

Reproductive Mortality in Two Developing Countries

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Abstract. Reproductive mortality includes mortality attributable to pregnancy, termination of pregnancy, childbirth and its sequelae, and contraception. Reproductive mortality has been estimated for the United Kingdom, the United States, and for states of the US. However, it has not previously been measured for developing countries, where maternal mortality often remains distressingly high. This paper reports on data from one governorate of Egypt, where reproductive mortality was 46 per 100,000 married women ages 15–49

(2.2 per cent of this was attributable to contraception), and one province of Indonesia, where reproductive mortality was 70 per 100,000 (of which 1.4 per cent was due to contraception). In both locations, complications of pregnancy and childbirth were a leading cause of death in the age group studied (the first cause in Indonesia, second in Egypt). Contraceptive prevalence was 24 per cent of married women ages 15–49 in Egypt and 48 per cent of this age group in Indonesia. (*Am J Public Health* 1986; 76:134–138.)

Introduction

Reproductive mortality includes mortality attributable to pregnancy, termination of pregnancy, childbirth and its sequelae, and contraception.¹ Maternal mortality remains at distressingly high levels in Third World countries. Deaths due to pregnancy, abortion, and childbirth are likely to decline only if there is a marked improvement in obstetric care coupled with widespread adoption of family planning. Contraception reduces maternal mortality by reducing the number of pregnancies, especially those to women in high-risk groups, i.e., older women and women with many births. At the same time, contraception itself also carries a small but measurable risk. In developed countries, as mortality due to childbirth has decreased, deaths due to fertility control have become relatively more important.^{1–3}

The majority of the world's women are in developing countries where data on reproductive mortality are seriously lacking. This study was undertaken to determine in two developing countries the causes of death to women of reproductive age, the level of reproductive mortality, and the proportion of reproductive deaths due to pregnancy/delivery and to contraception.

Methods

Two sites were selected for the study: the province of Bali in Indonesia, and the governorate of Menoufia in Egypt. These sites were chosen for: 1) prevalence of contraception; 2) an expected number of deaths sufficient for analysis; and 3) the likelihood of locating a high proportion of deaths. Because of the smaller population and lower death rate in Egypt, the study ran there for three years (January 1, 1981 to December 31, 1983).

Locating Deaths

Deaths occurring to women of reproductive age were identified from lists of all deaths. Lists of deaths were obtained in different ways for the two sites.

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Menoufia—Vital registration in Egypt is more than 96 per cent complete,⁴ and death lists were obtained from official records. In this study, one death was located by the interviewer before it had been registered.

Bali—In Indonesia, there is no vital registration. Family planning field workers make regular monthly visits to assigned areas and are each responsible for a population of similar size—a group of small villages, a single larger village, or a part of a town. The field workers were asked to list all deaths in their villages during the previous month; they did this in consultation with village heads who keep records of births and deaths within their area. To estimate the proportion of deaths identified, we compared the age-specific death rates we found with those from a study using a different method of death identification.⁵ We estimate that we were able to locate between 45 per cent and 50 per cent of the deaths. Estimates of rates are, therefore, adjusted for undercount, and these rates are consistent with a life expectancy at birth of 57.5 years that has been estimated for Bali and East Java.⁶ Although difficult to quantify, the most likely biases resulting from this serious undercount are: 1) women who use family planning are overrepresented, since family planning workers are more familiar with family planning acceptors and would be more likely to be aware of their deaths; 2) deaths in remote areas are underrepresented, since family planning workers are less likely to make regular visits to those areas. No data are available to test these two theories. However, only 26 per cent of women were using contraception at the time of death (34 per cent of the deaths unrelated to pregnancy) compared with 48 per cent for all women in Bali. We found no difference between older and younger women in the probability that the death would be reported. Deaths occurring in hospital were reported by the hospital. Thus, even though the field workers in the villages where the deceased lived only reported between 45 per cent and 50 per cent of the hospital deaths, the study was able to include all deaths from the complete lists provided by the hospital.

Data Collection

Trained interviewers visited the surviving family members and administered a standardized, pretested questionnaire on sociodemographic factors, symptoms of the disease that led to death, and reproductive and contraceptive history. The husband was interviewed in 78 per cent of the cases in Bali and in half the cases in Menoufia; the mother or mother-in-law was interviewed in 46 per cent of cases in Menoufia.

Assigning Cause of Death

Completed questionnaires were evaluated by physicians and a cause of death assigned.

