



Carolina Population Center - UNC



CPC20005542

Technical Papers

Number 72
January 1998

REGISTRATION OF BIRTHS, STILLBIRTHS AND INFANT DEATHS IN JAMAICA

International Institute for Vital Registration and Statistics

9650 Rockville Pike
Carolina Population Center Library
Bethesda, Maryland 20814-3998
University of North Carolina at Chapel Hill
USA
University Square
Chapel Hill, N. C. 27514 U. S. A.

JM-39

FOREWORD

This study addresses an important obstacle to registration coverage in the developing countries where the informant is a member of the family. The implementation of the recommendation to transfer the responsibility for the registration of hospital births and deaths (including stillbirths) to the medical institution where the event occurs should do much to improve the completeness of registration of livebirths, deaths and stillbirths.

This paper was previously published in the International Journal of Epidemiology and is presented in this publication series with the kind permission of the Editor of the journal.

The views expressed in this report are those of the authors and do not necessarily reflect those of the IIVRS.

The program of the International Institute for Vital Registration and Statistics, including the publication and distribution of the Technical Papers, is supported by a grant from the United Nations Population Fund.

Registration of Births, Stillbirths and Infant Deaths in Jamaica

AFFETTE M MCCAW-BINNS,*† KRISTIN FOX,**‡ KAREN E FOSTER-WILLIAMS,* DEANNA E ASHLEY** AND BERYL IRONS**

McCaw-Binns A M (Department of Child Health, UWI, Mona, Kingston 7, Jamaica), Fox K, Foster-Williams K E, Ashley D E and Irons B. Registration of births, stillbirths and infant deaths in Jamaica. *International Journal of Epidemiology* 1996; **25**: 807-813.

Background. Vital statistics underestimate the prevalence of perinatal and infant deaths. This is particularly significant when these parameters affect eligibility for international assistance for newly emerging nations.

Objective. To determine the level of registration of livebirths, stillbirths and infant deaths in Jamaica.

Methodology. Births, stillbirths and neonatal deaths identified during a cross-sectional study (1986); and infant deaths identified in six parishes (1993) were matched to vital registration documents filed with the Registrar General.

Results. While 94% of livebirths were registered by one year of age (1986), only 13% of stillbirths (1986) and 25% of infant deaths (1993) were registered. Post neonatal deaths were more likely to be registered than early neonatal deaths. Frequently the birth was not registered when the infant died. Birth registration rates were highest in parishes with high rates of hospital deliveries ($r_s = 0.97$, $P < 0.001$) where institutions notify the registrar of each birth. Hospital deaths, however, were less likely to be registered than community deaths as registrars are not automatically notified of these deaths.

Conclusions. To improve vital registration, institutions should become registration centres for all vital events occurring there (births, stillbirths, deaths). Recommendations aimed at modernizing the vital registration system in Jamaica and other developing countries are also made.

Keywords: vital registration, infant deaths, stillbirths, birth registration, Jamaica

Perinatal and infant mortality rates are widely accepted indicators of health and development. The principal source of these data is vital registration, the accuracy and completeness of which are often assumed. A reviewer of a paper recently submitted to an international journal for publication suggested that our classifying Jamaica as a developing country was unwarranted as international publications¹ list our infant mortality rate as 13/1000. This has implications for developing countries whose eligibility for international assistance may be based on inaccurate information. Studies have pointed to the shortcoming of these data in both developed^{2,3} and developing⁴⁻⁶ countries.

Previous studies^{7,8} (and one unpublished)⁹ have examined infant death registration in Jamaica and have

found it to be deficient and to have deteriorated over time. Puffer and Serrano (1968-1970) reported that 10% of infant and 8% of neonatal deaths in Kingston/St Andrew had not been registered. By 1980, Desai *et al.*⁸ reported that 69% of infant deaths in three parishes (Hanover, Trelawny, St James) were not registered. In 1981, 33% of infant deaths in Clarendon (another parish) had not been registered, including 54% of neonatal (0-27 days) and 63% of early neonatal deaths (0-6 days) (Figure 1).

Stillbirth registration has been equally poor. In 1978, of 612 stillbirths known to have occurred in government hospitals, only 425 were reported in official statistics.⁹ By 1985, the number reported had fallen to 276, with no indication from hospital statistics of any fall in the stillbirth rate. Since 1985, registration has been so poor that official statistics ceased reporting this information. They also ceased reporting infant deaths; however data may be gleaned from tables.¹⁰

The 1986 Jamaican Perinatal Morbidity and Mortality Survey¹¹ (JPMMS) provided an opportunity to evaluate vital registration as it aimed to identify all births, stillbirths and neonatal deaths occurring during a defined time period. In 1993, the Infant Mortality Study (IMS) aimed to determine the prevalence and level of underregistration of infant deaths. The two

* Department of Child Health, University of the West Indies (UWI), Mona, Kingston 7, Jamaica.

** Ministry of Health, Jamaica.

† Currently at the Tropical Metabolism Research Unit, UWI.

