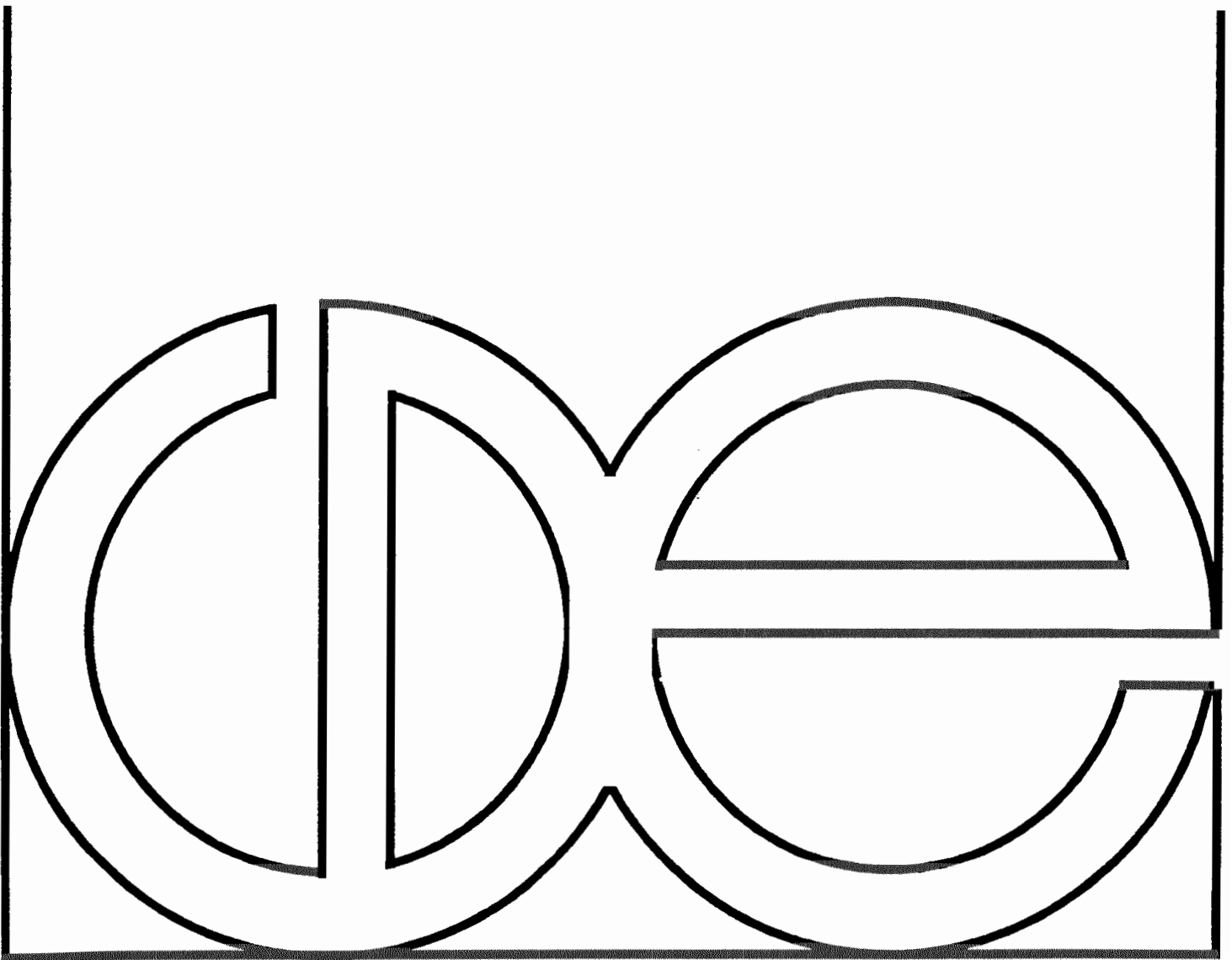


**EFFECTS OF SOCIOECONOMIC DISADVANTAGE
AND WOMEN'S STATUS ON REPRODUCTIVE HEALTH**

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CDE Working Paper 93-18



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Research on the effects of socioeconomic disadvantage and women's status on reproductive health is important for policymakers in developing countries where socioeconomic hardship makes it crucial to use existing maternal and child health care resources to the best advantage. Using multistate hazards models with unmeasured heterogeneity, this study attempts to disentangle the complexities of the role that socioeconomic factors and women's status play on maternal health. The most important finding from the study is that the burden of illness rests disproportionately on the economically disadvantaged women and on women with low social status.

¶ The research is supported by a fellowship from the Rockefeller Foundation. The data were made available by the United Nations Demographic Training and Research Institute of Yaoundé, Cameroon. Special thanks go to Jane Miller for her suggestions. Helpful comments on earlier drafts of this paper were made by Robert Jones and Susan Zimicki. Computations were performed using facilities of the Center for Demography and Ecology at the University of Wisconsin-Madison, which are supported by the Center for Population Research of the National Institute for Child Health and Human Development (HD-5876).

EFFECTS OF SOCIO-ECONOMIC DISADVANTAGE AND WOMEN'S STATUS ON REPRODUCTIVE HEALTH

1. INTRODUCTION

Many people in developing countries live under constant threat of illness and premature deaths, especially women and children. If progress is to be made in the prevention of death and disability associated with reproduction, specific factors that place women at risk must be determined. In developing countries, maternal mortality is estimated to range from approximately 100 to 1000 maternal deaths per 100,000 live births, with the highest levels in sub-Saharan Africa and South Asia (Kwast, 1989). These ratios imply an estimated 500,000 maternal deaths annually, with over 98 percent occurring in developing countries (World Health Organization, 1985). Thus, although a majority of pregnancies proceed normally and are not associated with significant health problems (Potts et al., 1983), there remains considerable potential for reducing the risks associated with pregnancy and childbearing.

The study of maternal morbidity has not attracted much attention from researchers, and hardly specific diseases are discussed in relation to the mortality they cause. To the extent that morbidity is a part of both the quality of development and health status, morbidity differences may be used to identify the onset of ill health of the society and also to locate proper health service system appropriate to specific groups of the population.

Most published data on maternal health in developing countries make references

to maternal mortality (for a review, National Research Council, 1989, pp. 33-35; Zimicki, 1989; Wallace and Giri, 1990). The figures for maternal mortality cannot tell the full story of suffering caused by untreated complications in pregnancy and labour or cumulative health problems of women in their childbearing ages. Though exact figures are not known, it is thought that, for every woman who dies, about sixteen women suffer damage to their health which may last the rest of their lives (WHO, 1980, 1985). Clearly, some forms of maternal morbidity cause untold misery to individual women and their families; yet in many developing societies, ill health associated with childbearing is so common that people tend to accept it as normal and mostly unavoidable, no matter how severe it is.

