Validation of Women's Perceptions of Near-Miss Obstetric Morbidity in South Benin

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ABSTRACT

This thesis examines whether measurement of morbidity prevalence through survey methods provides a suitable alternative to mortality measurement for safe motherhood programme needs assessment. It considers the validity of a survey instrument by comparing results from a questionnaire on near-miss obstetric complications to hospital clinical data.

Three groups of women - with severe obstetric complications, mild obstetric complications and with a normal delivery - were identified retrospectively in three hospitals in South Benin and interviewed at home using a questionnaire. The complications of interest were eclampsia, haemorrhage, dystocia and infections of the genital tract. The concept of near-miss death event was used to identify women with severe episodes of morbidity.

The aim of the analysis was to find questions with very high specificity for measuring the prevalence of obstetric conditions even at the expense of sensitivity. The questionnaire was able to detect, with sufficient accuracy, eclamptic fits, abnormal bleeding in the third trimester for a recall period of at least 3-4 years, and all episodes of haemorrhage independent of timing within a shorter period of 2 years. The specificity of questions and combinations of questions for dystocia and infections of the genital tract was weak, and generated disappointing results except when information on treatment was included. Overall, better results were achieved for antepartum and acute events than complications defined as such because they are at the extreme end of a continuum. Severity only made a positive difference in the case of eclampsia with an increase in sensitivity.

These results are interpreted in the light of methodological constraints and findings from similar studies. Although the study could support the use of individual interview surveys for eclampsia and haemorrhage, this methodology cannot be readily recommended in view of the insufficient specificity reported elsewhere. The way forward in terms of morbidity information as well as the future of the near-miss concept is presented in the final chapter.

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CHAPTER 1. INTRODUCTION AND RATIONALE: FROM MORTALITY TO MORBIDITY MEASUREMENT

"Que Dieu nous en garde, mais il y a des enfants qu'on met au monde qui conduisent directement au pays des morts ou bien on en fait encore d'autres qui survivent avec leur mère; il y en a d'autres qui préfèrent mourir seuls et laissent leur mère vivante. C'est comme cela que ça se passe. La vie et la mort cohabitent à l'accouchement" Respondent 3012, 11/09/95

Of all public health indicators, maternal mortality stands out as the parameter showing the largest differences between North and South (Graham and Campbell, 1990). These differences have convinced those working in the field of maternal health that the majority of maternal deaths[1] occurring in the world today are avoidable. Packages of preventive and therapeutic interventions have been proposed to reduce maternal mortality and complications in developing countries (WHO, 1994a). However, little information exists on the effectiveness of these packages, particularly in terms of mortality impact. This is in part due to the relative rarity of maternal deaths, the primary outcome of interest. For each death, several occurrences of illness or complications can be expected, so attention is now turning to the measurement of health outcome indicators for informing Safe Motherhood Programmes.

What are the health outcome indicators best suited to the current information needs of Safe Motherhood Programmes, and how best can they be obtained? This chapter will address these questions after a short description of the magnitude and causality of maternal mortality.

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[1] According to ICD-10 (WHO, 1992), "a maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes".

1.1 THE BURDEN OF MATERNAL MORTALITY

For every woman, the risk of dying increases during pregnancy and childbirth (Khlat, 1994). This risk varies in different parts of the world. In some countries, women have a lifetime risk of dying during pregnancy, childbirth and the puerperium as high as one in seven (WHO and UNICEF, 1996). This risk is, on average, very high in Africa (1/16), Asia (1/65), Latin America and the Caribbean (1/130), and is considerably lower in the industrialised world (for example, 1/3200 in Western Europe), where a combination of low fertility and high standard obstetric care is averting many maternal deaths. In high income countries, maternal death is now very infrequent. In Great Britain, for example, a maternal mortality ratio of 9.8 maternal deaths per 100,000 live births corresponds to an average of 70 deaths per year (Department of Health, 1996). This is not the case in developing countries, where women have learned to live with the risk of death, with a considerable degree of fatalism. For Beninese women for example, giving birth to a child is perceived as having 'one foot in the grave'. WHO estimates that 99% of maternal deaths occur in developing countries, and that the majority of these are avoidable (WHO and UNICEF, 1996). More recently, Safe Motherhood was identified as one of the World Bank's first priorities for improving the global health of adult women in developing countries (World Bank, 1993).

