MATERNAL AND CHILD HEALTH


Affette McCaw-Binns, Aileen Standard-Goldson, Deanna Ashley, Godfrey Walker and Ian MacGillivray

Background
As part of the reproductive health quality assurance programme, the Ministry of Health sought to review maternal deaths in public hospitals. These hospitals attend 95% of institutional births and 82% of all births.

Methods
Deaths among females 10–50 years in public hospitals during 1993–1995 were reviewed to identify pregnancy-related deaths. Cause of death and access to care were compared with previous studies (1981–1983 and 1986–1987 [12 months]).

Results
The maternal mortality ratio of 106.2 per 100 000 live births, was no different than the 119.7 observed in 1986–1987 and 118.6 for 1981–1983. The leading causes of death remained pre-eclampsia/eclampsia and haemorrhage. The only significant cause-specific decline occurred among deaths due to ruptured ectopic pregnancy ($P = 0.012$). While in 1986–1987 access to care was associated with risk of death from gestational hypertension ($P = 0.02$), these differences are no longer significant. Differences persist, however, for haemorrhage and all other causes, which were less likely to occur at the more skilled institutions. The region with the least obstetricians had the highest mortality ratio but the one with the most did not have the lowest ratio, indicating that quality is more important than quantity.

Conclusions
Regional differences indicate the capacity to reduce maternal mortality by at least 50% with re-allocation of skilled personnel and improved quality. All hospitals must be able to manage haemorrhage cases as patients are unlikely to survive referral.

Keywords
Maternal mortality, access to care, perinatal mortality, developing country, Jamaica

Accepted 30 August 2000

Maternal mortality is a sensitive indicator of the status of women, access to care, adequacy and quality of health care. In developing and developed countries vital registration systems do not accurately reflect the true incidence. In order to overcome the under-reporting and misclassification of these deaths, deliberate systems are needed to routinely compile accurate data.

Two community-based studies documented maternal mortality ratios of 107.5$^6$ and 114.5$^9$ deaths/100 000 live births. The hospital component, that is those maternal deaths occurring in hospital irrespective of place of delivery, was 118.6 and 119.7/100 000, respectively. These ratios are not significantly different from the national experience, and may therefore be monitored to reflect the true incidence. In 1986–1987 residents of parishes without an obstetrician were 2–3 times more likely to die from pregnancy-related complications than those in parishes with these services.

Interventions aimed at reducing maternal mortality included in-service education for midwives and doctors, improving transfusion facilities, educating pregnant women regarding danger signs, and upgrading of facilities. Emphasis was placed on management of gestational hypertension and referral of high-risk women to appropriate institutions. The Ministry of Health sought to review all maternal deaths in public hospitals for 1993–1995 as part of its reproductive health quality assurance programme.
Materials and Methods

All public hospitals were asked to submit all maternal deaths for review. Independently, government pathologists provided necropsy reports on pregnancy-related deaths they had investigated. Submissions were verified by four reviewers who scrutinized death registers at each hospital for deaths among women 10–50 years of age to ensure that all pregnancy-related deaths (direct, indirect, fortuitous, including late deaths) had been identified. Definitions and coding of cause of death and pregnancy complications were consistent with ICD-10 and British confidential enquiries, re-inclusion of fortuitous and late deaths. Data were analysed using SPSS for Windows (9.0) and EpilInfo (6.02).

Cause of death

A single main cause of death was allotted (IM, AM-B, AS-G). While not always the underlying cause of death, it was that condition which investigators felt was responsible for the woman’s death. If pre-eclampsia was complicated by placental abruption, the death would be attributed to the abruption—the fatal complication.

Denominator data

As the study examined pregnancy-related deaths in public hospitals, the denominator excludes births outside these institutions. For 1993–1995, of 174,246 registered live births, 142,239 (81.6%) occurred in public hospitals.

Access to care

Analysis of mortality by place of death can be misleading as seriously ill patients may succumb to their illness in referral hospitals. The point from which patients seek care, however, potentially identifies weaknesses in accessing care. Parish of residence preceding death has been summarized into the health region in which women lived and by its highest level of obstetric service.

