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Household surveys to evaluate reproductive health programs

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Survey programs since 1972 have documented the reproductive revolution spreading across much of the developing world (Robey et al., 1992; Morris et al., 1981; Kendall, 1979). These survey programs have also revolutionized the use of population-based household surveys with appropriate sample designs to collect accurate data on fertility, contraceptive use and non-use and health and reproductive behavior that impact on childhood mortality. These data have been used to establish baseline indicators and to evaluate impact of health and family planning programs over time. The innovative use of the calendar has led to reliable and comparative data on contraceptive continuation and failure rates (Moreno and Goldman, 1991). In many countries without adequate vital registration systems and/or program service statistics, the results have been used as official data by Ministries of Health at the national and regional level.

The World Fertility Survey (WFS) was the first worldwide program to collect comparable national survey statistics on fertility and family planning. The Demographic and Health Survey (DHS) program followed the WFS and Contraceptive Prevalence Survey (CPS) projects, both conducted until the mid-1980's. In addition, Reproductive Health Surveys (RHS), provided technical assistance through AID’s Participating Agency Service Agreement (PASA) with the Centers for Disease Control and Prevention (CDC), continue a series of surveys begun in 1975, mostly in Latin America, whose focus and methods are like those of the DHS and the CPS projects.

As outlined by Vaessen (1991), national family planning and health surveys provide accurate, objective information that can help policy-makers and program officials make better decisions and/or reallocate resources. They are efficient and unobtrusive if the time of interview can be controlled. They interview only a very small percentage of the population of interest but, by using probability sampling techniques, are representative of the entire group. Also, unlike program statistics, surveys cover non-users as well as users of services.
The AID-sponsored survey programs have become the standard world-wide even as data needs and questionnaire content have expanded from family planning to infant and maternal health to reproductive health. There are now new information needs to support a greater program accountability based on data that document change. The documentation of change may not only be at the national level but also at the sub-national level, for special populations and/or to evaluate specific projects. Special populations may include young adults and groups targeted for STD/HIV prevention. Additional indicators such as maternal morbidity and maternal mortality have important implications for sample size.

**Issues**

Let us look at some of the issues related to data collection by population-based household surveys. Six areas are of interest: length of interview, sample size, comparability of survey results, survey content, technical assistance costs and timing of repeat surveys.

Length of interview has become a serious problem as demands for information have increased. Both DHS and the Centers for Disease Control and Prevention (CDC) have discovered that long interviews (greater than 45 minutes on the average) lead to both interviewer and respondent fatigue and may affect quality of data. Quality of data related to long survey instruments continues to be a subject of serious discussions at demographic forums. In Paraguay, the interview time in the national reproductive health survey pretest shifted from 25.6 minutes when the respondent was nulliparous or primiparous to a maximum of 61.2 minutes!

In the old days, if we just wanted to measure contraceptive prevalence for three domains within a country, we needed about 3,000 women to obtain estimates within four percentage points in each domain (with a 95% confidence interval). However, if you want to compare prevalence every 3 or 4 years to measure program impact, an interval in which you may expect a 4 or 5 percentage point increase, sample size and costs obviously have to increase if you want to establish a significant difference among population sub-groups.

If you want a reliable estimate for infant mortality or maternal mortality, sample size requirements can jump to 9,000 women. Obviously, although contraceptive prevalence and other health indicators can be estimated at sub-national levels, maternal mortality and infant mortality may usually only be estimated at the national level and, at best, for urban and rural areas within a country.

Changes in survey content for special population groups or to evaluate specific projects call for great flexibility. Should male surveys include the husbands of women selected in the sample or should they be an independent sample? If you need information on unmarried males and their sexual activity and use of condoms, you need an independent sample (NFPB-Jamaica, 1995).
There has also been increasing interest in education and service programs for young adults to reduce unintended pregnancies in younger women. Since 1985, Young Adult Reproductive Health Survey (YARHS) have collected information about the sexual experience and contraceptive use of married and unmarried young people ages 15-24, both men and women (Morris, 1993). These household surveys have interviewed representative samples of youth in Jamaica, the Dominican Republic and Costa Rica and in 10 cities of five other Latin American countries. The YARHS are helping policy makers become aware of the extent of unprotected premarital sexual activity and unintended pregnancy among urban youth (Yinger et al., 1992). The results point to the need for better sex and reproductive health education in and out of schools as well as for innovative family planning services that provide access to contraceptive information and supplies for youth who are at risk of unintended pregnancy. In addition, several reproductive health surveys in Latin America have included a young adult module for women 15-24 years of age.