Beyond the statistics, the death of a woman in childbirth is a brutal and sudden event which disrupts the family and has a considerable long term emotional impact. The causes of maternal mortality are multiple, but generally two levels can be considered: the medical causes of death and the social circumstances. A woman first dies because of a pathological condition or a complication. Medical causes of maternal mortality present a remarkably uniform pattern across settings and time, with hypertensive diseases of pregnancy, haemorrhage, prolonged and obstructed labour, and puerperal infections responsible for two thirds of maternal deaths (WHO,1994a). Another 20% of maternal deaths are related to diseases or conditions

aggravated by pregnancy, such as anaemia and malaria. More difficult to account for are complications related to ectopic pregnancies and abortions which take a large toll in the first trimester of pregnancy, particularly in countries where induced abortions are illegal. Beyond the medical causes, there are also important contributing factors which relate to women's ability to command the resources of health care and to the accessibility of obstetric services and the standard of the care provided once a woman has reached the appropriate level of services. When discussing the proximate determinants of maternal mortality, Maine and colleagues identified three delays at the root of maternal deaths: delays by the woman and her family in recognising the existence of a complication which needed treatment; in reaching the appropriate level of care once a decision has been taken to seek care; and in being attended and receiving correct treatment (Thaddeus and Maine, 1994). This approach to understanding maternal mortality places most emphasis on infrastructural and patient-related substandard care factors, and has been widely adopted by the Safe Motherhood community.

1.2 INFORMATION NEEDS AND PERFORMANCE OF INDICATORS

1.2.1 performance of mortality as an indicator of health outcomes

The ability to count and describe the occurrence of the health outcome of interest is a prerequisite for assessing the health needs of a population. Information is required to: (i) establish levels and trends of health outcomes; (ii) identify their characteristics and determinants; (iii) monitor and evaluate the effectiveness of activities designed to influence their occurrence (Campbell and Graham, 1990). In maternal health, these three information needs have been fulfilled to different degrees.

Maternal mortality has been instrumental in putting women's health on the international agenda, as first indicated by the launch of the Safe Motherhood Initiative in Nairobi in 1987. Studies

highlighting unacceptable levels of maternal mortality in developing countries have played a critical role in bringing about efforts to address the problem (for example, Fortney et al, 1986; Kwast, 1988; Walker et al, 1986). Significant improvements have been made in the measurement of maternal mortality. In particular the application of the sisterhood method has enabled estimates of maternal mortality to be derived for the first time in several developing country populations (Graham, 1994; WHO and UNICEF, 1997). Likewise, considerable progress has been made in developing verbal autopsy instruments for ascertaining medical causes of maternal deaths which have proved useful in obstetric care audit and programme management (Chandramohan et al, 1998; Egypt Ministry of Health, 1994; Ronsmans and Campbell, 1995). Mortality, however, has proven a difficult yardstick with which to monitor the impact of maternal health programmes (Graham et al, 1996).

The main reason for this is that huge sample sizes and considerable resources are required to capture enough deaths for statistical precision and data tabulation. In an evaluation study conducted in The Gambia for example, there were 35 maternal deaths in a sample of 2,586 women followed during pregnancy over a 4-year study period (Greenwood et al, 1990). This represents an overall ratio of 1353 maternal deaths per 100,000 pregnancies with very large 95% confidence limits ranging from 944 to 1877.There is a growing consensus among international policy makers that in low income countries, where the statistical infrastructure is also limited, resources should be allocated to the implementation of Safe Motherhood Programmes rather than the measurement of maternal mortality (Maine et al, 1992; WHO, 1994b; WHO & UNICEF, 1996).This view led two UN agencies to widely disseminate the results of a demographic model for estimating maternal mortality in an attempt to deter low income countries from conducting further mortality studies (WHO & UNICEF, 1996). In the meantime,

several authors propose to rely on process indicators[2], sometimes defined in terms of 'unmet needs' for obstetric care, to demonstrate progress and identify areas of improvement (for example, Maine et al 1992; De Brouwere et al, 1996).

