ORIGINAL ARTICLE

Linking Death Reports from the Malaysian Family Life Survey-2 with Birth and Death Certificates

K Shamsuddin, Dr. PH*, E Lieberman, Dr. PH**, *Department of Community Health, Faculty of Medicine, Universiti Kebangsaan Malaysia, Jalan Tenteram, Bandar Tun Razak, Cheras, 56000, Kuala Lumpur, **Department of Obstetrics and Gynecology, Brigham and Women's Hospital and Harvard Medical School, Boston, MA 02115

Summary

The Malaysian Family Life Survey-2 (MFLS-2) was a population-based survey conducted in Peninsular Malaysia in 1988-89. Through detailed birth histories, it attempted to collect information on all pregnancies and their outcomes from ever-married women, as well as socioeconomic and health services-utilization data that might have affected mortality. The survey did not, however, collect information on the causes of infant death.

The two objectives of this study were to assess the feasibility of linking all reported deaths among live births of women interviewed in the MFLS-2 to the birth and death certificates kept by the National Registration Department, and to determine the causes of death from the successfully matched death certificates. This information could be used in the development of specific health programs to decrease infant and child mortality. In this study, the success rates for linking survey data to birth and death certificates were 34.5% and 31.8% respectively. Methodological problems faced during the study are discussed, as are the strengths and limitations of record linking as a means of increasing the utility of birth histories for studying the causes of death. Ways to improve linkage rates of survey data with the national birth and death registration are also suggested.

Key Words: Data linkage, Birth registration, Death registration, Research methodology

Introduction

Reproductive histories obtained through population-based surveys of reproductive-age women have been widely used in developing countries for studying the trends and determinants of infant and childhood mortality [1-5]. These surveys also generally collect information on household socioeconomic characteristics and health services-utilization patterns which may affect mortality levels and trends. Although complete birth histories may be collected, other health-related information associated with child survival is often limited to the last-born child, or to children born within five years of the survey.

The Malaysian Family Life Survey-2 (MFLS-2) differs from most surveys of this type in that it did attempt to collect complete birth histories, which is some cases spanned a period of more than three decades. It also collected detailed biological (including feeding-pattern), socioeconomic, and health services-utilization information that may be associated with each reported

pregnancy, regardless of how long ago it may have occurred [6,7]. However, it did not elicit information on the causes of death for the children reported dead by their mothers, although this information could be useful in formulating recommendations for specific intervention programs aimed at lowering mortality.

The two objectives of this study were to assess the feasibility of linking all reported deaths among live births of women interviewed in the MFLS-2 to the birth and death certificates kept by the National Registration Department, and to determine the causes of death from the successfully matched death certificates. This information could be useful for future research and in the development of specific health programs to decrease infant and child mortality.

Materials and Methods

This study was based on all reported cases of death obtained through birth histories from the "New" sample of women interviewed in the Malaysian Family Life Survey-2. [1] The MFLS-2 was conducted by the RAND Corporation in collaboration with the Malaysian National Population and Family Development Board (NPFDB), and was fielded between August 1988 and January 1989.

Two government agencies, the National Population and Family Development Board (NPFDB) and the National Registration Department, were approached for permission to carry out this study. Permission to go through the original household files to abstract confidential information on respondents interviewed in the survey was obtained from the NPFDB. Access to, and copies of, birth and death certificates kept at their central office was granted by the National Registration Department.

The questionnaire used for identifying all household members in the survey was MF21 (Household Roster). Questionnaire MF22 (Female Life History), which included a migration history and a reproductive history, was used to collect information on the deceased child's name, date of birth, the mother's place of residence at the time of the birth (district and state), and the birth site, recorded as either "at home" or "in hospital". It should be noted, however, that the survey did not collect information on the exact geographical location of the child's place of birth, and this was a problem since it would decrease the probability of correctly identifying the place of registration.

If the child was born in a hospital, the type, but not the name, of the hospital was also recorded. These included district or general hospitals, for those born in government hospitals, as well as private medical facilities. The MF22 was also used to collect such information as the mother's name and identity card number, and data on socioeconomic status, migration, and health services-utilization patterns relating to each pregnancy.

Questionnaire MF23 (Male Life History) was used to interview the husbands of the women, while MF24 (Senior Life History) was used for anyone who was 50 years old or older at the time of the survey. These questionnaires were used to obtain the father's name and identity card number.