**Maternal mortality**

Since the mid-1980's, surveys have collected data on maternal and child health care in addition to family planning. Data have been collected on pre-natal care, delivery, post-partum care and breast-feeding, and well-baby care, including immunizations and prevalence and treatment of diarrhea and acute respiratory infections. It is now recognized that maternal mortality is the health indicator that demonstrates one of the greatest differentials between developed and developing countries. However, maternal mortality is often underestimated in developing countries. The World Health Organization (WHO) estimates that 500,000 women die every year during pregnancy, childbirth, or abortion, leaving 1 million children orphaned, many of whom die or survive in poor health.

The International Decade of Women, 1975-1985, helped focus attention on the health problems of women. Studies done during this time raised alarm about the magnitude of maternal mortality and led to a "call to action" by the WHO at the International Safe Motherhood conference held in Nairobi in 1987 (Mahler, 1987).

Documenting a reduction in maternal mortality may be difficult due to the significant under-registration of maternal deaths. Lack of awareness of its magnitude stems in part from the fact that maternal deaths are often simply not reported. Even in the United States, with a well-developed vital registration system maternal mortality was shown to be underestimated by 37 percent (Koonin et al., 1988). In Honduras, a study showed that the number of maternal deaths was 4.4 times higher than officially reported (Castellanos et al., 1990).

This degree of under-reporting has highlighted the need for better methods of assessing the true magnitude of maternal mortality. The development and use of instruments which can reliably measure maternal mortality are critical in assessing whether WHO and its member states are meeting their desired goals. Recently, the
method of sibling survivorship has been applied to large household-based health surveys to measure maternal mortality. This has allowed a more reliable, population-based estimation of national maternal mortality ratios than that provided by official statistics.

The Safe Motherhood Initiative, launched in 1987, has led to an increase in studies about the magnitude and determinants of maternal mortality with population-based surveys utilizing the sisterhood method (Graham et al., 1989; Trussel and Rodriguez, 1990). The basic idea of the sisterhood method is to take a sample of women, inquire how many sisters she has, and of these, how many have died during pregnancy, childbirth, or the puerperium.

Maternal mortality estimates from three recent surveys in Ecuador, El Salvador, and Romania are derived from the sisterhood method. Respondents were asked whether each sister, if she has sisters, is still alive. If the sister is still alive, it is only necessary to know her current age; if she has died, additional questions are included to determine how long ago she died, her age at death, and in order to classify deaths as maternal whether the death occurred during pregnancy, childbirth or 6 weeks postpartum.

With these questions asked about sisters it is possible to estimate maternal mortality rates, defined here as annual maternal deaths per 100,000 women ages 15 to 49. The rates can be estimated for specific windows of time during the period before the survey. The width of the time period can be wider or narrower depending on the sample size of the survey. The information on maternal mortality obtained for the sisters can be combined with information on past trends in fertility obtained from the respondents to estimate maternal mortality ratios, which are defined as maternal deaths per 100,000 live births.

Table 1 shows results obtained from the maternal mortality module in the 1994 Ecuador Reproductive Health Survey. The upper panel gives results disaggregated by age for the 14-year period, 1981-1994, and the second panel gives overall results for two 7-year periods of time; 1981-1987 and 1988-1994. In this survey, 13,582 women were interviewed and they provided information on 39,583 sisters. Among this group of sisters there were 205 reported maternal deaths.

