REGISTRATION OF BIRTHS, STILLBIRTHS
AND INFANT DEATHS IN JAMAICA

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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.

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

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Registration of Births, Stillbirths and Infant Deaths in Jamaica

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**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 ($r = 0.97, P < 0.001$) 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 parishes (Hanover, Trelawny, St James) were not eligible for international assistance for newly emerging nations.

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**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
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 ($\chi^2$ 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

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

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

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

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

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 $\geq 28$ weeks gestation or weight $\geq 1000$ 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

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

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

<table>
<thead>
<tr>
<th>Type of maternity hospital facilities</th>
<th>Neonatal deaths identified by the study</th>
<th>Registration of births among babies who died ≤28 days (%)</th>
<th>Registration of deaths among babies who died ≤28 days (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specialist obstetrics</td>
<td>77</td>
<td>67.5</td>
<td>3.9</td>
</tr>
<tr>
<td>General obstetrics</td>
<td>69</td>
<td>27.5</td>
<td>17.4</td>
</tr>
<tr>
<td>Midwifery services</td>
<td>42</td>
<td>38.1</td>
<td>4.8</td>
</tr>
<tr>
<td>Total</td>
<td>188</td>
<td>46.3</td>
<td>9.0</td>
</tr>
</tbody>
</table>

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 use data provided by these sources to determine their case ascertainment rate. Only Cahalane et al. 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 Conditions 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 and neonatal deaths in the US note problems of classification, gestational age...
REGISTRATION OF LIVEBIRTHS AND NEONATAL DEATHS IN JAMAICA

TABLE 5 Livebirths registered compared to those interviewed (JPMMS)

<table>
<thead>
<tr>
<th>Mothers interviewed</th>
<th>Livebirth registered</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>Yes</td>
<td>9630</td>
<td>597</td>
</tr>
<tr>
<td>No</td>
<td>652</td>
<td>656+</td>
</tr>
<tr>
<td>Total</td>
<td>10,282</td>
<td>601+</td>
</tr>
</tbody>
</table>

*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. 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

<table>
<thead>
<tr>
<th>Infant deaths</th>
<th>Total deaths</th>
<th>Deaths registered (%)</th>
<th>Range % (lowest-highest parish)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6 days</td>
<td>268</td>
<td>12.7</td>
<td>8.3–37.5*</td>
</tr>
<tr>
<td>7-28 days</td>
<td>59</td>
<td>27.1</td>
<td>16.7–66.7*</td>
</tr>
<tr>
<td>29-364 days</td>
<td>159</td>
<td>47.2</td>
<td>27.8–92.3*</td>
</tr>
<tr>
<td>Total</td>
<td>486</td>
<td>25.7</td>
<td>16.9–47.2</td>
</tr>
</tbody>
</table>

*P < 0.0001.

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 mortality 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) 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 ($r_1 = 0.97, P < 0.001$). 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.
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);
   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 registrated within the legally required time limit).

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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.

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