1.2.2 reasons for considering other health outcomes

An important underlying assumption to this reliance on process indicators is that health providers and programme managers know which strategy to adopt to reduce maternal mortality. But how reasonable is this assumption? What can be achieved in settings with poor infrastructure is still very unclear. Most of the evidence on the effectiveness of specific interventions originates from clinical trials conducted in developed countries (Chalmers et al, 1989; Cochrane Library, 1998), and from studies of secular trends in mortality interpreted in the historical context of health services and technologies in the Western world (Loudon, 1992). Conventional wisdom has been challenged with indications that the potential of prenatal care for averting maternal death has not been systematically assessed despite widespread confidence in its effectiveness (Rooney, 1992). There are few published examples of demographic evaluation of safe motherhood programmes in developing countries (Greenwood et al, 1990; Fauveau et al, 1991; Foord, 1995), and their main findings are being questioned due to apparent inconsistencies between the observed mortality trends and expected impact or to the lack of statistical power (Graham and Filippi, 1994; Ronsmans et al, 1997a). In the Gambia example quoted earlier, there appeared to be a sharper drop in maternal mortality in the intervention area but chance could not be excluded as a possible explanation, because of the small number of deaths (Greenwood et al, 1990). In Bangladesh, early claims of success for a community based maternity care programme were revised several years later when data

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[2] Process indicators (for example, the proportion of births attended by trained personnel) measure whether the programme activities have been delivered. Outcome indicators (for example, maternal mortality ratio) measure whether the programme activities had the intended effect or impact on health.

had accumulated across time and comparison areas (Ronsmans et al, 1997a). The only randomised control trial showing a significant decline in maternal mortality among women supplemented with vitamin A (West et al, 1999), has been undermined by its inability to inform the data by changes in specific causes of death (Ronsmans and Campbell, forthcoming). In summary, current programme strategies in developing countries are, in many ways, educated guesses and good epidemiological evidence on the best way forward is still lacking.

Maternal mortality essentially plays an advocacy role for safe motherhood. Whilst reliance on maternal deaths to demonstrate progress and establish priorities is clearly problematic, there may still be a need for exploring alternative outcomes which are sufficiently sensitive to reflect changes in the state of maternal health and for which information can be disaggregated at cause-specific level or according to risk group. There are, in summary, three main reasons for this. First, the link between programme input and health effects still needs to be established for a number of interventions, making it hazardous to deduce the existence of significant health improvement on the basis of process indicators alone. Second, little information exists on maternal health outcomes apart from deaths, and these may present different patterns, or respond to interventions in a different way from mortality. Finally, the plurality of users of safe motherhood information has to be considered with health care providers, policy makers and donor agencies more likely to be impressed with, and pass judgement on, the basis of health outcome measures than process indicators alone (Graham and Filippi, 1994). A correlate to all these points is that it is, as yet, not known whether Safe Motherhood funds are spent where they should be.

1.2.3 morbidity-based indicators

With estimates ranging from 16.5 pregnancy-related complications per maternal death (Datta et al, 1980) to over 100 acute complications (Koblinsky et al, 1992), attention has shifted on the

potential usefulness of morbidity-based indicators for programme management. With a larger number of cases and episodes, morbidity-based indicators could be measured with higher precision and reflect changes in a shorter period and for less monetary and fieldwork effort. The possibilities of differentiating between types of morbidities, degree of severity or long term impairment, and also sub-groups of population which appear more affected, could facilitate prioritisation of health problems. Because of their greater incidence, morbidity indicators have already been proposed as a complement to mortality measures for quality of care audits of maternity services in developed countries where maternal mortality is low (Paterson et al, 1991).

Opportunities to speak directly to women who experienced ill-health - in contrast to mortality where by nature proxy respondents are interviewed - might form another strong argument for morbidity measurement. In settings where health coverage is inadequate, safe motherhood programmes require information complementary to routine sources and independent of data generated by health facilities to avoid selection biases. Household surveys regularly question women of reproductive age on the utilisation of MCH/FP services and the occurrence of specific childhood diseases (diarrhoea, acute respiratory infections, measles) or symptoms (fever) and child mortality (Boerma et al, 1991; UNICEF, 1995). They have been valuable for infectious diseases with distinctive clinical features such as diarrhoea and measles (Kalter, 1992). Their potential for collecting meaningful maternal morbidity data needs to be fully explored.

