.0209</td>
<td>0.0082</td>
</tr>
<tr>
<td>60-64</td>
<td>0.0253</td>
<td>0.0208</td>
<td>0.0134</td>
</tr>
<tr>
<td>65-69</td>
<td>0.0263</td>
<td>0.0443</td>
<td>0.0188</td>
</tr>
<tr>
<td>70-74</td>
<td>0.0446</td>
<td>0.0702</td>
<td>0.0219</td>
</tr>
<tr>
<td>75+</td>
<td>57.19</td>
<td>54.20</td>
<td>63.95</td>
</tr>
</tbody>
</table>

Difference: 2.99

Source: See table XI.3.
Delay to availability of results produces no firm results until its final round, because survey, on the other hand, can produce final results are only recorded between rounds; and it generally adequate precision. A United Nations manual on conditions of a country.

Obtaining the results. The single-round retrospective delay between the beginning of the field-work and of sample size problems. Thus, there is a substantial within a few months of the field-work and is thus very skilled manpower and administrative continuity.

Disadvantages of multi-round surveys

Complexity of operations

The major disadvantage of the multi-round approach is that the field-work is relatively complex and places heavy demands on financial and skilled manpower resources in countries where such resources are typically scarce. The enumeration units have to be clearly identified and mapped because the approach entails follow-up visits to the same units. The questionnaire is generally more complex and often there may be problems of transcription of the questionnaire for the follow-up visits. The survey operation is spread over an extended period of time and may be disrupted by political or administrative changes. The multiple visits to the same units may result in respondent and interviewer fatigue, adversely affecting the quality of data. Thus, the multi-round survey requires a highly trained and motivated field staff and a close supervision of all aspects of the field-work, a costly undertaking for many developing countries. The single-round retrospective survey, on the other hand, requires only a short period of field-work, does not require the reidentification of households and entails less demand for skilled manpower and administrative continuity.

Delay to availability of results

In its pure form, the multi-round survey produces no useful information until its second round, since events are only recorded between rounds; and it generally produces no firm results until its final round, because of sample size problems. Thus, there is a substantial delay between the beginning of the field-work and obtaining the results. The single-round retrospective survey, on the other hand, can produce final results within a few months of the field-work and is thus very convenient for a quick assessment of the mortality conditions of a country.

Larger sample size

Since death is a rate event, multi-round surveys need a large sample if rates are to be measured with adequate precision. A United Nations manual on sample surveys in Africa recommends a minimum sample size of 100,000 persons or 20,000 households for a demographic household survey. A multi-round survey should thus aim for 100,000 person-years of exposure, although the sample size can be reduced by extending the period of observation. Even this large sample may not be sufficient for a detailed study of differentials of adult mortality.

A systematic study of sampling errors for estimates from indirect techniques does not exist. However, most indirect measures are based on measures of cumulated lifetime experience, thus greatly increasing the number of events included in the analysis; for example, in orphanhood techniques, respondents of a given age report information on survivorship of their parents over a period of x years. Thus, effective sample size is much greater than the number of persons surveyed, generally resulting in greater statistical precision.

Higher cost

In terms of cash outlays, a multi-round survey is more expensive than a single-round retrospective survey of identical sample size. For example, the data-collection cost of a multi-round survey with R rounds will be roughly R times the cost of a single-round survey. The follow-up rounds may cost less than the initial baseline survey but this saving will be more or less compensated for by the additional costs that would be involved for clear identification of the units required for follow-up visits. Thus, even if costs for other items, such as data processing and analysis, do not differ between the two types of surveys, a multi-round survey will cost more than a single-round retrospective survey, particularly when the sample size benefits of the latter survey are considered.

SUMMARY AND CONCLUSIONS

This chapter has described two survey approaches to mortality measurement in developing countries, one a generally retrospective approach incorporating mortality studies in multi-purpose household survey programmes, and the other an essentially prospective approach, generally single-mindedly demographic in purpose, using multi-round surveys.

The utility of including a mortality element in multi-purpose survey programmes appears to be non-controversial. The mortality risks to which population subgroups are exposed are important socio-economic characteristics of the groups, and other elements in the survey programme can provide useful background information for the study of mortality. What remains controversial is the way in which mortality information should be collected. The single-round retrospective survey collecting only information on deaths in the preceding 12 or 24 months has rarely given satisfactory results; and even though recent analytical developments offer the possibility of assessing and adjusting such information on post-childhood deaths
as long as coverage reaches some 60 per cent, the approach should not be used on its own, since it is likely to be particularly defective for childhood deaths. Happily, two retrospective approaches seem capable of providing information about levels, trends and to some extent differentials in child mortality, namely, the maternity history (direct) and the survival of children ever born (indirect). The latter approach is cheaper, but the former provides much more information about differentials and trends, so the choice for a particular survey must depend upon its objectives.

The multi-round survey is expensive, cannot produce quick results and demands an institutional commitment and continuity hard to achieve in many areas. On the other hand, it can produce mortality information of adequate coverage and with great potential for the analysis of differentials, given the longitudinal nature of such studies.

Advances in survey methodology have undoubtedly contributed to the improvement of mortality statistics in developing countries. There is no one method that can be regarded as a panacea, however; and the methodology for a particular survey must depend upon its objectives, while recognizing the efficiency of pick-a-backing mortality studies on surveys of other population characteristics. Further experimentation is also required in important areas where the current methodologies are weak, such as the study of adult mortality differentials (difficult because the events are rare) and the collection of usable cause of death data.

This chapter has briefly described the multi-round survey approach to data collection and has discussed some of its strengths and its weaknesses. Several other approaches to the collection of mortality data are also available, some of which have been examined by the other participants of this Working Group. No single approach to data collection can be identified as being most suited for all situations. Obviously, a number of factors—including local statistical infrastructure and the availability of resources, in terms of money, and competent and experienced staff—will determine the suitability of a particular survey approach.

Multi-round surveys, when well organized and properly executed, can provide a wealth of data for mortality analysis. The multi-round survey has distinct advantages over the single-round retrospective survey in terms of obtaining reliable data for studying levels and differentials of morality. However, multi-round surveys are complex and require substantial input of money, skilled manpower and a high level of administrative organization. Needless to say, these are among the scarcest resources in many developing countries, which adds to the difficulty of mounting such surveys.

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**Notes**


7. Ibid.


15. In some multi-round surveys, interviews are carried out without any recourse to information collected in the previous round. At a later stage, data from the rounds are reconciled by matching information from different rounds. Such matching is time-consuming and problematical, and there appears to be little to recommend the "blind" procedure.


17. P. Cantrelle, op. cit.

18. For a detailed description of the survey methodology, see K. Hill and others, Encuesta Demográfica Nacional de Honduras: methodology results; indirect estimates, CELADE Series A, No. 156 (Santiago, Chile, Director General de Estadistica y Censos de Honduras and Centro Latinoamericano de Demografía, 1977).


21. P. Cantrelle, op. cit.

22. Dominique Tabutin, "Avantages comparés des enquêtes a passages répétés et passage unique pour la mesure de la mortalité dans


C. Arretx, op. cit.

Manual on Demographic Sample Surveys in Africa.