Research conducted in developing countries on women's health has mostly focused on the relationships between reproductive patterns and maternal health (for a review see Winikoff, 1983; National Research Council, 1989; Zimicki, 1989; Wallace and Giri, 1990). However, the general background of socioeconomic disadvantage, sociocultural problems, adverse traditional attitudes and low status of women are potentially important determinants of maternal reproductive health (World Health Organization, 1980; Kwast, 1989; Ford Foundation, 1991). History has shown that, even when causative factors of a disease are unknown and treatments are unavailable, changes in socioeconomic conditions and literacy rates can reduce ill health and mortality. One example of this phenomenon is the decline in mortality from tuberculosis before the availability of chemotherapy. Still, even when treatments are available, technology cannot always overcome social, economic, and behavioral factors (Jenkins, 1982). Improvements in literacy rates and

in general socioeconomic conditions are generally linked with declines in health differentials between the poor and those who are better off (Feldman, 1982).

Given the problem of maternal morbidity and mortality for women in developing countries, this research is based on the following premises: a) an effective maternal and child health programme can only be developed if the details of the health problems facing mothers are accurately understood; b) to accelerate development of maternity care in African countries and to use limited resources as effectively as possible, health care providers must know the characteristics of patients they serve and the risks associated with those characteristics. The study is designed to provide information on the reproductive histories of women and to identify groups at increased risk of health problems during pregnancy, delivery and postpartum.

We analyze information from the IFORD survey carried out in Yaoundé between 1978 and 1980 to test hypotheses about the impact of socioeconomic disadvantage and women's status on women's health. We show that the effects of socio-economic status, social disadvantage and women's status remain important risk factors for maternal health even after controls for other factors are introduced. Furthermore, we argue that a continuous-time multistate hazard approach is, in theory at least, the best method to analyze the risk factors for maternal morbidity in a longitudinal study. Finally we use continuous-time hazard models with unmeasured heterogeneity to address difficulties engendered by omitted covariates.

In what follows we first describe the relations between socio-economic status, women's status and maternal health, and the difficulties involved in the estima-

tion of effects. Next we discuss characteristics of the Yaoundé data and evaluate its shortcomings. We describe the sample and discuss the cause-specific maternal morbidity levels; and finally, we present modelling strategies and discuss the estimates and their implications.

2. THE RELATIONS BETWEEN SOCIO-ECONOMIC DISADVANTAGE, WOMEN'S STATUS AND REPRODUCTIVE HEALTH

Studies of social differentials in mortality and morbidity rates in developed countries have found that all-cause and cause-specific adult mortality and morbidity rates are inversely associated with socioeconomic status and that those rates are higher in areas with low or no education, poverty, low occupational status, and substandard housing (Institute of Medicine, 1982; Yeracaris and Kim, 1978; Lerner, 1980; Jenkins et al., 1979). A recent Ford Foundation's call for action (Ford Foundation, 1991) has suggested that maternal morbidity differentials in developing countries are at least in part, influenced by socio-economic status, cultural norms, and environmental factors. The general background of socioeconomic disadvantage, sociocultural problems, adverse traditional attitudes and low status of women may be important determinants as well (Kwast, 1989; Wallace and Giri, 1990). It is also been hypothesized that rates of morbidity are determined by the degree of modernization which brings about greater aspirations and increased scale of needs for better living standards.

2.1. Socio-economic status, social disadvantage and the burden of illness

Study variables and the control variables for the study are defined in Table 1. Markers of social disadvantage include employment, education, neighborhood of residence and modern amenities in the dwelling.

(a) Impact of education, employment and housing conditions on health.

Data from developed countries comparing physical and mental health of the poor with the rest of the population provide consistent evidence that socioeconomic status is associated with higher rates of death and disability (Kosa and Zola, 1975; Parron et al., 1982). Evidence of the significant role that socioeconomic factors play in health and disease has been demonstrated directly (Jenkins et al., 1977). Similar health differentials between social classes have been noted in Great Britain, despite major efforts to improve health service availability to the poor (Morris, 1979). Feldman (1982) noted that the greatest differential in mortality rates is associated with the attainment of higher levels of education. Such relationships have not been well documented in developing countries (for review, see Wallace and Giri, 1990). Ware (1984) pointed out that educated mothers are more likely to be better nourished, more willing to ignore harmful food taboos during pregnancy, and less subject to heavy manual work during pregnancy than their less educated counterparts. There are obvious reasons why educated mothers should make more use of modern health facilities, both for preventive and curative purposes. There is ample empirical evidence that supports this. While participation in mass health education campaigns may not be selective of the better educated, most studies

have shown a positive correlation between maternal education and use of modern curative services (Brown et al., 1982). Higher educational attainment and work outside the home are all likely to increase family income, which can be spent on a more nutritious diet, improvements in sanitation and water supply. Better housing, sanitation, diet, and health care, as well as lifestyles that give greater attention to physical and mental health promotion practices, are known to vary significantly with socioeconomic status (Wallace and Giri, 1990; Ford Foundation, 1991).

(b) Contributions of environmental exposure.

A healthy environmental setting is characterized by high national levels of life expectancy and low levels of morbidity from infectious and parasitic diseases. Even under conditions of equal employment, education and other socioeconomic characteristics, individuals living in substandard environmental and sanitary conditions are expected to experience differential exposure to pathogenic agents (e.g., Pelassy, 1976). Theories about the cumulative effects of psychosocial and economic stress have been examined (Jenkins et al., 1979; Brenner, 1982) and show promise of uncovering some mechanisms by which the environment can influence the health of the disadvantaged. Thus, even though physiological mechanisms that translate environmental factors into illness are not well understood, the influence of social disadvantage on the development of disease, on recovery opportunities, and on the survival changes is becoming increasingly clear (Parron et al., 1982; Wallace and Giri, 1990).

(c) Ethnicity and women's health.

Research on hypertension and hypertension-related diseases provides an exam-

ple of the importance of distinguishing factors of socioeconomic status from those of ethnicity (for a review, see Institute of Medicine, 1982; World Health Organization, 1988; Wallace and Giri, 1990; Ford Foundation, 1991). Various harmful effects of traditional practices in certain societies have been observed as a result of food taboos in the treatment of sickness in women and children and the feeding practices prior to, during and after delivery (Wallace and Giri, 1990). As a result, throughout the developing countries, there are women who enter their reproductive cycle generally malnourished or with specific areas of depletion and these conditions are exacerbated during pregnancy and lactation. It is not surprising that maternal weight gain during pregnancy has been associated with the ability to practice prolonged lactation (Wray, 1982). In Guatemala, it has been found that among mothers who breastfed for as long as possible, those who had shorter durations of lactation had gained less weight during pregnancy and had lost weight more rapidly postpartum. Those mothers with longer breastfeeding durations were those who had been able to gain weight more rapidly during pregnancy and, on average, continued to maintain their weight at above pre-pregnancy levels throughout lactation. The impact of the nutritional drain on the mother and duration of lactation may be important in considering another major consequence of breastfeeding -prolonged post-partum infertility. It is well known that full lactation leads to delay in the return of menses and ovulation in the mother, resulting in a lower total fertility in women who choose to breastfeed their children.

While ethnicity may be an important behavioral and social factor predicting health, direct measures of socioeconomic status and social disadvantage are needed

in addition to ethnicity. Since social class may be confounded by ethnic affiliation, attempts to isolate the effects of socioeconomic variables on reproductive health must consider variations within ethnic groups.

