Part Four

COLLECTION OF MORTALITY DATA THROUGH CIVIL REGISTRATION SYSTEMS
VI. ADVANTAGES AND DISADVANTAGES OF CONTINUOUS REGISTRATION SYSTEMS FOR NATIONAL, SUBNATIONAL AND DIFFERENTIAL MORTALITY ANALYSIS*

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For many years, there was only one recognized way of producing vital statistics, namely, from birth and death records filed for legal purposes. This limited view was held despite the fact that the statistics derived from these documents in the developing countries were generally so incomplete as to be of little or no value.

Shortly after the Second World War, there arose in developing countries a demand for birth and death statistics for planning, administration and evaluation of health programmes; measurement of population growth for family planning programmes; and for national social and economic development planning purposes. Because the then current civil registration systems were incapable of providing the needed statistics, other ways and means were sought to estimate demographic parameters, leading to the application of retrospective survey methodology and the development of indirect methods of estimating fertility and mortality rates. The availability of these methods for estimating birth and death statistics naturally raises questions about the value of civil registration data for statistical purposes.

It is the purpose of this chapter to discuss the advantages and disadvantages of the current continuous death registration system as a source of data for differential mortality analysis and other mortality studies. To provide a proper perspective to the problem, a historical background relating to the development of mortality statistics is first given; it is followed by brief discussions of the death registration process and the uses of both individual records and statistics derived from the death certificate. Then the advantages and disadvantages of the continuous registration system for the production of national mortality statistics are presented.

A. HISTORICAL DEVELOPMENT

The forerunner of the current civil registers were ecclesiastical registers, in which weddings, baptisms and burials occurring in the parish were recorded. The earliest known compilation of bills of mortality was issued in 1532. These bills were weekly lists of burials; and they included the name of the deceased, the parish in which the burial took place and the cause of death, with particular reference to the plague. The cause of death was determined by the searcher after she had viewed the body. In the more difficult cases, the searcher consulted a physician. The searchers made their reports to the parish clerk, who prepared an account of all the burials every Tuesday night. On Wednesday, the general account was made up and printed. On Thursday, the bills were distributed to subscribers who paid 4 shillings for an annual subscription.

More than a century later, John Graunt conceived of the idea of utilizing the London bills of mortality for analytical studies, which were published in 1662. Despite medical progress, the diagnostic quality of the bills did not improve. Also, interest in the old bills waned. Clerks of many parishes failed to report or reported only irregularly. Even when complete, the bills gave no information about the population of towns and counties.

In 1837, the Registration Act was passed in England, with provisions for the inquiry into the causes of all deaths occurring in the population. In 1839, William Farr was appointed compiler of abstracts in the Registrar General’s Office, and he, probably more than anyone else, developed and analysed mortality statistics to delineate the sanitary and health problems of the day. Farr reported on life and death in England, on the possibilities and difficulties of extending human life, on the effects of sanitation on mortality, on mortality and the economic situation, mortality and the water-supply, urban and rural mortality (pointing out healthy and unhealthy districts), mortality at different ages by sex, mortality of illegitimate infants, and on other topics.

Traditionally, official mortality statistics have been derived from the death record filed in compliance with the requirements of the civil registration laws to prevent the illegal disposition or transportation of a dead body. In other words, death statistics are, by and large, by-products of a legal process. An exception to this situation has been the attempt to collect national death statistics in the United States of America by the enumeration method in conjunction with the decennial
population censuses from 1880 to 1900. It should be noted that death registration laws were already in effect in all the states at that time. However, it was felt that the registration coverage was not sufficiently complete for the compilation of national mortality statistics. Therefore, census interviewers were used to collect, on a retrospective basis, information on deaths that occurred in the household over a period of a year. Unfortunately, the census approach yielded fewer deaths than were abstracted through the death registration process in the states with reasonably good registration systems. The census enumeration procedure was therefore abandoned after the 1900 census, and the United States Death Registration Area was formed specifically to provide national mortality statistics.

It was not until after the Second World War that developing countries felt an acute need for adequate mortality statistics. Death registration data were then found wanting, with little possibility of rapid development of the registration system. Other methods were therefore sought to produce mortality data. The resulting research efforts led in two general directions, one being direct methods of estimation utilizing field surveys or a combination of registration and surveys, and the other techniques of estimation utilizing indirect indicators of mortality.

B. SOME ASPECTS OF THE DEATH REGISTRATION PROCESS

The legal base for death registration is some type of civil law on registration which establishes the compulsory nature of and the requirements for registration of deaths. The law designates the person responsible for registration and the place of registration, and prescribes the time allowed for the registration of the event, the fees required, if any, and the penalty for failure to register.