Measuring maternal morbidity is not without its difficulties (Campbell and Graham, 1990). In many countries basic information on the levels, trends and determinants of maternal morbidity is still lacking. This situation reflects the absence of practical approaches and tools for gathering data in developing country settings, in particular at the community level (Graham and Campbell, 1990; Liskin, 1992). The widely quoted number of 16.5 maternal morbidities occurring for every maternal death in the world is based in one small, insufficiently documented

prospective study conducted in India over 15 years ago (Datta et al, 1980). More recent epidemiological studies carried out in a variety of developing country settings have revealed important differences in disease prevalence during pregnancy (Bouvier-Colle et al, 1998; Koblinsky et al, 1992; Fortney and Smith, 1996; Stewart et al, 1997). Dissimilarities in definitions of morbidity, data collection procedures, and other methodological issues related to the source and the quality of the information, have made it difficult to accept these differences as conclusive evidence of real maternal morbidity patterns across settings or populations (Graham et al, 1993). More basic research work is thus needed, particularly with respect to the development of meaningful maternal morbidity indicators and the identification and testing of appropriate strategies for collecting this information.

1.3 IDENTIFYING THE OUTCOME OF INTEREST

1.3.1 what is health?

A prerequisite to any measurement is the ability to identify the outcome of interest. Following the definition proposed by WHO, "health" is considered to be a complete physical, social and mental well-being, not just "the absence of disease or infirmity" (WHO, 1948). Because of the continuum between good or positive health and bad or negative health, there is, however, an important element of subjectivity in distinguishing between different states of health. Positive outcomes are more difficult to conceive than negative ones, with close substitutes sometimes presented in terms of quality of life assessment and including notions of physical and mental capabilities and personal satisfaction with health (Jenkinson, 1994). In contrast, death, the ultimate outcome of ill-health, is also the easiest to recognise. Diseases and disability can be defined according to objective and standardized bio-medical criteria. For these reasons, and because it seems more appropriate to many to attribute medical resources on the basis of those most ill, health is frequently measured in terms of disease and death, and sometimes disability,

but rarely through its positive aspects. Maternal health, the health of women as it relates to pregnancy, is affected by measurement constraints in a similar way to other conditions, yet pregnancy is a normal stage of life and a happy event for the majority of women.

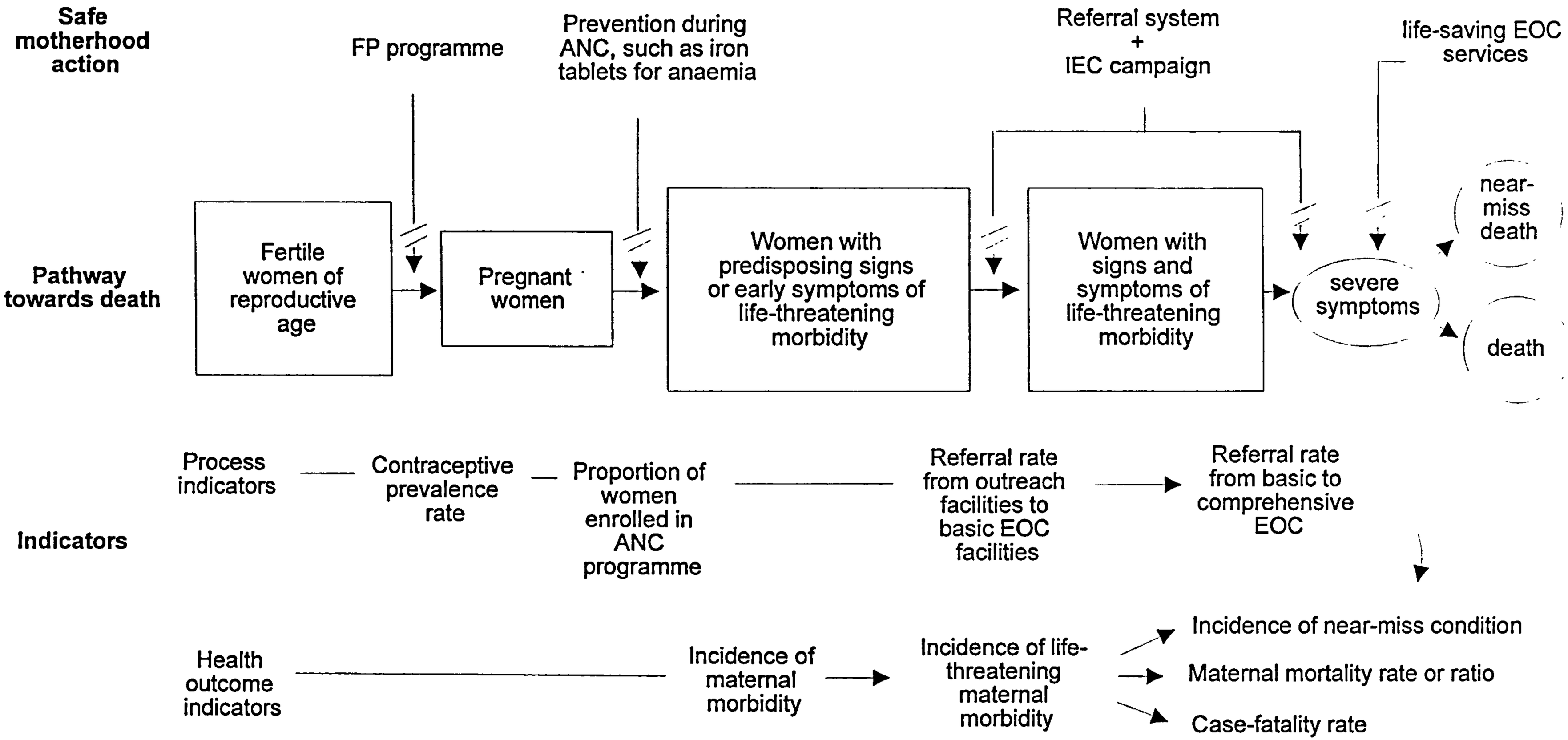
1.3.2 what are Safe Motherhood Programmes trying to do?