2.2. Women's status and women's health

Whether we consider their legal, socio-political, or economic condition, women's status is universally lower than men's, especially in many developing countries. For example: a) social benefits in most of the world are related to participation in the paid labor force, and in much of the world – notably in the Third World – much of the work women do is unpaid let alone acknowledged, either in the home, or in the informal sector of the economy; b) throughout the world, women produce half of the world's food, and in Africa, 80 percent; c) in all countries, women work longer hours than do men and earn less (Wallace and Giri, 1990). Recognition of the longstanding discrimination against women has led to a broader understanding that women's status is a key factor in their ability and desire to control their fertility thereby improving their health status. Discrimination may affect the way health professionals perceive, diagnose, and treat illness of women in their reproductive life. In much of the world, women are more likely than men to be malnourished, poor, and illiterate; they have fewer opportunities to earn income and less access to health care and education. In Africa for example, 36 percent of women are literate as compared with 57 percent of men (Ford Foundation, 1991). It has been found that in many places, changes in social and economic conditions and better-income earning opportunities for women counter traditional incentives

for large families, and improve health for women (Germain and Ordway, 1989). However, it has been difficult to isolate in previous studies from developing countries the effects of education, improved opportunities for women and changes in their socio-economic status on their health (Ford Foundation, 1991). A number of studies from developed countries have reported that lower social class groups have more negative life changes and that social deprivations result in more unstable and unsafe environments and more stressful family and social conditions (Dohrenwend, 1973; Lerner, 1975). Brenner (1982) found evidence to support the concept that incipient tendencies toward illness are exacerbated by increased vulnerability to socioeconomic changes. Social disadvantage also increases the likelihood of receiving inferior treatment (Institute of Medicine, 1982). Some of the characteristics of low status of women are apparent in the practices of polygamy which is common in both rural and urban areas of Africa.

In most African societies, marriage continues to ensure a sense of security and social support for women. As a consequence, the women's health still depends on their family's social and physical environment. The role of social support networks in mediating the effects of stress is a matter of growing interest, both in promoting health and in responding to illness (Hamburg and Killilea, 1979). Disruption of social ties and community contexts is a highly stressful experience for women in most societies where single (voluntarily or not) women with or without children are often stigmatized. In places where early marriage and childbearing are still the norm, the role of the family in health promotion and in prevention, early diagnosis and care of disease is of crucial importance. The major part of health care is

carried out by individuals and families before they come into contact with outside health workers. Women often have no access to information and technology, to income and education, and they are usually overburdened with work. Available evidence suggests that social support can reduce the number of complications of pregnancy for women under high life stress (Nuckolls et al., 1972). Whatever may be the significance of a possible link between marital status and health level, observation at least seems to confirm the existence of an association between the two (Vallin and Nizard, 1977). Most families in polygamous unions in developing countries have limited resources that must be allocated to a variety of family needs. Families with fewer young children to care for are likely to have more resources (including time, food, and money) to devote to the health of each family member. For example, women with smaller families may have more time to go to a clinic for treatment of an illness. There is also the possibility of family competition for resources. In most polygamous unions, many women are prevented from achieving their social status by legal, social, and cultural norms governing the traditional practices inherent to the institution of polygamy. This review highlights the notion that improved reproductive health may be closely interrelated with women's status. Those relationships are considered in this study.

2.3. Control variables.

Aside from problems associated with the available data, studies of the determinants of maternal reproductive health are limited for two main reasons. First, few of the available studies use multivariate statistical techniques to control for

potentially confounding variables. Thus, it is more difficult to conclude that specific high-risk characteristics are causally related to maternal health. This could result in an upward bias in the estimated effects. Second, many studies of maternal health fail to hold constant the effects of other variables.

The socioeconomic factors and women's status cannot be considered in isolation. Women in the lowest strata of society are likely to have been, from birth, the least privileged in nutrition, housing, education and social amenities which, in isolation or in combination, affect their reproductive health. Hence, assessing the effects of socioeconomic disadvantage and women's status on maternal health is complicated by the fact that unobserved factors that affect the social status of women may also affect health outcomes. On the other hand, women with greater concern about health may be both more likely to be of the high social class and more likely to engage in other behaviors that promote good health. In such a case, a simple correlation between socioeconomic conditions and health would overstate the direct effect of the former on the latter. In other cases, women in poor health may be more likely to seek health care because of specific needs.

Panel B of Table 1 presents the variables introduced in the analysis as controls factors. They have been shown to have a potential impact on maternal health (for review, see Parron et al., 1982; National Research Council, 1989; Zimicki, 1989; Wallace and Giri, 1990). Parron et al. (1982) emphasized the similar role played by social disadvantage in the etiology and pathogenesis of major diseases among adult minorities in the United States. They found that those diseases affect persons who are socially disadvantaged much more often and more severely than

they do people with greater resources and higher education. Also, these conditions have pathogenic outcomes that depend on a complex synergism of predisposing and precipitating factors or combinations of risk-enhancing effects (constitutional, socioeconomic, biological, behavioral, and environmental factors and psychosocial stress). Low birthweight is used as a proxy for maternal nutritional status prior to and during pregnancy. It has been found that mothers of low-birthweight babies are typically small in stature and head circumference (Wray, 1982). Changes in reproductive patterns may improve health by decreasing exposure to infection, injury, and other reproductive complications. The use of contraception itself, may affect women's health.

3. THE IFORD SURVEYS AS A SOURCE FOR THE ANALYSIS OF WOMEN'S HEALTH

Research on the causes and consequences of fertility behavior has a long history. However, data limitations still hamper the understanding of the determinants of maternal morbidity and mortality in developing countries. An additional drawback of existing data is that they are mostly hospital-based or at best are expressed as national averages, whereas it is known that there are often large differences in health status between different population groups within the same country. Information on levels of maternal mortality and other indices of reproductive health are difficult to obtain, especially in developing countries. It is even more difficult to obtain data adequate to investigate the possible risk factors of maternal health. For example, maternal mortality ratios of 700 deaths per 100,000 live births have

been reported in some parts of Africa. But even with these high levels of death, a sample of 100,000 women would be necessary to yield 700 maternal deaths. This problem of sample size is somewhat attenuated in the case of illnesses, since maternal morbidity is more common than mortality. However, since morbidity is less well-defined than mortality, it tends to be even more poorly reported from retrospective reports.

In this study we take advantage of unusually rich data collected prospectively by the IFORD survey of Yaoundé, Cameroon, to investigate the determinants of maternal health. Despite the importance of the data on maternal and child health from the IFORD surveys carried out in some African countries during the late seventies and early eighties under the auspices of IFORD (*Institut de Formation et de Recherche Démographiques*) have been little analyzed. This is in part due to potential limitations, both real and perceived, in the IFORD surveys (for a review, see Kuate Defo, 1992a). The focus of the IFORD studies was on large cities (Cotonou, Bamako, Brazzaville, Ouagadougou, Bobo Dioulasso, Lome and Yaoundé) and on births that took place within hospitals. This makes them less attractive than large scale, nationally representative surveys. Furthermore, as is common in panel studies carried out in developing countries, sizeable levels of attrition was characteristic of the IFORD studies. In spite of these caveats, it has been shown that sample-attrition through dropouts in the Yaoundé survey does not bias estimates of morbidity and mortality levels and differentials (Kuate Defo, 1992a, 1992b; Kuate Defo and Palloni, 1991). Moreover, a clear advantage of the IFORD surveys is their longitudinal nature. They contain detailed information on

a number of characteristics such as obstetric and reproductive histories, feeding practices, episodes of illnesses of the woman and her child, causes of infant deaths, timing of following conception, and outcome of pregnancy. These variables are rarely, if ever, available in large scale surveys (for a review, see National Research Council, 1989; Wallace and Giri, 1990; Zimicki, 1989). Furthermore, information on factors associated with maternal reproductive health in Sub-Saharan Africa is relatively scarce (for a review, Wallace and Giri, 1990). Studies that have been carried out to date are generally of small sample size, hospital-based, and restricted to the time around delivery (for a review, see National Research Council, 1989; Zimicki, 1989).