Health regions

The four regions and their respective parishes are the West (Westmoreland, Hanover, St James, Trelawny: urban population = 30%), the North East (St Ann, St Mary, Portland: urban population = 22%), the South (St Elizabeth, Manchester, Clarendon: urban population = 26%) and the South East (St Catherine, Kingston, St Andrew and St Thomas: urban population = 77%). They respectively house 18%, 14%, 22% and 46%, of the population.

Type of facilities

Hospitals are classified by their range of services. Type A hospitals (n = 3) provide a wide range of medical and surgical specialities. Located in the cities of Montego Bay (West) and Kingston (South East), they accept referrals from all over the island. Type B hospitals (n = 4: one/region) are regional referral centres providing obstetrics, paediatrics, general medicine and surgery. Type C hospitals (n = 11) provide general medical and surgical services. Deliveries are attended by midwives. Only low-risk deliveries should occur in these hospitals, with transfer of high-risk cases to the nearest Type A/B facility. Type A and B hospitals are comprehensive essential obstetric care (EOC) facilities while Type C hospitals are basic EOC centres. Categorized by the highest level hospital in the parish of residence, there are three Type A parishes (Kingston/St Andrew, St James); four Type B (Westmoreland, Manchester, St Ann, St Catherine) and seven Type C parishes (St Thomas, Portland, St Mary, Trelawny, Hanover, St Elizabeth, Clarendon).

---

Figure 1  Jamaica: Parishes, regions and location of public hospitals, by type/level of hospital
Results

A total of 151 pregnancy-related deaths were identified, including six late pregnancy deaths (43–364 days postpartum): gestational hypertension (2) complicated by renal failure and a cerebrovascular accident, puerperal sepsis (2), puerperal cardiomyopathy (1) and choriocarcinoma (1). There were three fortuitous deaths (burns to lower abdomen [housefire], sarcoma, hepatocellular carcinoma). Cause of death could not be determined for one woman. All are included for completeness.

Maternal mortality may be examined relative to the population at risk (women of childbearing age), or restricted to those giving birth, the traditional definition. Table 1 shows that when 1993–1995 is compared with 1981–1983, the age-specific mortality rate among women 15–44 years declined from 29.7 to 26.4/100 000 women (P < 0.005) but no change occurred in the maternal death rate/100 000 women 15–44 years (3.09 and 3.45, respectively) or the maternal mortality ratio (106.2 and 118.6/100 000 live births, respectively). Hospital maternal deaths account for 11.6–11.7% of registered deaths among women 15–44 years. When community deaths were included in 1981–1983 (n = 193), maternal deaths represented 15% of deaths in this age group.

Direct obstetric deaths

Table 2 presents recent trends in cause of death. The leading causes remain gestational hypertension and haemorrhage, with thromboembolism now ranked third. Genital tract sepsis and genital tract trauma (uterine rupture = 7; bladder perforation = 1) share fourth place. Five cases of uterine rupture were due to obstructed labour, with two associated with inappropriate use

| Table 1 | All-cause and hospital maternal death rate among reproductive age women, a and hospital maternal mortality ratio, b Jamaica: 1981–1983 and 1993–1995 |
| --- | --- | --- | --- |
| Review period | All causes | Maternal deaths | Maternal mortality ratio |
| | N | Rate a | N | Rate a | N | Rate b | % deaths in age group due to maternal causes |
| 1993–1995 | 1290 | 26.4 | 151 | 3.09 | 151 | 106.2 | 11.7% |
| 1981–1983 | 1283 | 29.7 | 149 | 3.45 | 149 | 118.6 | 11.6% |
| Relative risk c | 0.89 (0.82–0.96) | 0.89 (0.71–1.12) | OR = 0.89 (0.71–1.12) | 1.00 (0.81–1.24) |
| P-value | 0.0026 | ns | ns | ns |