‡ Currently at the Institute of Social and Economic Research, UWI.

Reprint requests to: Dr Affette McCaw-Binns, University of the West Indies, Mona, Kingston 7, Jamaica.

⁹ Ministry of Health. Report on Under-registration of deaths—Compiled from Data Collected in a House to House Pilot Study Conducted in (the parish of) Clarendon for Assessing the Extent of Under-registration of Vital Events, 1981. (personal communication).

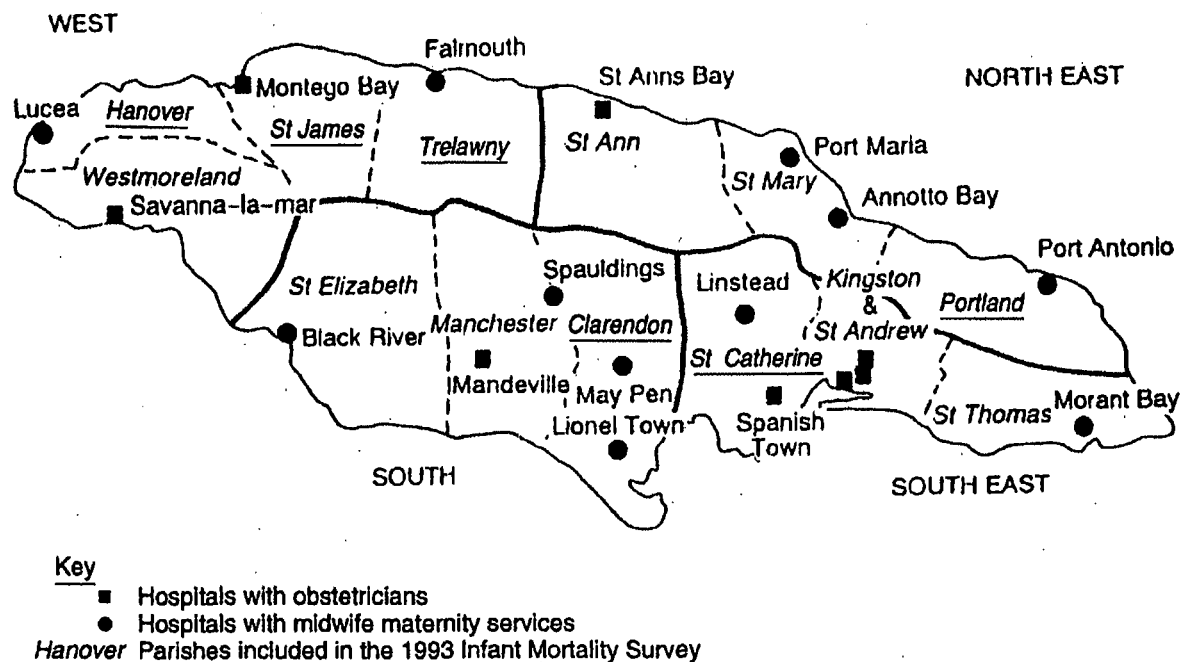


FIGURE 1 Map of Jamaica showing parishes and location and type of public hospitals

studies together point to problems with the vital registration system and the urgent need for reform to improve the quality and completeness of registration.

MATERIALS AND METHODS

The JPMMS sought to interview all women who delivered a liveborn or stillborn infant of at least 500 g anywhere on the island, regardless of outcome between 1 September and 31 October 1986. Participants lists were matched to birth, stillbirth and infant death registrations filed with the Registrar General's Department (RGD). Annually, there are 55 000–60 000 births and 12 000–15 000 deaths.

Certificates registering births and stillbirths between September 1986 and October 1987, and deaths between September 1986 and November 1987, were inspected to identify infants born during the survey period and dying within 28 days of birth.

Registrations not matched with an interviewed mother were labelled as 'missed by the study'. Infants for whom no registration documents were identified were labelled as 'unregistered'. Toward the end of the matching exercise, the RGD's annual computerized listing of births became available. This was checked in the event that records were missed during our inspection. No such secondary source existed for deaths or stillbirths.

The IMS tracked all births in six parishes (Hanover, St James, Trelawny, Portland, Clarendon, St Catherine; underlined in Figure 1). Reports on infant deaths from

all hospitals as well as reports from the community, the police and the vital registration office in the six parishes were matched to infants born in those parishes in the 1993 calendar year. The six parishes house 40% of the population with an urban (48%)/rural (52%) population mix similar to the national figures (50% urban/50% rural). Four parishes (Hanover, St James, Trelawny, Clarendon) had their vital registration levels evaluated previously. Table 1 shows that there is a high historical correlation (0.99) between the infant mortality rates in these six parishes and the national estimate.

Data were analysed using SPSS and EPIINFO. Parametric (χ^2 tests) and non parametric tests (Mann-Whitney; differences between means) were performed.