Menoufia—In Menoufia, a panel of physicians met regularly to discuss cases. In most cases the diagnosis was made by a single physician, although questionable cases were discussed by the panel. The panel consisted of a pathologist, an obstetrician-gynecologist, an internist, and specialists in infectious diseases and public health; all were from the governorate in which the study was conducted. To assess the reliability of the diagnoses in the Egyptian study, a 10 per cent random sample of first-year data was rediagnosed during the second year by the panel. Of the 70 cases reexamined, 39 had an identical diagnosis, and 23 were in the same broad disease category. Among the eight cases with disagreement were four in which there was a reordering of the underlying and contributing causes. The most important result was a small increase in the percentage of deaths attributed to disease of the circulatory system, from 33 per cent to 36 per cent. The most stable categories, as expected, were trauma, malignancy, and pregnancy-related deaths.

The person making the diagnosis of the cause of death was intended to be unaware of the contraceptive practice of the deceased, but blinding procedures were not always followed in the first year of the study. For this reason, all women identified as using contraception at the time of death were rediagnosed at the same time as the random sample described above. For these 44 rediagnosed cases, 32 had an identical diagnosis, and seven remained in the same broad disease category. In the second and third years, the blindness procedures were correctly followed.

Bali—In Bali a majority of cases were diagnosed by one physician, a pathologist, with access to a panel of local physicians (specialists in internal medicine, obstetrics and gynecology, and public health) for more difficult cases. In Bali, the degree of consistency when cases were rediagnosed was greater, but the reasons for discrepancy were very similar. It should be noted, however, that consistency does not imply accuracy.

Assignment to one of 10 broad categories of disease (such as disease of the circulatory system) was generally straightforward, even if the precise cause (such as ischemic heart disease) could not be determined with certainty. A cause of death could not be assigned in 5.1 per cent of cases in Menoufia and in 7.8 per cent of cases in Bali. It is important to note that a relatively large proportion of deaths occurring at the reproductive ages are due to acute conditions (such as trauma, infection, pregnancy complications) without contributing conditions. This greatly facilitates assignment of a cause of death, because acute conditions are more easily diagnosed than the multiple, chronic conditions from which older people often die. In the absence of autopsy data, it is difficult to validate this method of diagnosing cause of death. In Bali, information from the attending physician was incorporated into the diagnosis; in Menoufia, this was not available. We are currently comparing our data from Menoufia with the cause of death on the death certificates; our data appear to be the more accurate.

The cause of death was coded using a modification of the ICD-9 Basic Tabulation List.

A troublesome aspect of this study is the absence of other data to support or refute our methodology or our findings. Death registration in Egypt has been found to be complete,⁴ but there are no available data on cause other than

TABLE 1—Causes of Death to Married Women Aged 15–49 in Menoufia, Egypt, 1981–83, and Bali, Indonesia, 1980–82

Cause of Death*	Menoufia, Egypt N = 1691		Bali, Indonesia N = 1214	
	%	Rank	%	Rank
Diseases of the circulatory system (25–30)	28.1	1	12.7	3
Complications of pregnancy, childbirth and the puerperium (38–41)	22.8	2	23.0	1
Trauma (E47–E56)	14.4	3	9.6	4
Malignant neoplasms (09–17)	7.6	4	9.2	5
Infectious & parasitic diseases (01–07)	7.3	5	21.5	2
Diseases of the digestive system (34)	4.7	6	5.5	7
Diseases of the genito-urinary system (35–37)	3.7	7	1.5	9
Diseases of the respiratory system (31–32)	3.0	8	5.7	6
Miscellaneous (18–20, 225, 25–28, 42, 54)	3.0	9	3.2	8
All other causes (15, 21–24, 43, 44)	0.3	10	0.4	10
Unknown cause** (46)	5.1		7.8	

*Numbers refer to WHO's Basic Tabulation List.

**This includes sudden deaths and deaths from acute abdomen.

vital registration. Data from Bali do not exist: data from East Java⁴ are not entirely comparable because they were collected over a shorter period of time and covered a smaller population than our study. The more intensive nature of the East Java study (annual household surveys) should have found a larger proportion of deaths.

Results

In both Menoufia and Bali, complications of pregnancy emerged as a leading cause of death. It was the first cause in Bali and the second cause in Menoufia, accounting for almost one-fourth of the deaths in both areas (Table 1). Maternal mortality ratios per 1,000 live births were 26 per cent higher in Bali than in Menoufia. Although most women in both areas are delivered by traditional birth attendants, access to medical care is more widespread in Menoufia than in Bali, both in terms of the number of facilities and geography. Thus women with obstetric emergencies are more likely to reach hospital or be seen by a physician in Menoufia.