The Yaoundé-IFORD Survey (YIS) was carried out in Yaoundé, Cameroon, from January 1978 to January 1981. The survey was designed to measure levels and patterns of maternal health during the first two years post-partum, and its demographic, biomedical, cultural and socioeconomic determinants. The information was collected through a two-stage process of follow-up interviews. The first stage was initiated with the registration at maternity wards (hospitals) of newly delivered mothers who were residents of Yaoundé. The information gathered at this stage included demographic, cultural and socio-economic characteristics of the woman and her partner, characteristics of the pregnancy and of the newly born child. The second stage consisted of seven waves of interviews to the women or their surrogates. The interviews took place 1, 4, 8, 12, 16, 20 and 24 months after delivery. These interviews were designed to collect information on characteristics of the household, timing of following conception, breastfeeding regimens, and health

conditions of the mother and the child. The survey contained information on maternal episodes of illnesses collected at each wave. This study takes advantage of this longitudinal information to examine the potential impact of socioeconomic status and women's status on reproductive health.

The YIS is one of the most comprehensive survey undertaken where a given health condition of women and children was just one aspect of more general health concerns. Set up to obtain accurate data on the major causes of maternal morbidity as well as child health and survival, the survey's aim was to provide information for the improvement of maternal and child health in Cameroon. Classification of causes of morbidity and mortality was based on lay reporting, a procedure generally followed in longitudinal population-based studies of the IFORD-type (e.g., Cantrelle et al., 1986; Halabi et al., 1992). The basic question asked at time t was: a) 'have you been sick since the last interview?' and if yes, the question was asked about the nature of the most important (severe) condition experienced by the woman. The major advantage of this strategy is that it allows the woman to express her understanding of the nature of the disease condition; such information has the potential for evaluating the community's needs for health care services. This is in contrast to the Demographic and Health Surveys (DHS) (Boerma et al., 1991) or the World Health Organization surveys (Omran and Standley, 1981) which only give the woman (or surrogates) the opportunity to respond to precoded illness classification. The lay diagnosis of causes of maternal morbidity was then classified according to the 8th revision of the International Classification of Diseases (ICD). In cause-specific morbidity diagnoses by individuals we expect some random

misclassification of both cases and non-cases. This would have the effect of reducing the observed associations between exposure and outcome variables. Therefore, in the present study, we use all-cause morbidity for the multivariate analyses to circumvent the problems inherent in cause-specific misclassification.

In Cameroon, as in most African countries, the levels of maternal morbidity within the boundaries of large cities are presumably lower than the surrounding areas and the countryside. Nonetheless, there is strong evidence that the Yaoundé-IFORD survey data are a good reflection of health conditions of women and children prevailing in Yaoundé and should provide a good yardstick to evaluate influences on maternal reproductive health in this setting (Kuate Defo, 1992a).

4. Characteristics of the sample and burden of illness.

4.1. Characteristics of the sample.

Table 2 displays the sample means of selected variables that will be used in subsequent analyses. The study population is composed of 9592 women residents of Yaoundé in 1978. In all cases we define dummy variables and show frequencies corresponding to the various rounds of interview. Although attrition due to death and losses to follow-up of children could conceivably result in important shifts of the observed distributions for the variables, Table 2 reveals a strong sample stability and no changes worthy of notice.

4.2. Maternal morbidity: Structure and levels.

Table 3 presents the levels of cause-specific maternal morbidity by postpartum periods. It shows that, in general, women are not only ill at or around childbirth, but continue to have health problems throughout their reproductive life. The level of maternal morbidity varies from 170 per 1,000 women to 108, at 1-3 and 20-23 months postpartum, respectively. When these figures are broken down by causes, it appears that infectious and parasitic diseases (notably malaria), pregnancy-related diseases, respiratory infections, digestive diseases and nutritional deficiencies are the most important causes of maternal ill health throughout the first two years postpartum. In addition, in the ill-defined category, 'malaise and fatigue' are dominant conditions.

This structure of cause-specific maternal morbidity postpartum shows that besides complications of pregnancy and childbirth, other health conditions are prevalent during the puerperium (first six weeks postpartum). Thus, hospital-based studies on which most available evidence on maternal health is based provide less accurate estimates of the incidence of maternal mortality and morbidity than population-based studies of the IFORD-type (Zimicki, 1989). The range of factors that can go wrong during the puerperium is wide. Some disorders during this period are the result of complications that occur only during pregnancy and childbirth (e.g., hemorrhage). Others are not specific to pregnancy, although their outcome may be affected by pregnancy (e.g., resurgence of malaria). Yet others are the direct results of traditional cultural practices (e.g., digestive diseases). Malaria in particular is very widespread. Pregnant women lose part of their acquired immunity, and malaria attacks are therefore often more severe in pregnancy (Brabin,

1983; Bray and Anderson, 1979). Long-term sequelae of childbirth complications may include among other things, anemia. In developing countries, the percentage of non-pregnant women with haemoglobin levels indicative of anaemia ranges between 10% and 100%, versus 4% and 12% in developed countries (World Health Organization, 1980). Childbirth and the occurrence of a following conception can exacerbate this condition, through either loss of blood or failure to meet extra requirements of iron and folic acid needed during pregnancy. Not surprisingly, anemia in non-pregnant and pregnant women is a major health problem in this population as it is throughout the Third World (for review, see Wallace and Giri, 1990; National Research Council, 1989; World Health Organization, 1972).

Along with these health problems, we have to be conscious of the economic and social settings that give rise to them. In the past the epidemiological studies of communicable diseases revealed a great deal of variability in the exposure and resistance on the part of individuals. This variability was not a matter of chance however, as certain identifiable factors caused a clear predisposition to illness. For example in the case of tuberculosis, factors such as age, malnutrition, overwork, alcoholism, overcrowding and generally unhealthy conditions in dwellings were shown to be important determinants of the disease. Bringing these antecedent factors to light was a major development in organizing prevention to these diseases.

5. MODELS AND ESTIMATION OF THE RELATIONS.

While we are chiefly interested in the effects of socio-economic characteristics and family structure variables, we locate these factors within a more complex

causal framework that includes proximate as well as background variables. The models we formulate are designed to minimize some of the problems of simultaneity, spuriousness and selection that were discussed earlier.