RESULTS

JPMMS identified 10 482 babies, including 98 pairs of twins. There were 255 stillbirths and 10 227 livebirths, 188 of whom died in the first 28 days of life. The perinatal mortality rate (stillbirths plus early neonatal deaths) was 40 per 1000 deliveries. The neonatal mortality rate was 18.4 per 1000 livebirths.

The IMS identified 486 infant deaths in the six parishes, 69% of which were neonatal deaths. This yielded an estimated infant mortality rate of 24.4/1000 livebirths (confidence interval: 23.1–26.0 per 1000) and a neonatal mortality rate of 16.7 per 1000 livebirths; not significantly different from that found 7 years earlier.

TABLE 1 *Infant mortality rates in six parishes and in Jamaica: 1970-1980*

Year	Jamaica	Six parishes	Portland	Trelawny	St James	Hanover	Clarendon	St Catherine
1970	32	31	21	34	28	40	31	33
1971	27	30	26	33	29	26	29	32
1972	31	31	36	31	26	30	37	26
1973	26	23	21	21	20	47	22	20
1974	26	23	19	22	34	17	22	21
1975	23	21	16	11	29	11	26	19
1976	20	19	11	13	22	11	23	18
1977	15	12	7	3	23	3	12	12
1980	10	14	9	14	7	9	22	15

Source: Statistical Institute of Jamaica, Demographic Statistics (various years).

TABLE 2 *Registration of livebirths (JPMMS) by type of hospital facilities and degree of urbanization.*

Type of maternity hospital facilities	Livebirths identified by the study	Births registered at one year (%)	Proportion of hospital births 1986 (%)	Population in urban areas mid-Census 1982-1991 (%)
Specialist obstetrics	4323	96.6	95.5	82.3
Kingston	2615	97.2	99.9	100.0
St Andrew	878	97.2	89.4	87.0
St James	830	94.1	79.7	53.9
General obstetrics	3112	92.3	62.9	44.4
St Ann	574	89.9	55.1	21.7
Westmoreland	488	90.6	52.0	18.3
Manchester	814	96.1	79.0	34.0
St Catherine	1236	91.5	59.1	67.1
Midwifery services	2792	92.5	52.2	20.1
St Thomas	352	96.9	72.3	25.9
Portland	249	97.2	79.0	21.3
St Mary	435	94.5	67.6	20.9
Trelawny	272	94.1	50.7	18.4
Hanover	234	90.6	59.9	8.9
St Elizabeth	522	92.7	30.5	9.5
Clarendon	728	87.4	37.8	28.3
Total	10 227	94.2	72.6	49.0

Among JPMMS liveborn infants, 9630 (94%) were registered within one year of birth. Completeness of registration varied by parish, ranging from 97% (Kingston, St Andrew, St Thomas, Portland) to 87% (Clarendon). Registration was generally highest in parishes with high rates of hospital births ($r_s = 0.97$, $P < 0.001$). The level of perinatal care in the parishes was not associated with birth registration (Table 2).

Registration of stillbirths and neonatal deaths (1986) was discouraging. Documents were only identified for 24 stillbirths and 17 neonatal deaths. The Registration

of Births and Deaths Act (1881) only requires registration of stillbirths of 28 weeks or more gestation, so registration of these fetuses was assessed. Of 255 stillbirths, gestational age or birthweight was known for 220; 187 of whom were either ≥ 28 weeks gestation or weight ≥ 1000 g, if gestation was unknown. Of these, only 12.8% were registered (9.5% of all events). Only one parish, Trelawny, had a reasonable stillbirth registration rate (5/7 or 71%). Registration of stillbirths bore no relationship to type of hospital facilities (Table 3).

TABLE 3 Registration of stillbirths/fetal deaths (JPMMS) by type of hospital facilities

Type of maternity hospital facilities	Fetal deaths identified by the study	Fetal deaths of known gestation or birthweight	Fetal deaths of gestation ≥ 28 wks or ≥ 1000 g	% registered
Specialist obstetrics	107	96	82	6.1
General obstetrics	92	80	69	20.3
Midwifery services	56	44	36	13.9
Total	255	220	187	12.8

TABLE 4 Registration of births and deaths of infants who died in the neonatal period (0-28 days) by type of hospital facilities (JPMMS)

Type of maternity hospital facilities	Neonatal deaths identified by the study	Registration of births among babies who died ≤ 28 days (%)	Registration of deaths among babies who died ≤ 28 days (%)
Specialist obstetrics	77	67.5	3.9
General obstetrics	69	27.5	17.4
Midwifery services	42	38.1	4.8
Total	188	46.3	9.0
P	-	0.011	0.023

Only 9.0% (17) of the 188 neonatal deaths were registered. Matching was hampered by the absence of the infant's date of birth on the death certificate. Only age at death was recorded, which was often inaccurate.

When an infant dies in the neonatal period, often neither birth nor death is registered. Only 87 (46%) of the 188 neonates who died had their births registered, compared with 95% of infants who survived the neonatal period. These births were more likely to be registered in parishes with specialist obstetric services ($P < 0.01$). Those parishes which registered stillbirths were also registering neonatal deaths (Table 4).