In low-income countries, efforts concentrate on the improvement of obstetric services and referral links between facilities and communities to reduce adverse outcomes of pregnancy, in particular maternal deaths and complications. Well-being is not specifically addressed by these programmes, nor are 'minor' complaints such as nausea or vomiting. The primary emphasis is on reducing death and life-threatening complications. Thus, indicators of well-being or satisfaction, which are increasingly being used in developed countries in the context of health planning and for evaluating health interventions (Jenkinson, 1994), are of secondary relevance in developing countries because they are not the intended end-points. Furthermore, Safe Motherhood interventions focus on the prevention and therapeutic management of direct obstetric problems, whilst indirect causes of maternal death, such as those due to cardiovascular diseases or tuberculosis, tend to be ignored.

1.3.3 causal pathway

Figure 1.1 delineates the causal pathway that leads women from pregnancy to maternal death. Women at risk of maternal death are those of reproductive age. In regions of high fertility, a substantial proportion of these women are pregnant (typically around 15%) at any point in time. The majority of these pregnancies follow their natural course without problems, but some lead to complications. Of these complications, an unknown proportion turn into severe life-threatening maternal morbidity. The high number of maternal deaths originates from these severe episodes of morbidity. In western countries, women who survive these serious obstetric

Figure 1.1 Conceptual framework for evaluation of safe motherhood programme and examples of indicators



events have long been called near-miss maternal deaths (Graham and Luxton, 1989; Stones et al, 1991).

In choosing both process and outcome indicators, any evaluation of Safe Motherhood programmes needs to define clearly which stages of the causal pathway, from pregnancy to maternal death, are of interest. Interventions can take place at several points. For example, by diminishing the number of pregnancies, family planning programme activities have the potential to greatly affect women's lifetime risk of maternal death and the maternal mortality rate[3] (Trussel and Pebley, 1984). Similarly, effective antenatal care activities, such as high blood pressure screening and interventions to improve haemoglobin levels will contribute to the amelioration of pregnant women's overall health status and thus reduce the incidence of complications related to hypertensive disorders of pregnancy and anaemia. At a later stage in the causal pathway, effective referral and case management of women with early signs and symptoms of complications will reduce the incidence and, through affecting duration of illness episodes, the prevalence of severe complications. Once a serious complication has occurred, emergency obstetric care can stop women progressing to a death or near-miss death event, thus reducing case-fatality for life-threatening complications.

In the evaluation of programme impact, the use of indicators which focus on the most severe clinical manifestations of illness preceding deaths seems appropriate because of their close relationship to mortality, the ultimate outcome of interest and because they lie within the action framework of the majority of Safe Motherhood Programmes.