5.1. Two-state hazard models in a context of independent competing risks.

The model we pose is a two-state model for the risk of illness at any time within the course of the study:

$$\mu(t; X(t)) = \mu_0(t) \exp(\beta X(t)) \quad (0.1)$$

Where $\mu(t; X(t))$ is the risk of becoming ill in the postpartum interval $(t, t+dt)$ for a woman with a vector of characteristics $X(t)$, $\mu_0(t)$ is a baseline hazard and β is a vector of effects.

There are two assumptions implicit in this model. The first is that the relevant covariates are those explicitly recognized and that there are no omitted covariates affecting maternal morbidity risks (conditional homogeneity). The second assumption is that, conditional on measured covariates, sample losses can be treated as a competing and independent risk (conditional independence). Neither of these two assumptions is likely to be correct. In particular, the independence assumption is tantamount to asserting that losses to follow-up are totally explained by the first mechanism described in Section 3. However, as we will show later, violations to these two assumptions are unlikely to change our inferences regarding the effects of socio-economic status and women's status.

For most variables that change over time we have monthly information. However, we have adopted a conservative strategy to minimize errors of response. In particular, we will estimate effects assuming that we observe events in discrete segments: 0, 1-3, 4-7, 8-11, 12-15 and 16-23. When an illness occurs within a segment it is assigned to the middle. Experiments with alternative solutions, including the use of observed age at illness, do not change our results in any significant way. Censoring times are also assigned to the middle of the segment because, unlike the timing of illness, their exact values are not known. We include six time dependent covariates: breastfeeding, timing of the following conception, termination of following conception, antecedent morbidity, power source (electricity) and availability of clean water (see Table 1 for definitions). We use the following general rule to assign values to the time dependent covariates: let $X(t)$ be the value of the time dependent covariate at time t and $t < T$, where T is the lower value of an age segment selected for analysis ($T = 0, 1, 4, 8, 12, 16$). Its value can be either 0 or 1 depending on the occurrence (non-occurrence) of an event *before* the woman enters the segment $(T, T+n)$. For example, the value of breastfeeding for a woman who is followed to 4 months postpartum will be 1 if she stopped breastfeeding any time *before* month 4 and 0 otherwise. Similarly, the value of following conception will be 1 if the mother experienced a conception sometime before 4 months postpartum.

Estimation of model (1) proceeds under two different assumptions about the baseline hazard, $\mu_0(t)$. The first is that it can be represented as a piece-wise constant with nodes at 1-3, 4-7, 8-11, 12-15, and 16-23 months. The second is that it can be efficiently represented by a Weibull hazard. Since there was no difference

in the conclusions reached with either assumptions, we discuss results obtained under the latter since it requires a smaller number of parameters.

Table 4 shows the estimated effects of educational attainment on reproductive health. Of interest is the fact that after controlling for ethnicity (model III), educated women have a significant advantage over their uneducated counterparts, while a control for union status and type of union has the reverse effect. These results reinforce the notion that educated women have the ability to break ties with traditional norms and values which are harmful to their health.

Table 5 presents the effects of paid labor force participation on women's health. The results show that opportunities for labor force participation by women have direct beneficial effects on reproductive health. These effects are not confounded by other socioeconomic characteristics of the woman (models II through VI), characteristics of her partner (models VI), her obstetric and reproductive history (models VIII through XII), her breastfeeding methods and the timing of a following conception (models XIII), or by her health history (model XIV).

Table 6 presents the effects of environmental factors (neighborhood of residence) on women's health. There are direct deleterious effects of poor quality neighborhoods on reproductive health, net of all the other factors introduced in the models. The large differentials in maternal health between women living in poor neighborhoods and those who live elsewhere in the city indicate a special vulnerability and social disadvantage of the former in shaping and modifying their environmental risks.

In Table 7, we examine the possibility that modern household amenities may

affect maternal health. The results show that women living in households with clean water are less likely to be sick. The quality of the water supply may explain the high prevalence of digestive diseases noted earlier.

Table 8 presents the effects of ethnicity on maternal health. Most of the ethnic differentials are captured in the rates of recurrent illnesses among ethnic groups, although women from ethnic groups in the Centre and South regions remain disadvantaged even after controlling for other factors. The disadvantage in the prevalence of ill health between these ethnic groups living in Yaoundé cannot be accounted for by genetic factors alone. Hypotheses to explain such disadvantages include the possibility that women in lower social strata in the ethnic groups of the Centre and South regions have more harmful practices, such as intensive alcohol consumption and smoking during pregnancy and lactation, than women in other ethnic groups of similar social strata.

Table 9 examines the effects of marital status. It appears that the effects of unwed motherhood operate through maternal age at childbearing to affect maternal health (model XI). Furthermore, after also controlling for parity, any residual deleterious effects vanish (model XII). It would appear from these results that delays in age at marriage and concomitant delays in age at childbearing are themselves likely to lead to smaller family size and improved prospects for better maternal health. In addition, later age at marriage better education, and smaller family size are indications of changing social norms which are associated with improvements in women's health.

Finally, Table 10 examines the impact of polygamy on maternal health. Women

in polygamous unions are more likely to be in poor health than the other women. However, this disadvantage is captured by the ability of the household to have enough resources for its members (model IV) and the extent of the environmental degradation in which the woman lives (model V). These results support the notion that unequal access to resources may be the mediating factor for the relationship between polygamy and maternal health.

5.2. Models with unmeasured heterogeneity.

The possibility exists that none of the control variables capture conditions that simultaneously affect socio-economic status and women's status and modify morbidity risks associated with them. This is generally referred to in the literature as the problem of unmeasured heterogeneity (e.g., Vaupel et al., 1979; Trussell and Rodriguez, 1990; Rogers, 1992; Gill, 1992). To test whether or not our results are sensitive to omitted covariates, we use two-state hazard model with non-parametric heterogeneity (Heckman and Singer, 1984). We choose non-parametric heterogeneity over parametric heterogeneity since the results of the latter are very sensitive to the distribution imposed on the unknown covariate(s) (Trussell and Richards, 1985). In addition, since we are fairly certain that the duration structure of maternal morbidity is well represented by a Weibull, we are in a position to minimize the identification problems that plague hazard models with unmeasured heterogeneity (parametric or non-parametric).

We estimate two models with all covariates, one without unmeasured heterogeneity, and one which corrects for unmeasured heterogeneity. If the esti-

mated effects show no change, our inferences regarding socio-economic status and women's status receive further confirmation.

A comparison of the two models in Table 11 shows that the introduction of non-parametric heterogeneity with two points of support (additional points of support could not be estimated) has no impact on the estimated effects. These results suggest that the estimates are indeed robust.

6. DISCUSSION

This research was designed to explore the following questions related to the burden of illness among women during their reproductive life: a) what are the major causes of maternal morbidity? b) what aspects of socio-economic conditions are particularly harmful to the health of women? and c) what kinds of interventions are most likely to minimize the consequences of the disadvantaged? Answers to such questions are very limited in many developing countries. Research on the effects of social disadvantage and women's status on reproductive health is important for policymakers in developing countries where socioeconomic hardship makes it crucial to use existing maternal and child health care resources to the best advantage.