| Table 2 | Trend in maternal deaths in hospitals, by cause: number and ratio per 100 000 live births |
| --- | --- | --- | --- |
| | No. | Ratio | No. | Ratio | No. | Ratio |
| TOTAL | 151 | 106.2 | 53 | 119.7 | 149 | 118.6 |
| Direct deaths | 121 | 85.1 | 41 | 92.6 | 124 | 98.7 |
| Gestational hypertension | 51 | 35.9 | 19 | 42.9 | 40 | 31.8 |
| Haemorrhage | 25 | 17.6 | 6 | 13.5 | 26 | 20.7 |
| Thromboembolism | 18 | 12.7 | 3 | 6.8 | 10 | 8.0 |
| Genital tract sepsis | 8 | 5.6 | 4 | 9.1 | 3 | 2.4 |
| Genital tract trauma | 8 | 5.6 | 3 | 6.8 | 3 | 2.4 |
| Abortion | 4 | 2.8 | 3 | 6.8 | 7 | 5.6 |
| Ruptured ectopic pregnancy | 2 | 1.4 | 2 | 4.5 | 13 | 10.4 |
| Anaesthesia | 2 | 1.4 | 0 | – | 4 | 3.2 |
| Choriocarcinoma | 2 | 1.4 | 0 | – | 3 | 2.4 |
| Other direct | 1 | 0.7 | 1 | 2.3 | 3 | 2.4 |
| Indirect deaths | 26 | 18.3 | 10 | 22.6 | 21 | 16.7 |
| Diabetes mellitus | 5 | 3.5 | 1 | 2.3 | 3 | 2.4 |
| Cardiac disorders | 4 | 2.8 | 2 | 4.6 | 2 | 1.6 |
| Sickle cell disease | 4 | 2.8 | 4 | 9.0 | 8 | 6.4 |
| Pneumonia | 2 | 1.4 | 2 | 2.3 | 0 | – |
| Other indirect deaths | 11 | 7.7 | 2 | 4.6 | 8 | 6.4 |
| Fortuitous deaths | 3 d | 2.1 | 2 | 4.5 | 2 | 1.6 |
| Uncertain | 1 | 0.7 | 0 | – | 2 | 1.6 |

a Per 100 000 census population (age 15–44); 1991 (542 769*3) and 1982 (479 290*3).
d Sepsis (3), haemorrhage (1).
of misoprostol (Cytotec) and pitocin to induce labour. One notable improvement is a decrease in deaths due to ruptured ectopic pregnancy (\( P = 0.012 \)), which has steadily declined from 10.4 to 4.5 to 1.4/100,000 (n = 2).

### Indirect obstetric deaths

The most common medical problems complicating pregnancy were diabetes mellitus (5), cardiovascular disorders (4), including two cases of rheumatic heart disease, sickle cell anaemia (4) and pneumonia (2).

### Access to care: region of residence and obstetric services in mother's parish of residence

Emergency obstetric care is critical to survival when complications develop. Tables 3 and 4 compare the current series with previous studies (1986–1987, 22%; 1981–1983, 18%). Among those delivering at \( \geq 28 \) weeks gestation, the perinatal mortality rate (PMR) was 273/1000 deliveries, an improvement over the 375/1000 in 1986–1987 (\( P = 0.01 \)). When women who died undelivered after 28 weeks gestation are included, the fetal carnage rate rises to 462/1000 (46%), similar to the 490/1000 seen in 1986–1987. The PMR in the general population is 38/1000.

### Pregnancy outcome

One-quarter (26%) of women died undelivered; greater than in previous studies (1986–1987, 22%; 1981–1983, 18%). Among those delivering at \( \geq 28 \) weeks gestation, the perinatal mortality rate (PMR) was 273/1000 deliveries, an improvement over the 375/1000 in 1986–1987 (\( P = 0.01 \)). When women who died undelivered after 28 weeks gestation are included, the fetal carnage rate rises to 462/1000 (46%), similar to the 490/1000 seen in 1986–1987. The PMR in the general population is 38/1000.

### Discussion

Jamaica, a Caribbean nation of 2.4 million, is a lower middle income economy (per capita GNP: US$1540,\(^{18}\) crude birth rate: 24/1000; total fertility rate: 2.81\(^{19}\)). Most (89%) deliveries are attended by a trained practitioner.

As with all causes mortality, an epidemiological transition is underway for maternal deaths. The leading causes of death now hinge on quality of care and the demographic transition: gestational hypertension, thromboembolism and indirect causes. Declining fertility and development shifts childbearing into the
thirties when women are at increased risk of hypertension and indirect causes, while the high parity group at risk of haemorrhage and sepsis declines. The result is stagnation in the maternal mortality ratio.

Public hospital deliveries have increased in prevalence from 70% (1981–1983) to 73% (1986–1987) to 82% (1993–1995). Of the total maternal deaths reviewed previously, 78% and 79%, respectively, occurred in these hospitals suggesting that when complications develop, women will be brought to hospital, unless death is precipitate. Women have also shifted away from the basic and toward the comprehensive EOC facilities (from 69% to 73% to 78% of public hospital births for the three periods). Thus there is no evidence to suggest that home births are on the rise, with the risk of increased maternal deaths outside of hospitals. Private hospitals only attend 5% of births.