Reproductive mortality in Menoufia in 1981–83 was 46 per 100,000 women ages 15–49, of which only 2.2 per cent was attributed to contraception. In Bali in 1980–82, reproductive mortality was 70 per 100,000 women, of which 1.4 per cent was due to contraception (Table 2).

In Menoufia, reproductive mortality rates were similar for older and younger women. But in Bali, due to their lower fertility rates, older women had a reproductive mortality rate 28 per cent lower than younger women. In England, Wales, and the United States, older women have a reproductive mortality rate twice that of younger women, and more than three-fourths of their rate is due to oral contraception.^{1–3} In both Menoufia and Bali, on the other hand, reproductive mortality is dominated by maternal deaths. Deaths related to contraceptive use were rare and found only among women over age 30 (Table 2). In Menoufia, contraceptive-related deaths over the three years of the study are estimated at 9 in 68,583 users of contraception, or 4 per 100,000 users per year. All of these deaths were associated with oral contraception.

TABLE 2—Reproductive Mortality Rates per 100,000 Married Women Aged 15–49 in Menoufia, Egypt, 1981–83, and Bali, Indonesia, 1980–82

Ages	Maternal Deaths	Contraceptive Deaths	Total Reproductive Deaths	Average Annual Deaths*	Population MWRA**	Reproductive Mortality Rate***
Menoufia, Egypt						
15–29	186	0	186	62	126 475	49.0
30–49	199	9	208	69	159 189	43.3
Total	385	9	394	131	285 764	45.8
Bali, Indonesia†						
15–29	294	0	294	147	177 190	83
30–49	264	8	272	136	225 896	60
Total	558	8	566	283	403 086	70

*Deaths are for 3 years in Egypt, 2 years in Indonesia.
 **Married women of reproductive age. Source: Bali—1980 Census of Population, Bali Province. Central Bureau of Statistics. Jakarta 1983. Menoufia—1981 population is projected from 1976 census of population data provided by the Central Agency for Public Mobilization and Statistics, Cairo.
 ***Per 100,000 married women of reproductive age per year.
 †As noted in the text, we estimate that 45–50% of deaths were located. However, adjusting for different estimations of levels of coverage, the reproductive mortality per 100,000 married women is shown here:

Age	25%	50%	75%	100%
15–29	166	83	55	42
30–49	120	60	40	30
Total	140	70	47	35

A single pregnancy and delivery in Menoufia carried 48 times the risk of death as a year of contraceptive use.

In Bali, contraceptive-related deaths over the two years of the study are estimated at 8 in 188,241 users of contraception, or 2 per 100,000 users per year. However, if we located only 25 per cent of all deaths, rather than the 50 per cent we estimated, then contraceptive-related deaths would be 4 per 100,000 users per year, as in Menoufia. Most of the deaths were associated with intrauterine contraception. Using the 50 per cent location figure, a pregnancy and delivery was 120 times more likely to result in death than a year of contraceptive use in Bali.

Although contraceptive-related deaths were proportionately less frequent in Bali than in Menoufia, Bali had one-third more reproductive deaths than Menoufia (70 per 100,000 women of reproductive age compared with 46/100,000). However, among women age 30 and over, the difference was smaller (60 per 100,000 in Bali compared with 43/100,000 in Menoufia), as shown in Table 2, largely due to lower age-specific fertility rates among the older women in Bali relative to Menoufia.

Women who died were less likely to have been using contraception at the time of death than women in the general population. In Menoufia, overall contraceptive prevalence was 24 per cent,⁷ and in Bali prevalence was 48 per cent.⁶ Among women dying from causes unrelated to pregnancy, only 9 per cent in Menoufia and 34 per cent in Bali were using family planning. Information on contraceptive use was obtained only from family members in Menoufia, but in Bali, family members' reports were confirmed by family planning clinic records.

Oral contraception is the method most commonly chosen by contraceptive users in Menoufia. And in Menoufia, among women over age 30, there was a two-fold risk of cardiovascular events (hypertensive disease, ischemic heart disease, acute myocardial infarction, cerebrovascular disease, thromboembolism) among pill users relative to users of other methods of contraception and nonpregnant nonusers. By calculating the difference between the observed number of deaths (19) and the expected number (10), we attributed

nine of the 19 deaths from heart disease in pill users to the use of the pills (see Table 3).