The most important finding from this study is that the burden of illness rests disproportionately on the economically disadvantaged women and on women with low social status. The long-term effects of social disadvantage are apparent in the consistently documented excesses of morbidity among unemployed women, women living in poor neighborhoods, and women living in households with no clean wa-

ter source. These results remain robust even after controlling for other measured factors. Similarly, the estimation of models with unmeasured heterogeneity helps to dismiss the potential influence of some artifacts. The deleterious effects of polygamy and unwed motherhood operate through more proximate control variables (e.g., maternal age and parity).

This study expands knowledge about the socioeconomic, behavioral and cultural factors affecting reproductive health. It contributes to the growing recognition that research on maternal health must address the socio-political, cultural and economic determinants of the burden of illness among women in their child-bearing ages (Ford Foundation, 1991). It is likely that adverse social factors not only aggravate potentially serious complications of pregnancy, but also act as a deterrent to seeking effective obstetric, and pre- and post-natal care. Women in general take less advantage of the health services because of insufficient education and information, their dependent financial status, and the custom that in many developing countries the husband makes decisions on the time and place of health care for his wife. This is among the most important reasons why women are brought in as emergencies and in a moribund condition when complications of pregnancy or childbirth have become irreversible (World Health Organization, 1980, 1986). Health promotion and disease prevention among women during their reproductive life would require measures that improve their status and offer them more opportunities for employment, education, and better living conditions.

Many maternity hospitals and centers in developing countries have no opportunity to evaluate their services systematically and lack the tools to determine the

most effective means of improving pregnancy outcomes for mothers and infants, and the health of the gestating, lactating or childbearing mother. This lack of systematic tools to improve maternal and perinatal health has become apparent to increasing numbers of physicians in Africa who believe that more research is needed to identify areas where specific interventions are needed for women in their childbearing ages (van Ginneken and Muller, 1984). This study represents a contribution to this effort. This research has attempted to disentangle the complexities of the role that socio-economic factors and women's status play in the ecology of disease. Including these factors in the analysis of the etiology and pathogenesis of major diseases will increase our chances to improve the health of the socially disadvantaged. Access to economic resources and the ability to mobilize personal, family, and community resources – especially those of the health care system – have the most dramatic effects in modifying pathogenic outcomes (Parron et al., 1982).

While this study suggests that there are opportunities within the existing health care system for meeting many of the health care needs of the socially disadvantaged, further biobehavioral and psychosocial research is needed to determine how women's status and social disadvantage influence the demand for health care services, in order to ensure equitable as well as a more effective delivery of health care services and to break the vicious circle of disadvantage.

Table 1. Definition of Selected Variables#

Panel A: Estimated Variables	
EDU	1 if woman educated
EMP	1 if woman employed
CESETH	1 if ethnic groups are from Centre and South regions
LITSWETH	1 if ethnic groups are from Littoral and South-West regions
WEST	1 if ethnic groups are from West region
POORQUAT	1 if poor neighborhoods of residence*
POWER	1 if electricity in the house*
WATER	1 if use of clean water*
RHOUSE	1 if other modern amenities of the household*
MSIT	1 if woman not married
POLY	1 if polygamous union
Panel B: Control Variables	
HEDU	1 if husband educated
HEMP	1 if husband employed
PUBLIC	1 if delivery took place at public hospitals
MISSION	1 if delivery took place at missionary hospitals
STBI	1 if history of stillbirths
ABOR	1 if history of abortions
FAGE	1 if age at child's birth < 20 years
LAGE	1 if age at child's birth > 34 years
SECO	1 if parity 2-3
THIR	1 if parity 4+
CONTRA	1 if knowledge of contraceptive methods
NOCARE	1 if no prenatal care visits
CESA	1 if delivery by cesarian section
BF	1 if the index child was breastfed in the interval postpartum immediately preceding the one of estimation
FC	1 if a following conception occurred in the interval postpartum immediately preceding the one of estimation
FCEND	1 if a following conception was terminated in the interval postpartum immediately preceding the one of estimation
PILL	1 if a woman was sick in the interval postpartum immediately preceding the one of estimation

All variables were coded as dummies.

* Defined as time-varying covariates when people move residence during the followups.

Table 2. Sample Means of Estimated Variables by Interval Postpartum#

Variables	Interval postpartum (in completed months)						
	0	1-3	4-7	8-11	12-15	16-19	20-23
EDU	.85	.86	.86	.85	.85	.85	.86
EMP	.16	.16	.17	.17	.17	.17	.17
CESETH	.48	.49	.48	.48	.48	.48	.48
LITSWETH	.12	.12	.12	.12	.12	.11	.12
WEST	.33	.33	.34	.34	.35	.35	.36
POORQUAT	.44	.43	.43	.43	.43	.42	.42
POWER	.37	.39	.39	.39	.35	.34	.35
WATER	.71	.72	.70	.69	.61	.60	.62
MSIT	.28	.26	.26	.25	.24	.24	.23
POLY	.03	.03	.03	.03	.03	.03	.03

Variables are abbreviated as shown in Table 1.

Table 3. Cause-Specific Morbidity Rates (CSMR) by Interval Postpartum

Cause of Illness	Interval postpartum (in completed months)						
	0	1-3	4-7	8-11	12-15	16-19	20-23
All causes	136	170	160	147	144	136	108
Infectious and parasitic diseases	38	66	63	57	59	44	32
Malaria	28	54	52	49	50	39	27
Endocrine, nutritional and metabolic diseases	6	4	7	7	6	6	4
Complications of pregnancy, childbirth and the puerperium	13	6	4	4	5	8	6
Mental disorders	.4	.5	.4	.3	1	.2	0
Diseases of the nervous system and sense organs	6	11	10	10	9	8	6
Diseases of the respiratory system	6	16	16	12	13	9	10
Diseases of the digestive sytem	31	32	22	25	25	28	22
Diseases of the circulatory system	3	5	5	4	2	3	3
Diseases of the skin and subcutaneous tissue	2	1	1	1	2	1	2
Injury and poisoning	.3	.2	1	1	.5	.5	1
Symptoms, signs, and ill-defined conditions	29	29	30	26	23	28	23
Malaise and fatigue	21	22	24	17	16	20	16
Nausea and vomiting	1	.5	1	1	.5	1	1

Note: The CSMRs are expressed in per 1,000 women at risk.

Table 4. Estimated Effects of Education on Women’s Health

	Models							
	I	II	III	IV	V	VI	VII	VIII
Coefficient	-.039	-.031	-.072\$	-.091*	-.056\$	-.027	-.049¶	-.043
Standard error	.027	.027	.028	.028	.029	.029	.029	.030
Relative Risk	.96	.97	.93	.91	.95	.97	.95	.96
Negative Log Likelihood	29879	29873	29860	29697	29674	29648	29644	29627
Number of parameters	3	4	7	10	11	13	15	19
Number of observations	9592	9592	9592	9592	9592	9592	9592	9592

	Models					
	IX	X	XI	XII	XIII	XIV
Coefficient	-.047¶	-.048¶	.029	.068\$	.067\$	.050
Standard error	.030	.030	.033	.033	.033	.044
Relative Risk	.95	.95	1.03	1.07	1.07	1.05
Negative Log Likelihood	29626	29621	29577	29547	29547	28203
Number of parameters	22	24	26	28	31	32
Number of observations	9592	9592	9592	9592	9592	9592

* p <.01; \$ p <.05; ¶ p <.10.