However, the names of the children reported dead by their mothers in the MFLS-2 survey were not always given or recorded in full, or children may have died before being named. Furthermore, other necessary information for a birth or death certificate search (such as the exact place of birth) was also not always recorded, and this meant that a number of strategies had to be employed to conduct a search for these vital records (if any existed).

1 Four samples of the household population of Peninsular Malaysia were interviewed in the MFLS-2 : Panel, Children, New, and Seniors. The Panel sample was women who in 1976 were the primary respondents to the MFLS-1 survey. The Children sample consisted of children eighteen years old or older of the women interviewed as primary respondents for MFLS-1. The New sample consisted of women eighteen to forty-nine years of age, regardless of marital status, and ever-married women under the age of eighteen. In this paper we matched deaths among live births reported by the ever-married women in the New sample.

The initial data for a birth certificate search were abstracted from the original MFLS-2 questionnaires kept at the NPFDB and entered onto the search request forms issued by the National Registration Department. This information included, when available, the child's full name, sex, and date of birth (if exact birthday was not known, the year of birth was required).

The data required for a death certificate search included the child's full name and sex. Other information that could have been used in a search, such as the date of the death, was not collected in the survey. The child's age at death was abstracted (when possible) from the mother's reproductive history (MF22). As the survey did not collect date-of-birth information, the range of possible dates was calculated according to the difference between the child's reported date of birth and the age at death. In cases where data were missing, relevant information on other siblings was used for data imputation.

Determining the father's given name was often crucial for tracing the birth and death certificates of Malay and Indian children whose given names only had been recorded, as children from these ethnic groups take their father's given name for their surname (Of the three main ethnic groups in Malaysia, only the Chinese have what could formally be considered family names).

When the father's name was not directly recorded in the questionnaires, we looked to see whether a name for the father of other children in the household had been recorded. However, problems arose in obtaining the father's name in this manner when the mother was widowed or divorced, or when the deceased child was the result of a previous marriage. Failure to obtain the father's name in this fashion may also have been due in some cases to there being no surviving siblings in the household, or when only their given names were recorded.

After being completed with as much of the necessary information as possible, the search forms were then turned over to National Registration Department staff members, who searched for the birth and death certificates of each case.

If a case's name was known, the search began with the Alpha Index of Births, which is prepared annually for births in a given year by the Department of Statistics. It consists of a list of the names of infants in alphabetical order by first name for those of Malay and Indian ethnicity, while Chinese names are listed alphabetically by family name. The index also contains other key information, such as the registration sub-area, the birth certificate number, sex, ethnicity, and date of birth. When the name of a case was successfully searched, the birth registration numbers were noted, and the birth certificate was traced and matched to the information on the request form.

Once a birth certificate was successfully matched, it was inspected to see whether it contained any death information. This could include the child's date of death, the death certificate number, and the place where the death was registered. Based on this information, if any, a search for the death certificate could then proceed.

If, for one reason or another, a case could not be identified through the Alpha Index of Births, the Alpha Index of Deaths was searched. This index is similar to the birth index. It lists all deaths in a given year in alphabetical order (either by given name or family name, depending on the case's ethnicity), together with the registration sub-area, death certificate number, sex, date of death, ethnicity, and age at death. If a search of this index was successful, the death certificate could then be located, based on the death certificate number listed in the index.

When the name of a child was missing from both indices for the year concerned, those for the preceding and following years were searched. If the date of birth was unknown, the range of the possible years of birth was calculated by scanning the MF22 for the birth years of other siblings, or for any other information that might narrow the search. If a case was not listed in either the birth or death index, or if the case was that of an unnamed child born in a hospital, the birth records from hospitals where the child might have been born were scanned.

Once a birth certificate was successfully located, the date and place of birth were abstracted. Similarly, the date and place of death, the cause of death, and the occupation of the informants reporting the cause of

death (in order to determine whether they were medically qualified) were abstracted from each death certificate. All the information was then added to the MFLS-2 data set.

Results

Abstracting Confidential Information from the Original MFLS-2 Household Files

There were a total of 262 deaths among 6190 live births reported by mothers in the MFLS-2, and 261 of the household files of these cases were successfully traced at the National Population and Family Development Board. The names of 177 cases were successfully obtained from the Female Life History Questionnaire (MF22). The names of the other 84 cases (32.2%) were missing, either because the child died before being named, or because the mother could not remember or refused to provide the name of the dead child.