Few women who died in Bali had been oral contraceptive users (only 15 per cent of all family planning users choose this method); only one death due to cardiovascular disease occurred among users of oral contraception. (A 37-year-old hypertensive woman who died from a stroke had been taking oral contraceptives for several years even though another method had been recommended by clinic personnel.) Although we find the same two-fold risk of death from cardiovascular disease among pill users that we found in Menoufia, the confidence limits are wide and include unity.

Epidemiologic studies in the West have found an increased risk of ectopic pregnancy⁹ and pelvic inflammatory disease (PID)^{10–12} associated with intrauterine device (IUD) use. Both of these conditions can be difficult to diagnose. We found three cases of ectopic pregnancy in Menoufia, none of them in IUD users, and no cases in Bali (Table 4). Because of the difficulty in diagnosis, we looked also at women dying with acute abdomen of unknown origin. In Menoufia none of the women dying with this symptom had been IUD users, but

TABLE 3—Deaths from Cardiovascular Disease in Oral Contraceptive Users and Nonusers Aged 30–49; Menoufia, Egypt, 1981–83, and Bali, Indonesia, 1980–82*

Cause of Death	Menoufia		Bali	
	OC User	Nonuser	OC User	Nonuser
Cardiovascular disease**	19	109	1	29
All other causes***	59	755	10	614
Odds ratio	2.2		2.1	
95% Confidence Intervals	1.3, 3.8		0.3, 16.3	

*Pregnancy-related deaths are excluded from the Table.
 **Hypertensive disease, ischemic heart disease, acute myocardial infarction, cerebrovascular disease, thromboembolism.
 ***Rheumatic heart disease, cardiopulmonary disorders and all other heart and circulatory disorders are included in this category. When these conditions are included in the cardiovascular category the odds ratio is 1.0 (0.6, 1.6); when excluded from both categories the odds ratio is 1.9 (1.1, 3.4).

TABLE 4—Number of Deaths from Ectopic Pregnancy, Pelvic Inflammatory Disease (PID), or Acute Abdomen in IUD Users and Nonusers Aged 15–49 in Menoufia, Egypt, 1981–83, and Bali, Indonesia, 1980–82

Cause of Death*	Menoufia		Bali	
	IUD User	Nonuser	IUD User	Nonuser
Ectopic pregnancy	0	3	0	0
All other causes (except PID, acute abdomen)	23	1271	249	665
Odds ratio	0.0		**	
Upper 95% Confidence Interval	131.8			
PID	0	2	0	2
All other causes (except ectopic pregnancy, acute abdomen)	23	1271	249	665
Odds ratio	0.0		0.0	
Upper 95% Confidence Interval	238.0		10.9	
Acute Abdomen	0	10	6	13
All other causes (except ectopic pregnancy, PID)	23	1271	249	665
Odds ratio	0.0		1.2	
(Upper) 95% Confidence Interval(s)	31.1		0.4, 3.5	

*Pregnancy-related deaths are excluded from the Table.
 **Undefined because of empty cells in the Table.

TABLE 5—Reproductive Mortality Rates per 100,000 Women in Two Developed Countries (England/Wales; United States) and Two Developing Countries (Menoufia, Egypt; Bali, Indonesia)

	Age (years)				
	15–34	20–34	25–34	35–44	35–49
England/Wales 1950 ¹	—	—	8.7	6.2	—
England/Wales 1975 ¹	—	—	2.4	5.0	—
United States 1955 ²	8.4	9.8	—	6.4	—
United States 1975 ²	1.6	1.9	—	3.8	—
Massachusetts 1981 ³	0.9	—	—	1.5	—
Menoufia 1981–83*	48.1	50.2	51.4	50.1	42.5
Bali 1980–82*	80.1	79.9	78.3	68.5	57.4

*Married women only.
 NOTE: Superscript numbers 1, 2, 3 refer to citations in reference list.

and a correspondingly lower birth rate among high-parity older women. On the other hand, women in Menoufia have relatively easier access to hospital in cases of emergency, which probably explains why the maternal death rate is lower than in Bali. The birth rate in East Java (and almost certainly in Bali) has been almost halved since the development of the national family planning program (to 24.6 in 1981), and this fact alone has contributed enormously to reduction in maternal mortality, with only minimal increase in contraceptive-related mortality. In Egypt, the decline in the birth rate has been much slower (36.9 in 1982),⁷ so more impressive declines in maternal mortality can be expected in the future. Indeed, about half of the maternal deaths (52 per cent in Menoufia and 47 per cent in Bali) were to women who had already had at least four live births. High-parity women are often the first target of family planning programs.