There were 652 registered infants whose mothers had not been interviewed. Thus, at least 10 879 livebirths occurred during the study period. As Table 5 illustrates, what is not known is how many livebirths occurred which were neither interviewed nor registered. In four cases, post-partum information was recorded (85% of mothers were re-interviewed at 6-12 weeks post-partum), however these women had not initially been interviewed and their infants did not appear to have

been registered. There were probably others that were missed.

Seven years later, the IMS found in the six parishes surveyed, only 26% of all infant deaths and 15% of neonatal deaths had been registered. The mean age of registered infants was 3.5 months (± 3.9) compared with 0.9 (± 2.2) for the unregistered deaths ($P < 0.01$) showing that underregistration was greatest among early infant deaths. Only 13% of hospital deaths were registered compared to 52% of non-hospital deaths ($P < 0.001$) (Table 6).

DISCUSSION

In the developed world it is assumed that birth registration is complete, therefore birth surveys^{12,13} use data provided by these sources to determine their case ascertainment rate. Only Cahalane *et al.*¹⁴ reported an Irish survey where interviews exceeded registrations, yielding a 101.3% case ascertainment rate. Our experience was similar, where based on Registrar General's Department data (9941 births officially reported for September-October 1986) we would have achieved a coverage rate of 102.9%. Reported registration data would therefore be unsuitable for estimating the study's coverage (94% of livebirths occurring during the study period).

An annual Survey of Living Conditions¹⁵ monitors social and economic conditions. In 1992 the registration of births was examined for children 0-59 months. The survey found that 97% of births had been registered. Prevalence increased from 92% among the 0-11 month population to 97% for those 12-23 months to 99% by 59 months, indicating almost universal birth registration by the time the children enter school at 6 years of age when presentation of a birth certificate is mandatory.

Studies examining the completeness of registration of stillbirths/fetal deaths^{16,17} and neonatal deaths¹⁸ in the US note problems of classification, gestational age

TABLE 5 Livebirths registered compared to those interviewed (JPMMS)

Mothers interviewed	Livebirth registered		Total
	Yes	No	
Yes	9630	597	10 227
No	652	4 ^a	656+
Total	10 282	601+	10 883+

^a Mothers identified at postnatal follow-up, but not interviewed and not registered.

limits for registration of fetal deaths, and responsibility for registering the death. Lack of clarity concerning birthweight or gestational age requirements for registration may influence whether a perinatal death is registered, particularly among marginal infants.¹⁹ Unfortunately, registration of these events was so poor in Jamaica, that gestational age or weight were not the main issues.

Interviews with hospital personnel identified problems such as the absence of a certifying officer at the death, failure of next of kin to register the death and failure of hospitals to notify registrars when the family abnegate their responsibility.

Many neonates die without official admission to hospital (20% in the first hour, 59% in the first day). Often they were only seen by the midwife at delivery. Marginal infants (<1000 g or <28 weeks gestation) may be treated as abortions, whether liveborn or not. While midwives may legally issue stillbirth certificates, a neonatal death requires certification by a doctor. Doctors may be reluctant to certify deaths at which they were not present. Medical officers in charge of hospitals however must assume responsibility for certifying all deaths in the institution, including those on the maternity ward.

Institutions often dispose of perinatal deaths. This practice began because parents often abandoned the bodies due to the high cost of burial. This practice has removed the sole driving force to register the death, a death certificate being required for burial.

When certificates are completed, the system also fails. In some instances, midwives completed stillbirth certificates, however they were not forwarded to the Registrar. While birth notifications are forwarded to the Registrar if the parent fails to collect it within a specified time period, the death or stillbirth notification is not forwarded as there is no legal requirement that the institution does this.

TABLE 6 Registration of infant deaths identified by the IMS, by age at death

Infant deaths	Total deaths	Deaths registered (%)	Range % (lowest-highest parish)
0-6 days	268	12.7	8.3-37.5 ^a
7-28 days	59	27.1	16.7-66.7 ^a
29-364 days	159	47.2	27.8-92.3
Total	486	25.7	16.9-47.2

$P < 0.0001.$

^a n < 10.

Ndong *et al.*⁴ in the Cameroon report that while 98% of births occurred in hospitals, only 62% were registered. Only 4% of infant deaths were registered. Among reasons cited for non-registration of infant deaths was the apparent lack of perceived benefit to families. They report the common perception of not considering children to have been 'born' when death occurs soon after birth, also evident in our study.

Lumbiganon *et al.*⁶ report that in a rural Thailand community no stillbirths and 55% of infant deaths were registered over a one-year period. Underregistration was greatest among early (100%) and late neonatal deaths (60%) compared with post-neonatal deaths (8%). None of the unregistered infant deaths had their birth registered. The failure to register any perinatal death is another example of denying the existence of infants who die soon after birth.