In most countries, the responsibility for the registration of a death rests with a relative or the head of the family or of the household. Data concerning the deceased are obtained from the informant prior to or at the time of the registration. These data usually include the time and place of death, personal characteristics of the deceased; and characteristics of the parents, the attendants at the death, the informant, the witnesses and the registrar; and the method of interment. Another important datum is provided by the medical attendant, if any, or by the medico-legal authority, on the cause of death.

In most countries, the legal record, usually in the form of books of actas, is brief. For statistical purposes, additional information is collected from the informant at the time of registration. The legal record is placed in a permanent repository, while the statistical transcript is transmitted to the government agency responsible for vital statistics.

In other countries, the legal and the statistical forms are combined into a single death certificate. The original death certificates are bound into books and filed permanently for legal purposes. Provisions safeguarding the confidentiality of information in these documents vary, depending upon the country. However, certified copies of the record are generally issued to individuals upon request.

C. USES OF DEATH RECORDS AND STATISTICS

The death record provides a proof of death for the disposition of the remains, for the settlement of life insurance and social insurance claims and for the adjudication of property ownership and inheritance claims. It also provides legal evidence of the right of a surviving spouse to remarry. The death record has also been used for clearing various types of files, such as social security files, disease case registers, electoral lists, bank accounts and missing persons files.

The death record has been useful in health programmes in identifying cases of certain infectious diseases. In some countries, death certificates of those dying from specified infective and parasitic diseases are routinely referred to the programme unit concerned with their control. Death certificates are also used for investigations into causes of infant and maternal deaths, and as a source of data for various types of epidemiological studies.

Official mortality statistics derived from death records are used extensively for demographic studies and in public health programmes. These studies may deal with mortality differentials by age, sex, occupation, socio-economic characteristics, etc.; or they may deal with the demographic characteristics of the deceased to eliminate the effects of age, sex and ethnicity for studies of mortality-risk factors. For public health purposes, the statistics on causes of death figure prominently. Death statistics have long been used as indicators of health, as measures of the magnitude of health problems and for the evaluation of health programmes, despite certain limitations of mortality data for this purpose. The availability of mortality statistics on a routine basis for the various political subdivisions of a country is of central importance to the utilization of death statistics for these manifold purposes.

An important use of mortality statistics is in the study of determinants of disease. For example, Pool and Chan observed the differential decline in the tuberculosis mortality rate for the Maoris and attributed the decline to the disadvantageous position of the Maoris in New Zealand society until the 1940s. Poverty, poor diet and failure to seek medical treatment were cited as causes of the high mortality rate for the Maoris; and the decline was attributed to improved medical technology in the post-war period. Mass X-ray campaigns and the use of antibiotics were said to have contributed to the accelerated rate of decline.

Another example may be cited as a result of post-war experiences in a number of countries where
national malaria control programmes were carried out and where significant reductions in the general mortality rate occurred. Data for six countries where such programmes had been in operation for at least five years and for which adequate data were available showed that in all the countries a rapid decline in the crude death rate and in the infant mortality rate invariably followed the countrywide application of dichlorodiphenyltrichloroethane (DDT). The decline in mortality was most striking in Sri Lanka, where the crude death rate dropped from 20.3 to 14.3 per 1,000 population in a single year, 1946/47, after the beginning of the malaria eradication programme. Although there appeared to be little question about the dramatic decline in mortality in Sri Lanka, there was not general agreement as to the cause of the reduction. Meggama attributed part of the decrease to malaria control and the rest to the establishment and provision of health and medical services. Fredericksen found similar mortality reductions in nonmalarious areas not protected by pesticides, and concluded that the decline in mortality was associated with economic development and the consequent rise in the level of living. Newman, on the other hand, took the position that it was not possible to disentangle the effects of the various factors that were operating at that period.

There are many other examples of epidemiological studies based on official mortality statistics. A study was made of cancer mortality in countries where certain industries were located; and excessively high death rates were found for bladder, lung, liver and certain other cancer sites in 139 countries where the chemical industry was centred. In another study, lung cancer mortality in counties in the United States of America where paper, chemical, petroleum and transportation industries were located was compared with that for adjacent counties where there were no such industries. Excessively high lung cancer death rates among males were observed in the counties where these industries were located, which may account for part of the rapid rise of lung cancer reported for the southern coastal counties in the United States. It was suggested that these particular industrial operations should be studied to ascertain the aetiology of lung cancer.