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[3] The maternal mortality rate (number of maternal deaths over number of women in reproductive age) and the life time risk (maternal deaths over the reproductive period / women entering the reproductive period) take into account both the probability of becoming pregnant and the obstetric risk of dying during pregnancy. The maternal mortality ratio (number of maternal deaths over number live births) is the indicator most frequently used but only measures the obstetric risk of death, and therefore cannot be used to study the impact of family planning activities on maternal mortality. For a full discussion on this topic see Campbell and Graham (1990) and WHO (1994b).

Safe Motherhood Programmes act, however, on each of the different stages of the causal pathway simultaneously and careful documentation of, and reflection on, the content of the programme, using process indicators, will be necessary to understand morbidity change. The successful prevention of the final end-point on the causal pathway - death - may well lead to an apparent increase in the incidence of morbidity. A programme which effectively increases referral to and quality of obstetric services, for example, could lead to an increase in observed morbidity, at least in the initial stages.

1.3.4 experience in Western countries

Beyond the conceptual argumentation, a more practical impetus for focusing on the most severe life-threatening episodes of obstetric morbidity, designated as near-miss death, comes primarily from a study conducted in England (Stones et al, 1991), where there is a long standing tradition of obstetric care audit with the National Confidential Enquiries into Maternal Deaths (Department of Health, 1996). The diminishing occurrence of maternal deaths, and the resulting instability in figures at national level, has prompted health planners to search for alternative health outcomes to assess the quality of maternity care services (Paterson et al, 1991). Comprehensive morbidity data are also needed to explain whether national falls in mortality are related to lower incidence of complications or better case management (Department of Health, 1989). The study conducted by Stones and colleagues (1991) was aimed at developing a new strategy for monitoring adverse obstetric outcomes and investigating quality of care issues. Several hospital-based 'near-miss' studies have since been conducted in Western countries to document the incidence of severe morbidity and the epidemiological and clinical features of severely ill cases (for example, Bewley and Creighton, 1995; Bouvier-Colle et al, 1996; Yoong et al, 1996).

In the initial study, Stones and colleagues (1991) reviewed obstetric records of 2164 women, who delivered in a public hospital in Norwich, to determine the patterns of maternal morbidity and the frequency of life-threatening or near-miss episodes. Over a period of 6 months, 582 episodes of morbidity and 19 cases of near-miss were found, indicating a severe maternal morbidity ratio of 878 near-miss cases per 100,000 births. There were no maternal deaths recorded during the study period. Information was presented as a case-series of severe complications, illustrating the potential of the near-miss approach as a reflection tool for quality of care audit. The authors conclude that the accumulation of cases across facilities and the resulting increase in statistical power could also prove useful for monitoring purposes.

This was illustrated by a survey recently conducted in France recensing all patients with critical illness treated in facilities of two administrative regions (Bouvier-Colle et al, 1996). The cases were all women admitted to intensive care. Altogether, 435 women with serious diseases were identified, and 22 of these died. The severe maternal morbidity ratio was 310 per 100,000 live births. There were no differences according to region, but those women who were followed in university hospitals had a better prognosis for survival.

Other near-miss studies conducted show severe maternal morbidity ratios of 1934 per 100,000 (35/1809) in Manchester (Yoong et al, 1996), and 500/100,000 (30/6000)in London (Bewley and Creighton, 1995). A very important methodological issue with these papers relates to case-definition, and this affects comparability with the wide range of severe morbidity incidence across the different studies. Assessing severity is not an easy task. It demands predetermined criteria in addition to diagnostic definitions and is based on a notion of risk and poor prognosis, usually assessed in terms of likelihood of permanent disability or death. In practice, this notion is chiefly based on clinical experience, as very little evidence exists on the prognosis of case-fatality for the majority of maternal complications in the absence of effective interventions.