The mother's name was available for all cases, and in 258 cases the mother's identity card number was also recorded in the household files. The information on fathers was less complete. We managed to obtain, either directly or indirectly, the father's name in 239 cases (91.5%), however, only 16 fathers (6.1%) had their identity card numbers identified from the household files.

Of the total of 261 cases whose household files were successfully traced, 33 (12.6%) had unknown dates of birth. Among the 228 cases with known dates of birth, 44.7% were for births occurring from 1955 to 1970 and 55.3% were for births occurring after 1970.

Tracing Birth and Death Certificates at the National Registration Department

Overall, the critical factors for successfully tracing vital certificates with the Alpha indices of births and deaths were the accuracy of the reporting and recording of the year of occurrence of the birth or death, the name of child or infant, and the place of occurrence.

Of the 261 cases of reported death whose household files we traced, 90 birth and 83 death certificates were located at the National Registration Department. This was a rate of 34.5% and 31.8% for birth and death certificate tracing, respectively. Only in 76 cases (29.1%) were both the birth and death certificates successfully traced (Table I).

Among the 84 cases with no reported name, the rate at which we could locate at least one vital certificate was 15.5% (13 cases). In 8 of these cases (9.5%), both the birth and death certificates were traced. In contrast to this, of the 177 cases with reported names, 82 (46.3%) had both their birth and death certificates successfully traced. A reported name, therefore, was a highly significant factor in the successful tracing of the birth and death certificates.

There were several other characteristics generally associated with the successful tracing of birth certificates (Table II). During the MFLS-2 survey, mothers were asked to show the birth documents of their children to the interviewer, and the rate of successful tracing is significantly higher among those who had their children's birth documents inspected during the survey, than among those who did not.

The highest rate of successful birth certificate tracing among the three main ethnic groups was achieved among the Malays (39.9%), followed by Indians

Table I

Relationship Between Successful Birth and Death Certificate Tracing

Birth certificates	Death certificates		
	No	Yes	Total
No	164 (62.8%)	7 (2.7%)	171
Yes	14 (5.4%)	76 (29.1%)	90
Total	178	83	261

Table II

Frequency and Percent Distribution of Characteristics Associated with Successful Birth and Death Certificate Linkage (n=261)

Characteristics	Frequency Distribution of characteristics in Population N	Birth Certificate Successful linking (n=90) f	Percent	Death Certificate Successful linking (n=83) f	Percent
Inspected documents during survey					
Yes	20	13	(65.0)	11	(55.0)
No	241	77	(31.7)	72	29.6)
Ethnicity					
Malays	168	67	(39.9)	63	(37.5)
Chinese	29	7	(24.1)	5	(17.2)
Indians	55	15	(27.3)	14	(25.4)
Others	9	1	(11.1)	1	(11.1)
Sex of deceased					
Male	155	50	(32.3)	46	(29.2)
Female	102	40	(39.2)	37	(36.3)
Unknown	4	0	(0.0)	0	(0.0)
Place of birth					
Govt. med. fac.	94	34	(36.2)	29	(30.8)
Private med. fac.	20	3	(15.0)	4	(20.0)
Home/others	147	53	(36.1)	50	(33.1)
Types of residence					
Rural	186	60	(32.3)	57	(30.6)
Non-rural	68	28	(41.2)	24	(35.3)
Others	7	2	(28.6)	2	(28.6)
State of birth					
Non-KKPT states	172	63	(36.6)	55	(32.0)
KKPT states	82	27	(32.9)	28	(34.1)
Foreign lands	7	0	(0.0)	0	(0.0)
Year of birth					
1956-1970	74	28	(37.8)	24	(32.4)
1971-1980	86	33	(38.4)	33	(38.4)
1981-1988	68	11	(32.4)	17	(25.0)
Unknown	33	7	(21.2)	9	(27.3)
Age at death					
0 to 1 week	100	23	(23.0)	26	(26.0)
>1 to 4 weeks	21	7	(33.3)	7	(33.3)
>4 weeks to 1 year	80	35	(43.7)	28	(35.0)
>1 to 5 years	39	17	(43.6)	16	(41.0)
More than 5 years	18	8	(44.4)	6	(33.3)
Unknown	3	0	(0.0)	0	(0.0)

(27.3%), and the Chinese (24.1%). Overall, female cases had a slightly higher rate of successful birth certificate tracing than males (Table II).