In the studies described thus far, the observed changes and differentials resulted in inferences leading to hypotheses about disease causation. There are also studies that begin with a hypothesis about a disease and accumulate data to test it. For example, in an effort to ascertain whether naturally occurring asbestos resulted in increased risk of cancer mortality, the various counties in the United States with asbestos deposits were identified. Each of these counties was then matched with two others in the vicinity that did not have known asbestos deposits. The comparison of cancer mortality rates for the two sets of counties gave no evidence that naturally occurring asbestos is a hazard to the general population.

All the studies that have been cited have one characteristic in common: the investigations are based on traditional or official mortality statistics. As such, the data represent the result of various forces of mortality impinging on the general population as well as the special risk factors. Therefore, it is not possible to determine the effect of any particular factor. However, descriptive epidemiology is valuable in suggesting hypotheses or leads for further investigation.

For the testing of epidemiological hypotheses, it is necessary to include in the study measures of specific risk factors. This is the basis of the case control or the retrospective epidemiological study and the prospective epidemiological study.

In case-control mortality studies, the death certificate is employed to identify cases of a specific disease for retrospective epidemiological study. A follow-back is made to a data source for retrospective information on the specific aetiological factor under study, and a comparison is made between the exposed and the control group to establish whether the factor is associated with one group and not with the other. In this manner, retrospective studies have been made of leukaemia and childhood exposure to X-rays, using the death certificate as the starting-point for the study. More recently, a case-control study was undertaken to identify the factors associated with the unusually high lung cancer death rate among the male residents of coastal Georgia. It was found that the increased risk was associated with employment in the shipyards during the Second World War. It was also found that cigarette smoking produced a synergistic effect. The findings suggested that exposure to asbestos and possibly to other materials during wartime employment accounted for part of the excess mortality from lung cancer in the south-eastern coastal areas of the United States of America.

Prospective studies begin with a hypothesis about a disease and data are collected for two defined populations, the "experimental" group and the comparison or "control" group. These two population cohorts are then followed until an event (i.e., death in the case of mortality studies) occurs. The use of matched controls, that is, two populations similar in all controlled characteristics except for the factor being tested, provides a stronger base than retrospective studies for showing the effects of risk factors on mortality from a particular disease. Follow-up studies on mortality from lung cancer among asbestos workers found lung cancer to be a specific environmental hazard of certain asbestos workers. A number of studies on smoking and lung cancer were conducted on a prospective basis, as is the still ongoing investigation of the delayed effects of ionizing radiation from the atomic bomb explosions at Hiroshima and Nagasaki. None of these studies would be possible without access to death records.

D. ADVANTAGES OF A CONTINUOUS REGISTRATION SYSTEM

A major advantage of a continuous registration system is the fact that once the system has been
established on an adequate basis there will be a continuous flow of death records from the local registration units to a permanent repository to serve legal purposes. This flow makes possible the transcription or transmission of copies of death records to a central agency for data processing and statistical compilations.

Registration data deal with the entire universe of events, and many of the needed statistics are readily available annually. This availability is an invaluable feature of registration statistics in providing detailed all-purpose reference tables for various segments of the population that can be tapped for specific studies. It makes possible the conduct of analytical studies on numerous topics, either on a cross-sectional basis or over a period of time. The availability of trend data is a very important advantage of a continuous registration system.

The general availability of mortality data by various personal characteristics of the decedent, such as age, sex and ethnicity, for the country as a whole and for the different geographical divisions down to the smallest political subdivision, makes possible the utilization of mortality data for many purposes, as illustrated previously. Shapiro points out that for local health planning purposes the availability of data for the past and present—and the likely availability for the foreseeable future—for geographically disaggregated levels down to subdivisions of a city makes up for many of the defects that may be present in mortality statistics. The question posed to the user of mortality data for planning purposes is how to maximize the utility of this resource, although conceptual and technical issues still remain.

The compiled data will, at least for developed countries with well-established systems, generally be comparable from place to place within a country, and from one time period to another. Such internal consistency is one of the remarkable characteristics of registration data. Also, because the definitions and classifications used in vital statistics are usually international in nature, there is a considerable amount of comparability in the data for the various countries.

The availability of statistics on causes of death and the possibility of obtaining other medical information through the follow-back procedure make registration statistics virtually indispensable for public health and medical programmes. Even developing countries may be able to generate useful cause-of-death data through a system of lay reporting. This is not as far-fetched as it may sound because in developing countries a large proportion of all deaths occur in the childhood years, and the common diseases of childhood are sometimes recognized by the mother or present characteristic symptoms that the mother can describe. These cases, plus accidental causes, do not require medical training for an adequate description of the cause of death.