The first column presents maternal mortality rates, expressed as annual maternal deaths per 100,000 women ages 15-49, and shows that the rate increases with age. The middle column gives the estimated maternal mortality ratios, expressed as maternal deaths per 100,000 live births. The last column gives fertility rates, expressed as annual births per 1,000 women in the age group. The maternal mortality rate is affected by both the maternal mortality ratio, which is an indicator of the obstetric risk accruing to a given pregnancy, and by the fertility rate which indicates the number of times, on average, that a woman is exposed to that obstetric risk.
Table 1

<table>
<thead>
<tr>
<th>Age group of sisters</th>
<th>Maternal Mortality Rate*</th>
<th>Maternal Mortality Ratio**</th>
<th>General Fertility Rate (per 1,000 women)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24</td>
<td>20.9</td>
<td>146</td>
<td>143</td>
</tr>
<tr>
<td>25-34</td>
<td>31.8</td>
<td>184</td>
<td>173</td>
</tr>
<tr>
<td>35-49</td>
<td>35.2</td>
<td>438</td>
<td>80</td>
</tr>
<tr>
<td>Totals (15-49)</td>
<td>28.1</td>
<td>220</td>
<td>127</td>
</tr>
<tr>
<td>Totals (1981-1987)</td>
<td>40.3</td>
<td>302</td>
<td>143</td>
</tr>
<tr>
<td>Totals (1988-1994)</td>
<td>18.8</td>
<td>159</td>
<td>118</td>
</tr>
</tbody>
</table>

* Per 100,000 women  
** Per 100,000 live births

Comparing the two periods, 1981-1987 and 1988-1994, it can be seen that the maternal mortality ratio was estimated to have dropped by 47 percent from 302 to 159, and that when this is combined with the decrease in fertility from 143 to 118 births per 1,000 women, the result is an even more pronounced decline in the maternal mortality rate from 40.3 to 18.8 maternal deaths per 100,000 women.

Even with the maternal mortality decline estimated from the survey, the rates estimated by vital statistics are lower. In 1993, the most recent year with data available, the maternal mortality ratio estimated from vital statistics was 120 maternal deaths per 100,000 live births. If we compare this with the figure of 159 estimated by the survey for the most recent period, this would indicate that approximately 25 percent of maternal deaths are not registered in vital statistics.
Finally, reproductive health surveillance in Romania has shown the dramatic effects on the levels of maternal mortality of outlawing legal, safe abortions (Figure 1). In the first 10 years after restrictions on abortions were enacted in 1966, a five-fold increase in abortion related deaths was recorded and 99 percent of these abortions were classified as illegal. From 1980 to 1989, the abortion related maternal mortality ratio (MMR) fluctuated between 112 and 148 maternal deaths per 100,000 live births, a level 8 times higher than before the restrictive legislation was enacted. In December 1989, the new Government abolished the laws restricting abortion and contraceptive use. The effect of switching from the use of illegal, unsafe abortions to legal abortions was reflected in the drop of the MMR, beginning in 1990. After many years of high rates of maternal mortality, more than 85 percent abortion-related, the MMR decreased between 1989 and 1992 from 170 to 60 per 100,000 live births, a decrease entirely due to the 60 percent decline in the abortion-related deaths. In 1993, the MMR declined to 53 per 100,000 live births.

Maternal morbidity

Maternal mortality has been referred to as the tip of the iceberg. Millions of women suffer acute and chronic morbidities as a result of pregnancy and childbirth. It is estimated that there are over 100 acute morbidity episodes for every maternal death (Koblinsky et al., 1993). An understanding of maternal morbidity is important because of its relationship to maternal mortality, maternal disability and to perinatal morbidity and mortality. Most studies of maternal morbidity are hospital-based. Since many women in developing countries deliver at home such studies are not representative.
of all births\(^1\). Because of this paucity of information, a WHO working group emphasized the need for population-based studies on maternal morbidity (WHO, 1990).

CDC first added a maternal morbidity module, as well as a maternal mortality module, to the reproductive health surveys conducted in 1993 and 1994, in El Salvador and Ecuador, respectively (ADS, 1994; CEPAR, 1994). These modules were repeated in Paraguay in 1995 and Honduras in 1996 with some modification based on the experience gained in El Salvador and Ecuador. Selected results will be presented here for the two recently conducted national reproductive health surveys which included modules on maternal morbidity in El Salvador and Ecuador. These modules obtained information from women about problems they suffered during pregnancy, childbirth and the puerperium.