Birth certificate tracing rates for cases born either at home or in government medical facilities are similar, and are higher than for those born in private medical facilities. Birth certificate tracing rates are lower among cases born in rural areas and the less developed states of Kelantan, Kedah, Perlis, and Trengganu (the KKPT states), when compared to non-rural areas and the more developed states of Peninsular Malaysia. As expected, no foreign-born cases had their birth certificates traced.

Cases with known dates of birth had higher birth certificate tracing rates than those with unknown dates. However, among those with known birth dates, the tracing rate did not improve for more recent births (those occurring between 1981-88) when compared with those born in the earlier periods of 1956-1970 and 1971-1980.

The success rate of tracing birth certificates, however, did increase with the reported age at death. It was lowest (23.0%) among cases who died very early in life (within a week of birth), increased to 33.3% for those who died at the age of one to four weeks, and rose to 43.8% for those who died at an age of more than four weeks.

In general, the tracing of death certificates followed similar patterns, though there was a lower rate of success (Table II). The differences in the rates of tracing death certificates by place of residence, ethnicity, and sex were similar to those for birth certificates, however the inspection of birth documents during the survey only slightly improved the tracing rate of death certificates. There was also a slightly higher rate of tracing among home-delivered cases compared to those born in either government or private medical facilities, and among those born in the KKPT states (Kelantan, Kedah, Perlis and Trengganu) to those born in non-KKPT states. Again, similar to birth certificate tracing rates, we found a lower rate of death certificate tracing among very early deaths.

Causes of Death from Traced Death Certificates

Table III shows the reported causes of death found in the 83 death certificates traced in this study. The most common cause of death was fever, which was listed in 32.5% of the death certificates traced. This was followed by prematurity, which was listed as the cause of death in almost 17% of the traced certificates. *Sawan*, a

Table III

Causes of Death Reported in Traced Death Certificates (n=83)

Cause of Death	Frequency*
Fever	27
Prematurity	15
Sawan (including convulsion)	14
Acute gastroenteritis	6
Septicemia including shock	5
Asphyxia / aspiration and respiratory distress	5
Bronchopneumonia	4
Accident / medico-legal	3
Cough	2
Meningitis	2
Jaundice	2
Constipation	1
Brain cancer	1
Hemorrhagic disease	1
Thalassemia major	1
Pox	1
Unknown	3

**Total more than 83 because multiple causes of death were reported.*

broad and locally varying entity, best summarized by Griffith who described it as a condition which, ".... may mean convulsions, but is more likely to mean fever, fever with convulsions or some other unknown condition," [8] was also a commonly reported cause of death (14%).

Symptoms, rather than actual diseases, were the predominantly stated causes of death. This was to be expected as only 32 (38.5%) of the traced death certificates were certified by medical informants (Table IV). About a third of the non-medical informants were fathers of the deceased.

Discussion

Methodological Issues

This study demonstrates that our ability to link population-based survey data with birth and death certificates in Peninsular Malaysia is rather limited. This is probably even more true in other developing countries, as the organizational structure and the rate of coverage of the registration of vital events in Peninsular Malaysia in relatively better [10].

The birth and death reporting system in Malaysia has been highly decentralized, and this has been the case since at least independence in 1957. This decentralized system has encouraged and facilitated the reporting of births and deaths. Reporting can be done at the smallest administrative unit by the village headmen or policemen, who, in small villages and towns, serve as the registrars of vital events. This not only decreases the cost but greatly improves the registration of births and deaths. Furthermore, a copy of each birth and death certificate issued anywhere in the country is kept at the head office of the National Registration Department by the Registrar-General of Births and Deaths. These certificates are systematically indexed and kept in one place, which was a great logistical advantage to our linkage efforts. Unfortunately, searches had to be done manually, as the registration system only became computerized in April 1990 with the introduction of the National Population Registration System (SPPN) in Peninsular Malaysia.

Despite the study's relatively poor yield of successful tracing and matching (34.5% for birth certificates and 31.8% for death certificates), the fact that we were able to carry it out at all is in itself significant. The overall success rate for a study by Kwok et al., which was the first to link birth and death certificates in Malaysia, was 73%, but their study population was limited to the infants born in three Malaysian states in one year, 1984 [9]. For a number of reasons, our task was more difficult. We attempted to link deaths reported in a population survey to birth and death certificates, our study population was deaths from reported live births extending over a period of several decades (1956-1988) in an area that consists of eleven states, and the occurrence of death was not limited to infancy.