It is difficult to ascertain the cost of registration statistics because a large part of the collection cost is borne by the legal registration process. However, it is probably fair to say that the unit cost of registration data from an established system is considerably less than that of data obtained from interview surveys.

The continuous flow of data on a permanent basis obviates the necessity of mounting periodic surveys with attendant high costs and possible changes in survey personnel, objectives, procedures and definitions. In addition to the statistics, the death registration system provides death records which make possible the identification of deaths of persons for use in communicable disease control and in other public health programmes, such as those covering maternal and child health. It also makes available death records for retrospective and prospective epidemiological studies. The General Register Office of England and Wales gives invaluable assistance in notifying epidemiologists of deaths occurring to members of a study cohort. In the United States, the National Center for Health Statistics is now establishing a national death index to provide similar services to those engaged in scientific investigations. These services make it possible to conduct epidemiological studies that would otherwise be impossible to carry out, except at exorbitant cost.

E. DISADVANTAGES OF A CONTINUOUS REGISTRATION SYSTEM

There are a number of possible disadvantages to a continuous registration system. In developing countries, the most serious of these disadvantages is incompleteness of coverage. In most developing countries, access to the local registration offices is difficult in the rural areas. In many countries, special problems are posed by nomadic and indigenous populations. To complicate matters still further, there is very little incentive to register vital events even if there is awareness of the need to register deaths. The absence of the need for death certificates and the lack of awareness on the part of the public of the necessity to register deaths have been cited by civil registration authorities as the greatest obstacles to registration improvement. Incomplete death registration, especially outside the major cities, is a primary impediment to the use of the data for mortality analysis. Another major factor is the quality of the local registration personnel in developing countries. Sometimes they are scarcely literate; almost always they are inadequately paid and untrained. As a result, the completeness and quality of the collected data are adversely affected. In addition, dealing with an illiterate population presents special problems in eliciting seemingly simple information, such as the age of the deceased; and the poor quality of the information concerning the characteristics of the deceased represents a further major complication in the use of the data for mortality studies.

The monolithic nature of the registration system, dealing with the total population of a country, is a definite disadvantage in any effort to make changes or otherwise to improve the system. Changes come slow-
ly. The United States of America, an industrialized country with a literate population, took over 30 years to qualify all the states for the national death registration area.

In view of these problems, virtually all developing countries find themselves without adequate death statistics in their period of greatest need for data for social and economic planning and for health planning and administration of health programmes. Some countries are adopting other means of collecting data to fill the gap, while others are still struggling along with the registration of vital events.

F. DISCUSSION

The continuous registration system offers data possibilities that cannot be achieved in any other way. Single-round and even multi-round surveys have not, in general, been successful in obtaining adequate counts of deaths. A discussion of the limitations of single-round surveys points out that mortality data for Algeria, the Niger, Uganda and the United Republic of Tanzania were never published because of the obvious defects in the information on deaths obtained from single-visit retrospective surveys. The basic problem is that it is extremely difficult to identify retrospectively persons who are no longer present. For example, deaths occurring in single-person households are not identifiable in retrospective surveys. Dissolution of the family or household may also occur upon the death of the head of the family or household, or of one of the spouses. In addition, there may be taboos or general reluctance about revealing the facts of death, especially to strangers. In all countries, it is difficult to obtain information on deaths of infants who die soon after birth. Other non-sampling problems also are encountered in social surveys, such as recall problems, erroneous dating of events and misreporting of age.

The indirect estimation methods are based on characteristics, mainly concerning the survival or otherwise of close relatives, of the living population obtained in a census or a survey. These data, such as proportions of surviving children of mothers at various ages or of persons at various ages with surviving mother, are transformed into mortality estimates for childhood and adulthood. The results of indirect estimation techniques are subject to errors from the above-mentioned non-sampling problems arising in census and social survey interviews. The validity of the estimates also depends upon the assumptions underlying the analytical development of the methods. In some cases, it is clear that the conditions were not met; while in others, it is difficult to judge the validity of the assumptions, although, in general, it has been found that typical deviations from the assumptions have only a modest impact on the estimates obtained.