Both of these surveys used a three stage probability sample with a first stage selection of census sectors with probability proportional to the number of households in each sector, a second stage selection of households and a third stage selection of one woman of reproductive age, 15-49 years old, in each household. Women who reported a pregnancy which terminated in the 2 to 3 years prior to the survey were asked about the occurrence of specific symptoms and problems during and after their last pregnancy, among which the leading causes of maternal mortality: hemorrhage, infection, hypertensive disorders and prolonged labor.

The total number of women who responded to these questions was 1,945 in El Salvador and 4,290 in Ecuador. In Ecuador several symptoms and signs, primarily those during the antenatal period, were more likely to be reported by women who received medical care. It is unclear whether this is due to the fact that women sought care for these problems or became aware of these problems after receiving care. Bleeding associated with loss of consciousness was lower among hospitalized women but the rate of convulsions was higher, and it still has to be investigated whether referrals explain the higher hospital convulsion rate.

In El Salvador, the percentage of women reporting maternal morbidity was high. The incidence of important causes of maternal morbidity included postpartum bleeding (35 percent), post-partum fever (15 percent), prolonged labor (15 percent), loss of consciousness (11 percent), possible preeclampsia (8 percent), and convulsions (2 percent). The prevalence of antenatal morbidity was higher among women who received prenatal care and raised questions about the interpretation of some self-reported maternal morbidities. The prevalence of morbidity during labor and delivery, on the other hand, was higher among women who delivered at home, when compared with those who delivered in the hospital. Studies such as this are a step toward understanding and preventing maternal morbidity and its sequelae.

\(^1\) Also, women who deliver at home and die during childbirth are often not registered and contribute toward the underenumeration of maternal mortality reports.
Health service utilization in El Salvador improved slightly in the 5-year periods between 1983-1988 and 1988-1993. While 71 percent of women had at least one prenatal visit during their last pregnancy only 56 percent delivered in a hospital. While 36 percent of women were assisted during childbirth by a traditional birth attendant (TBA), 5 percent delivered at home by themselves, without any assistance at all.

Health service utilization is promoted as an important way to improve maternal health. It is therefore desirable to assess the impact of health service utilization on maternal outcomes. While it is not possible to assess its impact on maternal mortality using this type of survey methodology, it is theoretically possible to assess its impact on the prevalence of maternal morbidity. However, this study revealed difficulties in the interpretation of self-reported maternal morbidity information with respect to health service utilization. We found, for instance, that all of the antenatal morbidities which we measured were higher among women who received prenatal care than among those who did not. It is unlikely that prenatal care increases the prevalence of antenatal morbidity. Rather, women who are experiencing problems, such as antenatal bleeding, are more likely to visit a clinic to receive treatment. Another explanation for this finding is that prenatal care increases a woman’s awareness of complications she may be experiencing which might not otherwise be apparent. The prevalence of self-reported anemia is more than double among women who received prenatal care than among those who did not. This is probably due to the fact that during their visit they had their hemoglobin checked and were told they were anemic. Unless a woman’s hemoglobin drops very low she will not be aware that she is anemic.

Because of these contradictions, it is probably more appropriate to look at other indicators of maternal health to assess the effectiveness of antenatal health service utilization. These include outcomes of the pregnancy and the perinatal period such as stillbirth, neonatal death and birth weight. Unfortunately, results of FESAL-93 are limited by the fact that only 48.5 percent of women knew their infant’s birth weight. In addition, the small sample size did not permit an assessment of the impact of antenatal care on perinatal morbidity.

Morbidity during childbirth is probably most closely linked with maternal mortality in developing countries. Given that many of these complications are difficult to prevent, efforts to improve the treatment of obstetric emergencies during labor and delivery are a cornerstone of the WHO’s recommendations to reduce maternal mortality. Hospital delivery is more consistently associated with a lower prevalence of morbidity during childbirth than is prenatal care. With the exception of convulsions, all of the morbidities studied here are more prevalent among women who delivered outside the hospital. There are different ways to interpret this finding. On the one hand it is likely that hospital delivery prevents the occurrence of some of these morbidities (severe bleeding with loss of consciousness, labor > 24 hours, fever). On the other hand, women with complications may develop the complication at home and be referred as quickly as possible to a hospital where the delivery occurs. This referral process
tends to increase the prevalence of complications among women who deliver in the hospital. Under ideal circumstances, all women with complications would deliver in the hospital. Nevertheless, in El Salvador, the prevalence is higher among women who do not deliver in the hospital suggesting that the referral process is not functioning properly.