Reliance on parents to register deaths which are culturally disregarded in diverse centres such as Thailand, Cameroon and Jamaica will only result in continued underregistration of infant deaths. It is necessary to transfer the responsibility for birth and death registration from parents and relatives to health units. A registration mechanism that uses medical institutions should substantially improve coverage and timeliness of registration. These recommendations are currently being field tested in six of 24 government hospitals in Jamaica.

Desai *et al.*⁸ estimated the IMR at 27 per 1000 in 1980. Assuming that the contribution of neonatal mortality to total mortality has not changed between 1986-1987 and 1993, one could estimate that the 1986-1987 infant mortality rate was 26 per 1000. In 1993 the rate of 24 per 1000 represents an insignificant change in infant mortality over 13 years. It is possible that as Jamaica and other newly emerging nations control those problems which contribute to high post-neonatal

mortality (diarrhoea, malnutrition, other communicable diseases) and are left with the residual of neonatal deaths which traditionally do not get registered, we fail to see any movement in the true infant mortality rate as we eliminate the deaths that usually get registered. The registration rate, however, falls precipitously.

A 1981-1983 study of maternal mortality²⁰ in Jamaica also found significant underregistration of maternal deaths. This included misclassification of deaths where either the certifying officer failed to note that the woman was recently pregnant or if the pregnancy was noted, the coder failed to account for this in coding the cause of death. This effectively resulted in only 26% of maternal deaths being accounted for in the official statistics. Official statistics for 1988, 1989 and 1990 only report 12, 12 and 7 maternal deaths respectively while deaths in government hospitals numbered at least 34, 37 and 30. This indicates a need for retraining of both medical practitioners and RGD personnel.

Deaths requiring a Coroner's inquest pose a major challenge. The official Demographic Statistics (1993)¹⁰ notes:

'... although Police Traffic ... statistics list 'Deaths due to motor vehicle accidents' as 343, 400 and 393 in 1988, 1989 and 1990 respectively, certified deaths due to this cause numbered 23, 23, and 40 in those years respectively ... It can only be concluded that delay in processing [accidental] deaths through the Coroner's Court has led to the non-inclusion of deaths due to those causes in the statistics published by the Registrar General's Department'.

Currently, the death is not registered until the inquest is held or the Coroner rules that no inquest is necessary. The inquest or the ruling often occurs a year or more after the death. When the death does get registered, the statistical data are not updated, resulting in the non-reporting of the deaths. Thus, while death certificates were found for 56% of maternal deaths between 1981 and 1983, only 13% of sepsis deaths were registered and reported, as these were more likely to involve a Coroner's inquest.

The existing Death Registration Act will allow institutional registration of hospital deaths as in the absence of the next of kin, the 'person present at the death' may register the death. Because institutions must notify all births, birth registration rates are higher in parishes with high rates of hospital deliveries ($r_s = 0.97$, $P < 0.001$). With 81% of stillbirths, 88% of neonatal deaths, 70% of infant deaths and 75% of maternal deaths occurring in hospitals, registration of hospital deaths would more nearly reflect the national experience.

The Registration Act needs updating to allow registration of fetal deaths of 500 g or more in keeping with international trends. It may also be useful to allow midwives to certify all perinatal deaths, not just fetal deaths. Date of birth and other identifying information need to be added to the death certificate to facilitate record linkage.

Hospital managers need to be updated regarding their statutory responsibilities in the registration process. Doctors and midwives should benefit from specific instructions in completing death and stillbirth certificates. This should be incorporated into their early training.

Public education on the importance of registering births, stillbirths and deaths, regardless of the victim's age at death, would support improvements in vital registration.

RECOMMENDATIONS

Our findings suggest that the following recommendations should contribute to improving the level and quality of vital registration in Jamaica and other developing countries.

1. Transfer responsibility for the registration of all hospital births and deaths (including fetal deaths) to the medical institution where the event occurs.
2. Train doctors and midwives in the correct completion of death and fetal death certificates, utilizing guidelines for registration of fetal and neonatal deaths over 500 g, in keeping with WHO recommendations.²¹
3. Incorporate training in completion of death and fetal death certificates into the curriculum of medical and midwifery training programmes.
4. Train hospital medical records officers to facilitate implementation of the expanded registration system. (Implementation of ICD 10 presents an ideal opportunity.)
5. Retrain RGD coders in coding perinatal, infant and maternal deaths in particular and all deaths generally.
6. Amend existing legislation to allow provisional registration of Coroner's cases prior to the inquest.
7. Amend death registration legislation so that:
 - a) all fetal deaths exceeding 500 g will be registered (see ICD 10 guidelines and draft certificate of cause of fetal death);²²
 - b) midwives may certify all perinatal deaths, not just fetal deaths.
8. Review birth, fetal death (stillbirth) and death registration procedures and documents to:
 - a) update information collected (birthweight must be added);

- b) facilitate linkage of birth and death records;
- c) standardize data collected on pregnancy history of mother in keeping with ICD recommendations to facilitate data comparability internationally;
- d) create a separate neonatal death certificate.