- I: Intercept+slope+EDU;
- II: I+EMP;
- III: II+CESETH+LITSWETH+WEST;
- IV: III+POWER+WATER+RHOUSE;
- V: IV+POORQUAT;
- VI: V+MSIT+POLY;
- VII: VI+HEDU+HEMP;
- VIII: VII+PUBLIC+MISSION+STBI+ABOR;
- IX: VIII+CONTRA+NOCARE+CESA;
- X: IX+LBW+NDEL;
- XI: X+FAGE+LAGE;
- XII: XI+SECO+THIR;
- XIII: XII+ABF+FC+FCEND;
- XIV: XIII+PILL.

Note: Variables are abbreviated as shown in Table 1.

Table 5. Estimated Effects of Employment on Women’s Health

Models								
	I	II	III	IV	V	VI	VII	VIII
Coefficient	-.110*	-.108*	-.126*	-.150*	-.140*	-.112*	-.112*	-.130*
Standard error	.028	.028	.029	.029	.029	.029	.029	.030
Relative Risk	.90	.90	.88	.86	.87	.89	.89	.88
Negative Log Likelihood	29873	29873	29860	29697	29674	29648	29644	29627
Number of parameters	3	4	7	10	11	13	15	19
Number of observations	9592	9592	9592	9592	9592	9592	9592	9592

Models						
	IX	X	XI	XII	XIII	XIV
Coefficient	-.133*	-.133*	-.162*	-.168*	-.169*	-.136*
Standard error	.030	.030	.030	.031	.031	.039
Relative Risk	.88	.88	.85	.84	.84	.87
Negative Log Likelihood	29626	29621	29577	29547	29547	28203
Number of parameters	22	24	26	28	31	32
Number of observations	9592	9592	9592	9592	9592	9592

* p <.01; \$ p <.05; ¶ p <.10.

- I: Intercept+slope+EMP;
II: I+EDU;
III: II+CESETH+LITSWETH+WEST;
IV: III+POWER+WATER+RHOUSE;
V: IV+POORQUAT;
VI: V+MSIT+POLY;
VII: VI+HEDU+HEMP;
VIII: VII+PUBLIC+MISSION+STBI+ABOR;
IX: VIII+CONTRA+NOCARE+CESA;
X: IX+LBW+NDEL;
XI: X+FAGE+LAGE;
XII: XI+SECO+THIR;
XIII: XII+ABF+FC+FCEND;
XIV: XIII+PILL.

Note: Variables are abbreviated as shown in Table 1.

Table 6. Estimated Effects of Neighborhood of Residence on Women’s Health

Models								
	I	II	III	IV	V	VI	VII	VIII
Coefficient	0.369*	0.362*	0.407*	0.329*	0.338*	0.348*	0.363*	0.361*
Standard error	0.041	0.042	0.042	0.043	0.043	0.043	0.043	0.043
Relative Risk	1.45	1.44	1.50	1.39	1.40	1.42	1.44	1.43
Negative Log Likelihood	29849	29845	29825	29674	29648	29644	29627	29626
Number of parameters	3	5	8	11	13	15	19	22
Number of observations	9592	9592	9592	9592	9592	9592	9592	9592

Models					
	IX	X	XI	XII	XIII
Coefficient	0.358*	0.379*	0.376*	0.376*	0.264*
Standard error	0.043	0.043	0.044	0.044	0.061
Relative Risk	1.43	1.46	1.46	1.46	1.30
Negative Log Likelihood	29621	29577	29547	29547	28203
Number of parameters	24	26	28	31	32
Number of observations	9592	9592	9592	9592	9592

* p <.01; \$ p <.05; ¶ p <.10.

- I: Intercept+Slope+POORQUAT;
II: I+EDU+EMP;
III: II+CESETH+LITSWETH+WEST;
IV: III+POWER+WATER+RHOUSE;
V: IV+MSIT+POLY;
VI: V+HEDU+HEMP;
VII: VI+PUBLIC+MISSION+STBI+ABOR;
VIII: VII+CONTRA+NOCARE+CESA;
IX: VIII+LBW+NDEL;
X: IX+FAGE+LAGE;
XI: X+SECO+THIR;
XII: XI+ABF+FC+FCEND;
XIII: XII+PILL.

Note: Variables are abbreviated as shown in Table 1.

Table 7. Estimated Effects of Housing Factors on Women’s Health#

Models						
	I	II	III	IV	V	VI
POWER	-.003 (.026)	-.001 (.026)	-.003 (.027)	-.002 (.027)	-.006 (.027)	-.008 (.027)
Relative Risk	1.00	1.00	1.00	1.00	0.99	0.99
WATER	-.180* (.033)	-.126* (.034)	-.138* (.034)	-.133* (.034)	-.128* (.034)	-.129* (.034)
Relative Risk	0.83	0.88	0.87	0.88	0.88	0.88
Negative Log Likelihood	29728	29674	29648	29644	29627	29626
Number of parameters	5	11	13	15	19	22
Number of observations	9592	9592	9592	9592	9592	9592

Models					
	VII	VIII	IX	X	XI
POWER	-.001 (.027)	-.001 (.027)	-.005 (.027)	-.005 (.027)	-.011 (.034)
Relative Risk	1.00	1.00	0.99	0.99	0.99
WATER	-.131* (.034)	-.131* (.034)	-.123* (.034)	-.122* (.035)	-.075¶ (.042)
Relative Risk	0.88	0.88	0.88	0.88	0.93
Negative Log Likelihood	29621	29577	29547	29547	28203
Number of parameters	24	26	28	31	32
Number of observations	9592	9592	9592	9592	9592

Standard errors are in parentheses underneath the estimated coefficients.

* p <.01; \$ p <.05; ¶ p <.10.

I: Intercept+Slope+POWER+WATER;

II: I+RHOUSE+EDU+EMP+CESETH+LITSWETH+WEST;

III: II+MSIT+POLY;

IV: III+HEDU+HEMP;

V: IV+PUBLIC+MISSION+STBI+ABOR;

VI: V+CONTRA+NOCARE+CESA;

VII: VI+LBW+NDEL;

VIII: VII+FAGE+LAGE;

IX: VIII+SECO+THIR;

X: IX+ABF+FC+FCEND;

XI: X+PILL.

Note: Variables are abbreviated as shown in Table 1.