**Direct deaths**

Women with haemorrhage were 1.86 times (95% CI: 1.06–3.24; \( P = 0.03 \)) more likely to die in under 24 hours than those dying from other causes. We must ensure that the skills to manage this complication exist at all types of facilities along with blood, blood products or plasma expanders as haemorrhage rarely sends warning signals and prompt intervention is essential.

The reduction in deaths due to ectopic pregnancy may be due to use of pelvic ultrasonography. Thromboembolism continues to take a heavy toll, with an apparent failure to detect and treat deep vein thrombosis or respond to women who complain of shortness of breath. Deaths from obstructed labour could be prevented by use of the partograph to identify problem deliveries earlier as patients may have to be transferred.

**Indirect deaths**

While the number of indirect deaths was small, they occurred to low-risk women (para 2–3 women in their twenties). Routine screening is indicated for women at high risk of gestational diabetes (age \( \geq 30 \) years, obese/overweight, previous fetal macrosomia \( \geq 4000 \) g) and to identify sickle cell anaemia. All women with medical problems should be treated as high risk and managed in the comprehensive obstetric facilities in close collaboration with the internal medicine team.

**Access to care**

Distance and delay in treatment are the main factors determining maternal death. In Zambia where mortality is high and in the US where it is low, there is measurable added risk for residents of remote areas. In Jamaica the rural/urban split is more marked in parishes with less sophisticated health care (rural population: Type A parishes: 23%, Type B: 55%, Type C: 80%).

Time away from the family and long distances profoundly affect women’s willingness to seek care. We therefore aim to increase access to care by establishing weekly outreach high-risk antenatal clinics in Type C parishes. These clinics see referrals from primary care midwives and general practitioners and separate out low-risk women who need reassurance and basic treatment (e.g. sexually transmitted disease, anaemia, assessment of pelvic adequacy for primiparae) from women who need more intensive management. They also reduce overcrowding at the Type B hospital antenatal clinics. Service deficiencies in the north east region are receiving urgent attention, with an additional obstetrician now in place and a third slated to join the team later in 2000.

We also need to examine the obstetric content of the medical and midwifery curriculum, and the obstetric experience of interns, residents and midwives to improve their competency in dealing with the more common complications.

**Quality of care**

Once issues of access are resolved, further improvement will depend on offering better quality services. At a retrospective review of health records, some notes were inadequate or indecipherable. Staff need to write clearly and in more detail. Lack of information in the records has been associated with substantial shortfalls in quality of care and has medico-legal implications.

Failures to recognize and appropriately act on signs and symptoms; inappropriate management of complications; delays in intervention and decisions to transfer patients to the required level of care; delays among junior medical staff in seeking consultant advice; failure of consultants to adequately supervise junior staff, all contributed in varying ways to some of these deaths.

Patient responsibility should be recognized, as some failed to present to hospital despite advice from primary care or hospital staff. We must, however, accept blame for ineffective patient education. Tools may be compromised if they ignore patient literacy, level of interest in reading versus oral and pictorial forms of communication, and whether patient’s identify with subjects in posters or leaflets.

All deaths are to be investigated. Next-of-kin are to be interviewed by primary care officers to identify social contributors to mortality. Primary and secondary care personnel are encouraged to share findings at a joint interdisciplinary death conference where they seek to achieve consensus regarding cause of death, recognition of avoidable factors and initiation of preventive measures at the local level. Findings are reported to the national level. These meetings should not be limited to deaths but should review management of all life threatening complications.

The regional variations suggest that with better allocation of skilled resources and more attention to quality of care, including patient education, we can reduce maternal mortality by at least 50% within current resource constraints. Community involvement is critical, as only when communities take responsibility for resolving the challenges to the their health will true and lasting improvement in health status be achieved.

**KEY MESSAGES**

- Type A hospital (comprehensive EOC (essential obstetric care): obstetrics; other tertiary care).
- Type B hospital (comprehensive EOC: obstetrics, paediatrics, general medicine, surgery).
- Type C hospital (basic EOC—no obstetrician).
References