9. Develop a system of birth and death record linkage.
10. Develop an automated system of birth and death registration to facilitate transfer of information between hospitals, the Registrar General's Department and users.
11. Explore incentives for registering vital events (e.g. automatic free copies if registered within the legally required time limit).
12. Public education.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the financial support provided by the International Development Research Centre (IDRC) which financed the JPMMS; PAHO, which facilitated the record matching at the RGD for the JPMMS; and UNICEF which financed the IMS. Our thanks also to the Jamaican mothers, parents, guardians and health staff whose cooperation made our studies a reality.

REFERENCES

- ¹ United Nations. *World Population Prospects: The 1992 Revision*. New York: UN, 1993.
- ² Bouvier-Colle M-H, Varnoux N, Costes P, Hatton F. Reasons for the under-reporting of maternal mortality in France, as indicated by a survey of all deaths among women of childbearing age. *Int J Epidemiol* 1991; **20**: 712-21.
- ³ Dept. of Health, Welsh Office, Scottish Office Home and Health Dept., Dept. of Health and Social Security, Northern Ireland. *Report of Confidential Enquiries into Maternal Deaths in the United Kingdom, 1988-90*. London: HMSO, 1994.
- ⁴ Ndong I, Gloyd S, Gale J. An evaluation of vital registers as sources of data for infant mortality rates in Cameroon. *Int J Epidemiol* 1994; **23**: 536-39.
- ⁵ Burkhalter B, Miller R, Silva L, Burleigh E. Variations in estimates of Guatemalan infant mortality, vaccination coverage, and ORS use reported by different sources. *Bull PAHO* 1995; **29**: 1-24.
- ⁶ Lumbiganon P, Panamonta M, Laopaiboon M, Pothinam S, Patithat N. Why are Thai official perinatal and infant mortality rates so low? *Int J Epidemiol* 1990; **19**: 997-1000.
- ⁷ Puffer R, Serrano C. *Patterns of Mortality in Childhood*. Scientific Publication No 262. Washington, DC: PAHO/WHO, 1973.
- ⁸ Desai P, Hanna B, Melville B, Wint B. Infant mortality rates in three parishes of western Jamaica, 1980. *West Ind Med J* 1983; **32**: 83-87.
- ⁹ Statistical Institute of Jamaica. *Demographic Statistics, 1980 and 1985*. Kingston: Statistical Institute of Jamaica Printing Unit, 1981 and 1986.
- ¹⁰ Statistical Institute of Jamaica. *Demographic Statistics, 1993*. Kingston: STATIN, 1994.
- ¹¹ Ashley D, McCaw-Binns A, Foster-Williams K. The Perinatal Morbidity and Mortality Survey of Jamaica: 1986-1987. *Paed Perinat Epidemiol* 1988; **2**: 138-47.
- ¹² Butler N, Bonham D. *Perinatal Mortality: The First Report of the 1958 British Perinatal Mortality Survey*. Edinburgh and London: Livingstone, 1963.
- ¹³ Tzoumaka-Bakoula C. The Greek National Perinatal Survey I: Design, methodology, case ascertainment. *Paed Perinat Epidemiol* 1987; **1**: 43-51.
- ¹⁴ Cahalane S, Kennedy J, McNicholl B, O'Dwyer E. Perinatal mortality survey for County Galway, 18 months, October 1958 through March 1960. *J Irish Med Assoc* 1965; **57**: 137-42.
- ¹⁵ The Planning Institute of Jamaica and the Statistical Institute of Jamaica. *Jamaica Survey of Living Conditions, Report 1992*. 1994. Kingston: STATIN/PIOJ, p. 77.
- ¹⁶ Greb A, Pauli R, Kirby R. Accuracy of fetal death reports: Comparison with data from an independent stillbirth assessment program. *Am J Public Health* 1987; **77**: 1202-06.
- ¹⁷ Goldhaber M. Fetal death ratios in a prospective study compared to state fetal death certificate reporting. *Am J Public Health* 1989; **79**: 1268-70.
- ¹⁸ McCarthy B, Terry J, Rochat R, Quave S, Tyler C. The under-registration of neonatal deaths: Georgia 1974-77. *Am J Public Health* 1980; **70**: 977-82.
- ¹⁹ Golding J. Epidemiology of fetal and neonatal death. In: Keeling J (ed.). *Fetal and Neonatal Pathology*. London: Springer-Verlag, 1987, pp. 151-52.
- ²⁰ Walker G, McCaw-Binns A, Ashley D, Bernard G. Identifying maternal deaths in developing countries: experience in Jamaica. *Int J Epidemiol* 1990; **19**: 599-605.
- ²¹ World Health Organization. *International Classification of Diseases and Related Health Problems, Tenth Revision, Volume 2: Instruction Manual*. Geneva: WHO, 1993, p. 131.
- ²² World Health Organization. *International Classification of Diseases and Related Health Problems, Tenth Revision, Volume 2: Instruction Manual*. Geneva: WHO, 1993, p. 90.