Complications during childbirth occur among all groups of women. Results of FESAL-93 show little difference, for example, in the prevalence of intense bleeding during childbirth based on area of residence or level of education. However, striking differences are noted in the development of life-threatening bleeding which was defined as bleeding associated with loss of consciousness. Whereas intense bleeding is reported by 28 percent of women with 10 or more years of education and by 30 percent of women with no education, a minimal difference, bleeding associated with loss of consciousness is reported by only 6 percent of women with 10 or more years of education compared with 28 percent of women with no education, a greater than four-fold difference. A similar picture is observed when women from the Metropolitan area (10 percent with life-threatening bleeding) are compared with women from rural areas (25 percent). Hemorrhage is one of the most common causes of maternal mortality. The results observed in FESAL-93 highlight the differences in the likelihood of developing a life-threatening morbidity for different population groups and the need to resolve some of these differences if maternal mortality is to be reduced.

Results on maternal morbidity in the Ecuador survey are, in general, similar to El Salvador, thus contributing to the consistency of self-reported morbidity in the region. However, larger sample size and the validation study (see next section) make the Ecuador data set more attractive for subsequent multivariate analysis. Descriptive findings are presented in detail in the survey report (CEPAR and CDC, 1994). A brief summary of findings are presented here.

About half of women reported dizziness and almost half reported swollen feet. One-fourth reported both anemia and bleeding (25 percent moderate to severe bleeding). Severe bleeding was associated with perinatal morbidity, premature births and low birth weight. Of 2,806 women (70 percent of total sample) who had their blood pressure measured, one in four had high blood pressure with about two-thirds categorized as probable pre-eclampsia.

The four most common morbidities reported during childbirth were intense bleeding (30 percent), premature rupture of the membrane (27 percent), prolonged birth (22 percent), and fever (22 percent). The intense bleeding and premature rupture was reported in a significantly greater proportion of home deliveries. Forty percent of women received antibiotics during the birth or post-partum period. Two-thirds of women with a caesarean delivery received antibiotics. In the post-partum period, at least one-fourth of women reported intense bleeding and/or pain during urination. Another 16 percent reported foul vaginal discharge and 14 percent reported mastitis.
Validation study: Ecuador

A WHO working group on maternal morbidity has stressed the importance of studies to validate self-reported information. The survey in Ecuador provided an opportunity to validate survey findings by comparing women’s reports of maternal morbidity to information obtained from medical records (Lozada et al., 1995).

The validation study included the women who answered questions from the maternal morbidity module and who received care for an abortion or delivery in a public hospital or maternity in the urban areas of Quito, Guayaquil, Cuenca and Machala. All women who delivered in these hospitals were included regardless of their area of residence. Only records from public hospitals were abstracted because of the ease of access of these records and the greater difficulty in obtaining information from private hospitals and clinics. These four cities were selected because of their size and the large number of women attended in their hospitals. Other cities were not included due to economic constraints.

A total of 736 women met the requirements mentioned above to be included in the validation study. Of these, 41 women were not included because data about the date of birth or abortion and/or city or hospital of birth was missing, leaving a total of 695 women. Of the 695 medical records solicited, 528 (76 percent) were located. However, this percentage varied depending on the outcome of the pregnancy (abortion or birth). Only 41 percent of the records pertaining to an abortion were located compared with 78 percent of those related to a birth. Since the percentage of abortion records located was so low it was not possible to validate the information related to abortion morbidity. All subsequent results are limited to births which are defined as pregnancies greater than or equal to 6 months gestation.

The inability to locate 22 percent of the medical records could result in a bias if record loss was not random and certain groups of women were more likely to have "lost" records. However, no important differences in the demographic characteristics were observed (age, residence, education, or socioeconomic status) for these two groups of women. There were also no important differences observed in the morbidity findings for women whose records were and were not located.