Many of the reproductive deaths occurring in both Menoufia and Bali are preventable through increased use of prenatal care and training of traditional birth attendants to identify and refer high-risk patients before emergencies develop. Many of the deaths due to hemorrhage and sepsis could have been prevented had the deliveries occurred in facilities with drugs and blood transfusions available. A smaller proportion of the eclamptic deaths could have been prevented given adequate prenatal care and appropriate management. Deaths from ectopic pregnancy and thromboembolism are the least preventable.

The most important finding to emerge from this study which remains firm in spite of methodologic shortcomings is that reproductive mortality is high in these two sites, and that almost all reproductive deaths are due to pregnancy and childbirth rather than contraception.

Table 5 shows reproductive mortality rates for two developed countries and for sites in one developed and two developing countries. Beral reported that in England and Wales reproductive mortality in 1975 was less than one-third what it was in 1950 for women aged 25–34. At the later date, reproductive mortality stood at 2.4 deaths per 100,000 women aged 25–34, compared with 8.7 per 100,000 women in that age group 25 years earlier. For older women (ages 35–44), the improvement was less marked, declining from 6.2 to 5.0 per 100,000 women.¹ Sachs and colleagues reported similar decreases between 1955 and 1975 for the United States,² and even lower rates in Massachusetts in 1981.³

In the United States and in England and Wales, oral contraception has been shown to increase the risk of cardiovascular events in users, especially those over age 30.^{13,14} Most pill-associated deaths in the West are to women who

in Bali six out of 19 were IUD users, giving a slightly increased risk of acute abdomen among users (odds ratio = 1.2, 95 per cent confidence limits are 0.5, 3.3). Examination of these six cases suggested that in two the possibility of ectopic pregnancy could not be ruled out.

We found no cases of PID in current IUD users in either site (Table 4), but one of the two women in Bali diagnosed as having died from PID had recently had an IUD removed.

Thus in Bali, the deaths possibly related to contraceptives are one death from stroke to a woman using oral contraception, one death from infection soon after removal of an IUD, and two possible ectopic pregnancies in women with IUDs. (These two ectopics are not shown in Table 4 because of the uncertainty of diagnosis.) No deaths due to sterilization or methods of contraception other than oral or intrauterine were found in either Menoufia or in Bali.

It is important to note that the estimates of contraceptive-related deaths in Menoufia and in Bali are not strictly comparable because they were estimated differently. In Menoufia, the estimate is statistical (the excess of observed over expected deaths). In Bali, on the other hand, there were too few cases of PID for statistical analysis, and there were no deaths in which ectopic pregnancy was diagnosed with certainty—only cases where the possibility could not be excluded. Thus, this number should be viewed as an upper limit rather than a best estimate.

Discussion

In the West, the greatest advances in obstetric safety were made before the advent of modern methods of family planning, so that when birth rates declined after 1960, further declines in reproductive mortality were possible. In the developing countries today, obstetric advances are technologically possible but not always feasible to apply. Modern contraception has preceded modern obstetric care in many cases and, by reducing birth rates, is making an important contribution to reduced reproductive mortality. Menoufia and Bali illustrate contrasting problems in obstetric care. On the one hand, Bali has a higher prevalence of contraception

also smoke.¹⁵ There were no cardiovascular deaths to pill users under age 30 in either site in this study. These findings are consistent with the research findings from the United States and the United Kingdom.

In 1981, there were 309 maternal deaths in the United States (with a population of 220 million). This research reports 128 deaths per year in Menoufia with its population of only 1.9 million, and 279 deaths per year in Bali, which has a population of 2.6 million. These figures mean that, relative to their population size, Menoufia has 48 times as many maternal deaths and Bali 77 times as many as the United States. It is clear that the potential exists for great strides in reducing reproductive mortality in these two developing countries and that reducing fertility through contraception will make a significant contribution to that reduction.

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Call for Papers for Conference on the Humanities

The Association for Faculty in the Medical Humanities, a section of the Society for Health and Human Values, has issued a call for papers for a conference, to be held during the annual meeting of the Association of American Medical Colleges, October 24-26, 1986 in New Orleans.

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