Table IV

Percentage Distribution of Reported Cause of Death by Type of Informant (n=83)

Type of Informant	Frequency	Percent
Medical informants (doctor)	32	38.5
Non-medical informants (father)	15	18.1
Non-medical informants (others)	36	43.4
Total	**83**	**100.0**

The accuracy of the year of birth or death, the name of the child and the place of occurrence are the critical factors for using the Alpha indices of births and deaths to trace vital certificates and we believe that the yield of successful tracing could have been significantly improved if it had been planned for prior to the implementation of the survey. Greater emphasis could then have been placed on getting accurate information on the names of deceased children, particularly in regards to their full names and the correct spelling of names. The misspelling of phonetically similar names was probably common during the field survey, and this made the task of matching much more difficult.

In this study, unnamed infants posed a special problem, especially in the use of the Alpha indices. Over 30% of the cases had no names, and this significantly decreased the yield of successful tracing. To facilitate the identification of unnamed children, the Alpha indices should use a consistent system of identifiers, such as "Baby of [Mother's Full Name]," when the birth or death of an unnamed child is registered.

If the child's name cannot be obtained, information on the exact locale of where the birth took place would help to identify the probable birth registration area, and these records could then be searched. However, the child's place of birth is presently based solely on information in the mother's migration history in the MFLS-2, and this information can be misleading. The migration history may indicate, for instance, that a mother was living in a certain area in the year she gave birth. The child may well have been born in that area, but that does not necessarily mean that the event was registered there. Furthermore, the mother might just as well have returned to her hometown or village in another registration area to deliver the child, and the event might be recorded there.

At present, the alternative method for tracing the birth and death certificates of unnamed cases is to use the available information on the event's place of occurrence to identify the most likely registration area. Records for the probable registration area are then manually scanned and matched to the parents' names. This was the most common strategy used to trace unnamed children born in hospitals, but it is a very tedious and time-consuming exercise, particularly when the date of birth was not accurately reported or recorded.

Consistent with the findings by Kwok et al., tracing was more successful among the Malays and the Indians than among the Chinese [9]. Malay and Indian names, which use the father's given name as the child's surname, tend to be more individually specific that the limited number of family names employed among the Chinese, and this was probably an important factor in tracing these cases with the Alpha indices.

The rate of successful tracing in this study did not significantly differ according to place of residence, though it was slightly higher among non-rural births. The rates also did not differ significantly between home- and hospital-born children. This is probably due to the decentralized nature of the registration system.

We also found cases in which, despite our inability to trace a birth certificate, we were able to trace a death certificate. This finding is also consistent with that of Kwok et al., who suggested that this occurred because birth certificates may not be issued for infants who died at a very young age [9].

Our relatively low rate of successful tracing could also have reflected the poor registration of births and deaths in the 1950s and 1960s, and it is possible that the births and deaths reported in the MFLS-2 birth histories are more complete than the official records from the period. However, while this may be the case, based on our findings the rate of tracing did not differ by year of birth, and the rates of birth certificate tracing for earlier births are similar to that of later births.

In addition, this study does not address the problem of the deaths of children that may have been omitted by their mothers during the population survey, either through intentional misreporting or poor recall. Our study only considered reported deaths, and we do not know the degree to which deaths were omitted in the MFLS-2.

Theoretically, data linkage should have been most easily accomplished using the birth and death records stored with the Department of Statistics. The law requires that a copy of all birth and death certificates at the National

Registration Department be sent to the Department of Statistics, and these records have been computerized since the 1970s. Unfortunately, births and deaths are not easily linked through the existing system, as there is no common code to match birth certificates with death certificates beyond the child's name, which may be missing or misspelled on one certificate or the other. It may be for this reason that the Kwok et al., study [9] was conducted manually and did not benefit from the computerized system in the Department of Statistics. Furthermore, in conducting their study, they also found that not all the required information on birth and death certificates had been coded and transferred to computer tapes.

Substantive Issues

As the total number of deaths reported in the MFLS-2 was very small (262), and the information elicited spanned more than three decades (from 1953 to 1988), it is very difficult to identify trends of specific causes of death.

Furthermore, the whole issue as to the completeness of the registration of births and deaths in Peninsular Malaysia is equivocal. According to one United Nations report, the Malaysian vital registration system is virtually complete, with coverage of at least 90% of deaths [10], while Hirschman and Tan argued that the estimated 3.3% under-registration of deaths from the unpublished 1967/68 Socio-economic Sample Survey of Households may have been too low [11]. A subsequent United Nations report, however, found the registration of births and deaths in Peninsular Malaysia to be incomplete, as the registered data excludes the deaths of live-born infants who died before their births had been registered [12].