An immediate and disturbing finding of the study was the poor quality of the medical records in the hospitals and maternities. There were 10 variables being studied in which more than 20 percent of the records had "no data" or data missing. These variables were eliminated from the validation study. They included contraceptive advice after delivery (79 percent), gestation at first prenatal visit (76 percent), vaccination against tetanus (75 percent), number of prenatal visits (55 percent), placenta delivered completely (38 percent), placenta delivered spontaneously (36 percent), anemia or low iron during pregnancy (30 percent), received prenatal care (26 percent), and hemorrhage during childbirth (24 percent).

For other variables, the percentage of agreement ranged from 53 to 99 percent. Low agreement (less than 67 percent) was found for parity (55 percent), ankle edema (53
(percent), headache (56 percent), number of gestations (65 percent) dysuria (63 percent), membranes artificially ruptured (63 percent), and oxytocic used (64 percent).

Data quality was assessed both objectively and subjectively. Objectively, the percentage of records with no data for each of the variables of interest was analyzed. We found that for some variables more than 50 percent of the records had no information (contraceptive advice after delivery, gestational age at first prenatal visit, tetanus vaccine, number of prenatal visits). It was decided that any variable which did not have information in at least 76 percent of the records would be excluded from analysis. In addition to those mentioned above, this criterion also excluded the questions about whether iron was taken during pregnancy and whether the woman was anemic. Surprisingly, there was also insufficient information about the type of placental delivery (spontaneous or manual) and whether the placenta was complete.

The objective assessment, however, does not present a complete picture of the quality of the medical records. Although most records were actually located, there was disappointment over the poor quality of many of the medical records. It was found that information was often inconsistent. For instance, the number of gestations, abortions, live births and still births would vary from one part of many of the records to another. Some of the health workers would include the present pregnancy in the gravidity count and others would not. There are checkboxes for antenatal problems on the forms, but we suspect that these were not filled out correctly and were often left blank. It was found that women with hypertension during delivery who received phenobarbital (given for preeclampsia) were discharged as normal deliveries.

The general impression is that the low quality of medical records means that for many variables they cannot be viewed as the gold standard. If the medical record is not a gold standard it cannot be used to assess the predictive value (true positive or true negative) of the interviewee’s responses. In fact, for some responses we have more confidence in the self-reported information than in that obtained from the medical record.

A good example is the sex of the child. We would expect a very high degree of agreement (near 100 percent) for this information but we found it to be only 93 percent. While there may always be errors during the survey in checking boxes or in typing in data, generally we would consider the mother to be the gold standard on this question. Thus, this percent agreement (93 percent) could be considered the best that can be expected.

**Conclusion**

There have been significant developments in population-based surveys collecting demographic and health data over the last 20 years, including question wording and sequence, field work methodology, and perhaps most important, the turnaround of data using specially designed data entry/edit software. Surveys have provided accurate, objective information that can help policy-makers and program managers
to make better decisions. Also, unlike service statistics, surveys cover non-users as well as users of public sector services. More recently, the subject matter of these surveys has been extended from the traditional demographic, family planning and maternal and child health to other reproductive health topics such as maternal mortality and morbidity.

The sisterhood method is an indirect technique used to estimate maternal mortality in developing countries where maternal deaths are often poorly registered in official statistics. It has been used successfully in many population-based surveys. The major advantages include its minimal data requirements and analytical simplicity, as well as its lower sample size requirements relative to other estimation procedures. Nevertheless, any population-based survey involves considerable financial and personnel resources and may not have the sample size necessary for sub-national estimates. Another limitation is that this method estimates maternal mortality for a period of about 10 years before the study. Thus, guidelines need to be developed for a more efficient, low cost approach to estimating maternal mortality at sub-national levels.

The collection of maternal morbidity data is a more recent development and may have the greater potential to provide service providers with information on which they can develop intervention strategies to prevent maternal mortality. The consistency of responses on morbidity during pregnancy in several Latin American surveys has been encouraging but definitive validation studies are needed.

References


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