(Revised version received January 1996)

PUBLICATIONS OF THE IIVRS TECHNICAL PAPERS

1. A Programme for Measurement of Life and Death in Ghana, D.C. Mehta and J.B. Assie, June 1979
2. Vital Statistics System of Japan, Kozo Ueda and Masasuke Omori, August 1979
3. System of Identity Numbers in the Swedish Population Register, Karl-Johan Nilsson, September 1979
4. Vital Registration and Marriage in England and Wales, Office of Population Censuses and Surveys, London, October 1979
5. Civil Registration in the Republic of Argentina, Jorge P. Seara and Marcelo E. Martin, November 1979
6. Coordinating Role of National Committees on Vital Health Statistics, World Health Organization, Geneva, January 1980
7. Human Rights and Registration of Vital Events, Nora P. Powell, March 1980
8. The Organization of the Civil Registration System of the United States, Anders S. Lunde, May 1980
9. Organization of Civil Registration and Vital Statistics System in India, P. Padmanabha, July 1980
10. Registration of Vital Events in Iraq, Adnan S. Al-Rabie, September 1980
11. Generation of Vital Statistics in Mexico, General Bureau of Statistics, Mexico, November 1980
12. Age Estimation Committee in Qatar, Sayed A. Taj El Din, December 1980
13. The Development of the Vital Statistics System in Egypt, Gamal Askar, January 1981
14. Vital Statistics Data Collection and Compilation System: Hong Kong, Donna Shum, March 1981
15. Major Obstacles in Achieving Satisfactory Registration Practices and Vital Events and the Compilation of Reliable Vital Statistics, IIVRS, May 1981
16. Methods and Problems of Civil Registration Practices and Vital Statistics Collection in Africa, Toma J. Makannah, July 1981
17. Status of Civil Registration and Vital Statistics in El Salvador, Enrique Olmado Sosa, July 1982
18. Recommendations from Regional Conferences and Seminars on Civil Registration and Vital Statistics, IIVRS, September 1982
19. Potentials of Records and Statistics from Civil Registration Systems for Health Administration and Research, Iwao M. Moriyama, September 1982
20. Improving Civil Registration Systems in Developing Countries, Forrest E. Linder, October 1982
21. Social Indicators Derived from Vital Statistics, Nora P. Powell, November 1982
22. The Operation of the Vital Statistics System of the United States of America, Anders S. Lunde, April 1983
23. Demographic Information from Vital Registration Offices in Mexico, 1982, Juan Carlos Padilla, Jose Garcia Nunez and Jaime Luis Padilla, June 1983
24. General Description of Population Registration in Finland, Hannu Tulkki, July 1983
25. The National Importance of Civil Registration and the Urgency of Its Adaptation to a Modern Society, Committee on Legal and Organizational Requirements for a Civil Registration System in Latin America, August 1983
26. Study of A Civil Registration System of Births and Deaths—An Experiment in Afghanistan, B.L. Bhan, October 1983
27. Actions for the Improvement of Civil Registration and Vital Statistics, IIVRS, December 1983
28. Urgently Needed Reforms in Civil Registration in Asian Countries, IIVRS, October 1986
29. Organization and Status of Civil Registration and Vital Statistics in Various Countries of the World, IIVRS, December 1986
30. The Status of Civil Registration and the Collection of Vital Statistics through Alternative Sources in Papua New Guinea, M.L. Bakker, July 1987
31. Organization and Status of Civil Registration in Africa and Recommendations for Improvement, IIVRS, April 1988
32. Registration of Vital Events in the English-speaking Caribbean, G. W. Roberts, June 1988
33. Organization and Status of Civil Registration and Vital Statistics in Arab Countries, IIVRS, October 1988
34. Recommendations from Regional Conferences and Seminars on Civil Registration and Vital Statistics: An Update, IIVRS, November 1988
35. Health Data Issues for Primary Health Care Delivery Systems in Developing Countries, Vito M. Logrillo, N.Y. State Department of Health, May 1989
36. Considerations in the Organization of National Civil Registration and Vital Statistics Systems, Iwao M. Moriyama, July 1989
37. Approaches to Data Collection on Fertility and Mortality for the Estimation of Vital Rates, December 1985, United Nations Statistical Office, September 1989
38. Publicity Plans for Registration Promotion, K. K. Rastogi, Office of Registrar General, India, November 1989
39. Some Observations on Civil Registration in French-speaking Africa, Michel Francois, Institut National de la Statistique et des Etudes Economiques/Centre Francais sur la Population et le Developpement, February 1990
40. Automation of Vital Registration Systems in the United States; A Summary of Selected States' Activities, Vito M. Logrillo, N.Y. State Department of Health, April 1990
41. The Development and Organization of Civil Registration in Sri Lanka, D.S. Munasinghe, July 1990
42. Computerisation of the Indexes to the Statutory Registers of Births, Deaths, and Marriages in Scotland, David Brownlee, October 1990
43. Measurement of Birth and Death Registration Completeness, Iwao M. Moriyama, November 1990
44. Reforms in the Civil Registration and Vital Statistics Systems of Morocco, Violeta Gonzales-Diaz, United Nations Statistical Office, April 1991
45. The Impact of Cause-of-Death Querying, H.M. Rosenberg, Ph.D., National Center for Health Statistics, U.S.A., June 1991
46. Incomplete Registration of Births in Civil Systems: The Example of Ontario, Canada, 1900-1960, George Emery, Department of History, University of Western Ontario, August 1991