Table 8. Estimated Effects of Ethnic Affiliation on Women’s Health#

Models							
	I	II	III	IV	V	VI	VII
CESETH	0.147*	0.185*	0.219*	0.261*	0.290*	0.284*	0.264*
	(.032)	(.033)	(.033)	(.034)	(.034)	(.034)	(.034)
Relative Risk	1.16	1.20	1.24	1.30	1.34	1.33	1.30
LITSWETH	0.054	0.089\$	0.071¶	0.108\$	0.104\$	0.099\$	0.084\$
	(.041)	(.042)	(.042)	(.043)	(.043)	(.043)	(.043)
Relative Risk	1.06	1.09	1.07	1.11	1.11	1.10	1.09
WEST	0.100*	0.114*	0.088\$	0.114*	0.085\$	0.083\$	0.087\$
	(.033)	(.033)	(.033)	(.033)	(.034)	(.034)	(.034)
Relative Risk	1.10	1.12	1.09	1.12	1.09	1.09	1.09
Negative Log Likelihood	29870	29860	29697	29674	29648	29644	29627
Number of parameters	5	7	10	11	13	15	19
Number of observations	9592	9592	9592	9592	9592	9592	9592
Models							
	VIII	IX	X	XI	XII	XIII	
CESETH	0.260*	0.259*	0.219*	0.194*	0.194*	0.156*	
	(.034)	(.034)	(.035)	(.035)	(.035)	(.046)	
Relative Risk	1.30	1.30	1.24	1.21	1.21	1.17	
LITSWETH	0.081¶	0.080¶	0.047	0.032	0.032	0.028	
	(.043)	(.043)	(.044)	(.044)	(.044)	(.057)	
Relative Risk	1.08	1.08	1.05	1.03	1.03	1.03	
WEST	0.083\$	0.084\$	0.073\$	0.081\$	0.081\$	0.052	
	(.034)	(.034)	(.034)	(.034)	(.035)	(.045)	
Relative Risk	1.09	1.09	1.08	1.08	1.08	1.05	
Negative Log Likelihood	29626	29621	29577	29547	29547	28203	
Number of parameters	22	24	26	28	31	32	
Number of observations	9592	9592	9592	9592	9592	9592	

Standard errors are in parentheses underneath the estimated coefficients.

* p <.01; \$ p <.05; ¶ p <.10.

I: Intercept+slope+CESETH+LITSWETH+WEST;
II: I+EDU+EMP; III: II+POWER+WATER+RHOUSE;
IV: III+POORQUAT; V: IV+MSIT+POLY;
VI: V+HEDU+HEMP; VII: VI+PUBLIC+MISSION+STBI+ABOR;
VIII: VII+CONTRA+NOCARE+CESA;
IX: VIII+LBW+NDEL; X: IX+FAGE+LAGE;
XI: X+SECO+THIR; XII: XI+ABF+FC+FCEND;
XIII: XII+PILL.

Note: Variables are abbreviated as shown in Table 1.

Table 9. Estimated Effects of Marital Status on Women’s Health

Models								
	I	II	III	IV	V	VI	VII	VIII
Coefficient	0.204*	0.193*	0.234*	0.210*	0.215*	0.214*	0.172*	0.157*
Standard error	0.025	0.026	0.026	0.026	0.026	0.027	0.056	0.057
Relative Risk	1.23	1.21	1.26	1.23	1.24	1.24	1.19	1.17
Negative Log Likelihood	29853	29850	29829	29673	29648	29649	29644	29627
Number of parameters	3	5	8	11	12	13	15	19
Number of observations	9592	9592	9592	9592	9592	9592	9592	9592

Models						
	IX	X	XI	XII	XIII	XIV
Coefficient	0.153*	0.158*	0.084¶	0.044	0.042	0.038
Standard error	0.057	0.057	0.057	0.058	0.058	0.078
Relative Risk	1.17	1.17	1.09	1.04	1.04	1.04
Negative Log Likelihood	29626	29621	29577	29547	29547	28203
Number of parameters	22	24	26	28	31	32
Number of observations	9592	9592	9592	9592	9592	9592

* p <.01; \$ p <.05; ¶ p <.10.

- I: Intercept+slope+MSIT;
II: I+EDU+EMP;
III: II+CESETH+LITSWETH+WEST;
IV: III+POWER+WATER+RHOUSE;
V: IV+POORQUAT;
VI: V+POLY;
VII: VI+HEDU+HEMP;
VIII: VII+PUBLIC+MISSION+STBI+ABOR;
IX: VIII+CONTRA+NO CARE+CESA;
X: IX+LBW+NDEL;
XI: X+FAGE+LAGE;
XII: XI+SECO+THIR;
XIII: XII+ABF+FC+FCEND;
XIV: XIII+PILL.

Note: Variables are abbreviated as shown in Table 1.

Table 10. Estimated Effects of Polygamy on Women’s Health

Models								
	I	II	III	IV	V	VI	VII	VIII
Coefficient	0.097*	0.084*	0.090*	0.059\$	0.051¶	0.008	0.021	0.021
Standard error	0.029	0.029	0.029	0.029	0.029	0.030	0.030	0.030
Relative Risk	1.10	1.09	1.09	1.06	1.05	1.01	1.02	1.02
Negative Log Likelihood	29875	29870	29857	29696	29673	29649	29644	29627
Number of parameters	3	5	8	11	12	13	15	19
Number of observations	9592	9592	9592	9592	9592	9592	9592	9592

Models						
	IX	X	XI	XII	XIII	XIV
Coefficient	0.021	0.021	0.012	-.000	0.000	-.010
Standard error	0.030	0.030	0.030	0.030	0.030	0.040
Relative Risk	1.02	1.02	1.01	1.00	1.00	.99
Negative Log Likelihood	29626	29621	29577	29547	29547	28203
Number of parameters	22	24	26	28	31	32
Number of observations	9592	9592	9592	9592	9592	9592

* p <.01; \$ p <.05; ¶ p <.10.

- I: Intercept+slope+POLY;
II: I+EDU+EMP;
III: II+CESETH+LITSWETH+WEST;
IV: III+POWER+WATER+RHOUSE;
V: IV+POORQUAT;
VI: V+MSIT;
VII: VI+HEDU+HEMP;
VIII: VII+PUBLIC+MISSION+STBI+ABOR;
IX: VIII+CONTRA+NO CARE+CESA;
X: IX+LBW+NDEL;
XI: X+FAGE+LAGE;
XII: XI+SECO+THIR;
XIII: XII+ABF+FC+FCEND;
XIV: XIII+PILL.

Note: Variables are abbreviated as shown in Table 1.

Table 11. Models With Unmeasured Heterogeneity

Variables	Models	
	I	II
EDU	0.050 (.044)	0.048 (.044)
Relative Risk	1.05	1.05
EMP	-.136* (.039)	-.134* (.039)
Relative Risk	0.87	0.87
POORQUAT	0.264* (.061)	0.263* (.062)
Relative Risk	1.30	1.30
POWER	-.011 (.034)	-.011 (.034)
Relative Risk	0.99	0.99
WATER	-.075¶ (.042)	-.074¶ (.042)
Relative Risk	0.93	0.93
CESETH	0.156* (.046)	0.155* (.046)
Relative Risk	1.17	1.17
LITSWETH	0.028 (.057)	0.028 (.056)
Relative Risk	1.03	1.03
WEST	0.052 (.045)	0.051 (.045)
Relative Risk	1.05	1.05
MSIT	0.038 (.078)	0.033 (.078)
Relative Risk	1.04	1.03
POLY	-.010 (.040)	-.008 (.040)
Relative Risk	0.99	0.99
Negative Log Likelihood	28203	28203
Number of parameters	32	33
Number of observations	9592	9592

Note: Variables are abbreviated as shown in Table 1.
Standard errors are in parentheses underneath the estimated coefficients.

* p <.01; \$ p <.05; ¶ p <.10.

I: Model with all variables, but excludes control for unmeasured heterogeneity.

II: Like Model I, but includes control for unmeasured for Heterogeneity (2 support points).

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