For countries with no data at all or very inadequate mortality statistics, even the limited mortality measures provided by the combination of surveys and indirect estimation techniques are valuable for certain purposes. Also, estimates of the completeness of death reporting provided by indirect methods that have been developed are useful approximations for assessment purposes. On the other hand, it seems apparent that the limitations of the survey and indirect methods of estimation are such that they cannot ever provide the type and amount of statistical data that are obtainable from death registration data. The advantages for analytical purposes of the data provided by a continuous registration process are so substantial that other methods cannot be regarded as adequate long-term substitutes for death registration data, although in the short and medium terms such other methods may represent the only feasible source of mortality data for some countries.

If there are no satisfactory alternatives to the continuous registration process, what are the possibilities of developing registration data within a reasonable time frame? This question is not easy to answer because there have not been outstanding developments in civil registration parallel to those in survey methodology and indirect estimation methods over the past 15-20 years. Perhaps this is because changes and improvements cannot be obtained quickly in a continuous registration system. To try to establish and improve a national registration system is simply too large a task for the usual staff and budget. Also, some problems are amenable to solution and others are not, depending upon the state of social and economic development of the country. Problems of civil registration have been classified by Linder as follows:

(a) Relatively intractable problems: problems that can be solved within the framework of long-range social and economic development, but can scarcely be solved by short-range actions taken within the civil registration system itself;

(b) Problems that are soluble but require national or outside technical assistance funds;

(c) Soluble problems: problems that can be solved within the national domain with relatively small financial requirements.

Instead of tackling all the problems at once, Linder suggests that certain tasks should be deferred. One approach to improving the data is the adoption of registration areas. For example, the death registration area was established in the United States in 1900, beginning with 10 states (out of 48) and the District of Columbia. As the states qualified by adopting a standard death certificate form and by demonstrating that 90 per cent or more of deaths were registered, they were included in the registration area. By 1933, the registration area covered all the population in the country.

For developing countries, a beginning might be made with the capital city and major efforts devoted to the establishment of a satisfactory death registration system. After the registration system in the capital city is deemed operational, efforts should then be transferred, one by one, to the other major cities, leaving the difficult and sometimes sparsely settled rural areas
to the last. A problem with this approach is that until coverage has become fairly extensive, the data will be limited to urban experience.

Another possible approach is that suggested by Hauser, who proposed that a national sample vital statistics system be established comprising a sample of complete primary registration units or combinations thereof. This system would make possible the focusing of energy and funds on a limited number of primary registration units instead of dealing with all the units in the country at once. Data from a representative sample are certainly more desirable than data limited to urban areas, but it would be more complicated administratively to work on a number of non-contiguous primary registration units simultaneously. In addition, a review of the experiences of a number of countries undertaking sample registration projects observes that most of the recent sample registration schemes have departed from the original concept and have established a sample system independent of the existing legal system. This is an unfortunate departure in that it defeats the original purpose of obtaining continuous improvement in the registration system.

As a strategy to improve civil registration in a country, it would appear to be sensible to concentrate activities on problems most amenable to solution in geographical areas with the greatest population where government services are more likely to be available to the public. Because of the nature of registration problems, a fully operational system cannot be expected overnight. A good deal of patience and persistence is needed.

The development of a death registration system requires a satisfactory legal base and an administrative organization of local offices. It also requires the understanding and co-operation of the public, of medical attendants and others in the healing arts, of hospitals and clinics, of undertakers and of those in charge of burial places and crematoria. An active and innovative programme is needed—not a passive waiting for death certificates to be filed. It is a long road to success but the reward at the end is worth while in terms of an invaluable data source to serve the health and demographic needs of the country.

**SUMMARY**

Over the years, mortality statistics derived from the civil registration process have been used extensively for the delineation of public health problems and for various analytical studies for health and demographic purposes. In addition, the individual death record has been useful in identifying infective foci of disease as well as in the epidemiological studies of chronic diseases. Examples of various analytical uses of mortality statistics are also given. The most important feature of registration statistics is that they can provide detailed all-purpose reference tables annually, for various segments of the population, which can be tapped for specific studies. For public health purposes, a most valuable datum relates to causes of death.

The continuous registration system offers data possibilities that cannot be attained in any other way. On the other hand, death statistics for developing countries are frequently of limited usefulness because of incompleteness of the registered events. The improvement of completeness and quality of official death statistics in these countries is a difficult task requiring time and effort. Some suggestions have been made on steps that might be taken to develop and improve national death registration systems.

**NOTES**

3. For a full description of the civil registration procedure, see *Handbook of Vital Statistics Methods* (United Nations publication, Sales No. 55.XVII.1).


21See, for example, Samuel H. Preston and others, "Estimating the completeness of reporting of adult deaths in populations that are approximately stable", *Population Index*, vol. 46, No. 2 (Summer 1980), pp. 179-202.