These problems are further compounded by our study's low success rate in tracing the death certificates of those reported dead in the survey. The success rate of matching survey records with death certificates was only 31.8% of the total deaths reported in the survey, and we were only able to abstract the cause of death for 83 children out of the 261 cases whose household records were traced from NPFDB.

Furthermore, the quality of the information on the causes of death is questionable. Only 38.5% of the 83 deaths we traced were medically certified, while the remainder were given by lay persons. While this is consistent with the situation in the country in general (as late as 1989, only 40% of all deaths were medically certified [13]) this percentage was only 30 - 35% in the 1950s and 1960s.

Of the 83 death certificates traced, over 20% listed causes of death that were associated with prematurity or other neonatal problems. Many of the other reported causes of death were symptom-based, such as fever, *sawan*, cough, and constipation, which are of little help in identifying the actual etiology of the diseases that caused death.

The cause-of-death findings from our study should therefore be viewed with caution. Even though this information is consistent with the general trend in Malaysia regarding the pattern and proportion of medically-certified deaths, we cannot exclude selection bias, as the causes of death for successfully-traced death certificates may well be different from those we were unable to trace.

For all of the above reasons, therefore, our findings on causes of death from this study are rather limited. Furthermore, it is difficult for us to conclude anything on either the reliability of the death reporting in Peninsular Malaysia or the causes of death listed on the death certificates we traced for those reported dead in the MFLS-2 survey.

Conclusions and Recommendations

The possibility of linking population-based survey data with birth and death certificates in Peninsular Malaysia is rather limited. Validation of birth dates, birth weight or other information obtained through population surveys with information on birth and death certificate kept at the Department of Registration is currently not feasible. Validation will be unreliable because of the low rate of successful linkage.

The rate of linkage in this study might have been improved if plans for data linkage has been made prior to the conducting of the population survey. Particular steps could then have been taken to train survey interviewers to obtain and accurately record complete

information on the child's name, date of birth, and the actual place of birth, as these are essential to the effective use of the Alpha indices in linking individual cases to their birth and death certificates.

Among the many problems identified, is the difficulty of tracing or matching the vital certificates of unnamed children. Both the national registration system and the Department of Statistics, which prepares the Alpha indices, should employ a standardized system of identifiers (e.g. "Baby of [Mother's Full Name]") to record the births and deaths of unnamed children. Furthermore, the Alpha indices should be expanded and standardized to include information on both parents' names, as opposed to the current practice which follows the naming system peculiar to each ethnic group. This could take the form of "[Child's Full Name] son/ daughter of [Father's Full Name] and [Mother's Full Name]". This would result in a standardized system for recording all names, regardless of their ethnic origin, which would facilitate vital certificate tracing and the ability to link this information with other sources of data.

Regardless of steps taken to improve data linkage, however, the linking of population survey information with death certificates for the purpose of determining the cause of death is not cost effective. Compounding the low rate of successful linkage, the number of deaths reported in sample populations were too small to study trends in the different causes of mortality. Furthermore, the quality of cause-of-death information listed on many death certificates is poor, as it comes from non-medical informants.

In order to study better the causes of death among sub-populations such as infants and children, alternative strategies must be tried. The Ministry of Health could, for example, field studies in a few selected states of the country. Steps should also be taken to maintain and improve the quality of information on medically-certified hospital deaths, which could be done through the continuing education of medical personnel, with particular attention to the standard way of filling out death certificates. At the same time, information on non-hospital deaths could be enhanced through the use of verbal autopsies, which could be conducted by health staff other than doctors [14].

These measures would improve the quality of information on the causes of death, which could then be used for planning specific, national health programs. However, the vital registration system as a source of information on causes of death is indispensable. Without it, it would be very difficult to study the national trend in mortality. The existing system should therefore be improved to facilitate computerized linkage of birth and death certificates through the use of common codes which will act as identifiers.

The computerization of the National Population Registration Survey (SPPN) offers an opportunity that may facilitate data linkage, but due attention to future data linkage issues must be paid if the promise of this system is to be realized. One such step would be to have the unique national registration number given to each individual at birth used not only for registering births and deaths, but for recording individual medical and hospitalization services obtained in the country.

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