47. The Vital Registration and Statistics Systems in Libya and its Improvement, Dr. Abdus Sattar, Census and Statistics Department, Libya, September 1991
48. Proceedings of International Statistical Institute Session on Recent Actions to Improve Civil Registration and Vital Statistics, Cairo, September 1991, November 1991
49. Completeness and Reliability of Birth and Death Notifications in Kuwait, Nasra M. Shah, Ali Mohammad Al-Sayed, Makhdoom A. Shah, Kuwait, March 1992
50. Automation of Mortality Data Coding and Processing in the United States of America, Robert A. Israel, National Center for Health Statistics, USA, June 1992
51. Approaches to the Measurement of Childhood Mortality: A Comparative Review, Kenneth Hill, Johns Hopkins University, School of Hygiene and Public Health; September 1992
52. Proceedings of the IAOS Third Independent Conference Session on Civil Registration and Vital Statistics, Ankara, Turkey, September 1992; December 1992
53. Measurement of Adult Mortality in Less Developed Countries: A Comparative Review, Ian M. Timaeus, Centre for Population Studies, London School of Hygiene & Tropical Medicine, February 1993
54. Death Registration and Mortality Statistics in Colombia, Francisco Z. Gil, Departamento Administrativa Nacional de Estadística (DANE), Colombia, November 1992; April 1993
55. Historical Development of Cause of Death Statistics, Iwao M. Moriyama, September 1993
56. Correcting the Undercount in Maternal Mortality, M. S. Zdeb, V. M. Logrillo, M. A. Ellrott, New York State Department of Health, U. S. A., November 1993
57. Techniques for Evaluating Completeness of Death Reporting, Eduardo E. Arriaga and Associates, Center for International Research, U. S. Bureau of the Census, June 1993; June 1994
58. Are Live and Stillbirths Comparable All Over Europe? Legal definitions and vital registration data processing. Catherine Gourbin and Godelieve Masuy-Stroobant, Institute de Démographie, Université catholique de Louvain, 1993; August 1994
59. An Evaluation of Vital Registers as Sources of Data for Infant Mortality Rates in Cameroon, Isaiah Ndong, Stephen Gloyd and James Gale; International Journal of Epidemiology, Vol 23 No. 3, June 1994, October 1994
60. The Estimation of Fertility from Incomplete Birth Registration Data for Indian Towns and Cities, G. S. Somawat, Demography India, Vol 19, No. 2 (1990) pp. 279-287; February 1995
61. The Evaluation of the Completeness of Death Registration in the Presence of High Net Out-Migration: The Case Example of Mauritius, Salaiman Bah, Population Studies Programme, University of Zimbabwe, 1995
62. Comparative Analysis of Deaths Registered in the Civil Registration of Cameroon: The Case of the Mayoralties of Yaoundé (1986 - 1993), Samuel Kelodjoue, October 1995
63. Organization of National Civil Registration and Vital Statistics Systems: An Update. IIVRS December 1995
64. Comparability of the Birth Certificate and 1988 Maternal and Infant Health Survey, Kenneth C. Schoendorf, M.D., M.P.H., Jennifer D. Parker, Ph.D., Leonid Z. Batkhan, Ph.D., John L. Kiely, Ph.D., Division of Analysis, National Center for Health Statistics, 1993; 1996
65. The Impact of Computerization on Population Registration in Sweden, Ingrid Svedberg, Swedish Tax Administration, 1996
66. The Civil Registration System in Denmark, Casper Møllig, Central Office of Civil Registration, Denmark, 1996
67. Role of Technology in the Civil Registration Process, Vito M. Logrillo, IIVRS, June 1997
68. Comparability of the Death Certificate and the 1986 National Mortality Followback Study, Gail S. Poe, Eve Powell-Griner, Joseph K. McLaughlin, Paul J. Placek, Gray B. Thompson, and Kathy Robinson, October 1997
69. Organizational Structure for Civil Registration and Vital Statistics Systems, Vito Logrillo, October 1997
70. Legal Aspects of Civil Registration in the Philippines, Jose C. Sison, Rene L. Cayetano, and Rene A. V. Saguisag, October 1997
71. Estimating the Completeness of Under-5 Death Registration in Egypt. Stan Becker, Yousseff Waheeb, Bothaina El-Deeb, Nagwa Khallaf, and Robert Black. Demography Vol. 33-No. 3, August 1996
72. Registration of Births, Stillbirths and Infant Deaths in Jamaica. Affette M. McCaw-Binns, Kristin Fox, Karen E. Foster-Williams, Deanna E. Ashley, and Beryl Irons. Int. Jour. of Epidemiology Vol. 22, No. 4. 1996