In order to identify severe morbidity, Stones et al (1991) and Yoong et al (1996) used criteria based on signs and symptoms, such as blood loss in excess of 2,000ml for defining near-miss death events linked to haemorrhage. But there are clearly difficulties among health professionals in reaching consensus on definitions to enable comparisons across studies (Bouvier-Colle, 1996). There is also a need for flexibility in order to accommodate rare complications, as criteria cannot be defined for every condition. Another approach to case definition uses information on the type of care provided (Bewley and Creighton, 1995; Bouvier-Colle et al, 1996). With this approach, a woman who stayed in intensive care, for example, in relation to a pregnancy, qualifies as near-miss death or critical illness. Its main advantages are that it is immediately operational and measures morbidity beyond the narrow categories of direct and indirect obstetric complications. However, experience from previous intensive care "performance" studies shows that it does not provide representative information on the relative distribution of complications and that it is dependent on the local infrastructure and standard protocol and treatment (for example, Collop and Sahn (1993); Graham and Luxton (1989); Kilpatrick and Matthay (1992); Mabie and Sibai (1990); Ng et al (1992); Stephens (1991)). The objectives of these studies were usually to describe the workload, performance and needs of single intensive care units situated in tertiary-level hospitals. Because of variation in case-management policies, they find very different levels of serious morbidities (from 105 to 883 per 100,000 deliveries), different patterns of complications (although hypertensive disorders of pregnancy are a constant feature) and different case-fatalities. Bouvier-Colle and colleagues (1996) calculate the occurrence of severe morbidity across several hospitals, and this slightly conceals differences in magnitude due to hospital policies. However, international comparisons using intensive care criteria for case-definition are likely to be difficult to interpret.

More recently, Mantel et al (1998) in South Africa have proposed a comprehensive set of definitions based on organ failure (for example cardiac, liver or renal dysfunction) and

emergency treatment (intensive care admission, emergency hysterectomy and anaesthetic accidents). These definitions were applied to identify sub-standard care factors in a prospective audit of near-miss cases in two tertiary hospitals in Pretoria. Although this paper represents a considerable step forward in the conceptualisation of near-miss events, the universality of the proposed definitions is still debatable. Several of the organ-based definitions use diagnostic criteria which would be difficult to apply in developing country facilities with minimal equipment.

1.4 DATA COLLECTION CONSIDERATIONS IN MORBIDITY MEASUREMENT

Safe motherhood programmes in developing countries attempt not only to increase the effectiveness of case management in averting deaths, but also the efficiency of the referral system in bringing severely-ill women to the hospitals. Therefore, ideally, the occurrence of near-miss death events and severe complications should be measured at two ends: in services, where the data are available to investigate quality of care and hospital case-fatality; and in the community to document prevalence and the patterns of morbidity occurrence, and to investigate the responsiveness of the community in the event of near-miss complications. Successful uses of hospital data on maternal health outcomes have been reported in the recent literature, particularly in specialist centres where very complicated cases are referred (Prevention of Maternal Mortality Network, 1995; Pathak et al, 1998). The main measurement issues with this type of study are related to the definition of the outcome of interest and the quality of information contained in medical records. Less straightforward is the development of feasible approaches for collecting health data at the community-level.

Retrospective individual health-interview surveys are the main approach for getting information at community-level. Health examination surveys, which include a clinical component (involving physicians and medical equipment) are not a feasible option for conditions which are rare and acute, such as direct obstetric complications, as a huge sample size would be needed to

capture these events in sufficient number in the context of cross-sectional surveys, whilst prospective studies are extremely labour intensive (Bhatia and Cleland, 1996; Ronsmans, 1996).

An important issue that needs to be addressed is the meaning of the information collected by retrospective health-interview surveys and the extent to which survey reports of illness should match medical diagnoses. Medical sociologists differentiate between the concepts of 'disease', which is diagnosed and treated by physicians and refers to pathological changes in the body, and 'illness' which relates to the personal experience of disease (Radley, 1994)[4]. Zurayk and Kabakian (1996) argue eloquently about the usefulness of women's perspective on their health as it cannot be dissociated from the way medicine is or should be practised in different settings. Women have cultural anticipations "about which bodily disturbances require medical attention and which ones are 'normal'" which need medical practitioners' awareness (Radley, 1994). More generally, information on perceived ill-health has been used in developing countries for exploring issues related to health care seeking behaviour and for understanding the way individuals and communities prioritise their health needs (Kroeger, 1988a; Murray and Chen, 1992). Health-interview surveys have, for example, successfully investigated how perceived symptoms of reproductive morbidity influence contraceptive choice and continuation (Bulut et al, 1997; Cotten et al, 1992).

One difficulty is that programme managers in developing countries need information based on disease models in order to measure the needs and achievements of safe motherhood activities. They are faced with the considerable challenge of reducing fatalities and this takes precedence over improving positive health. Measurement comparability over time and repeatability must be ensured in order to identify trends, which necessitates strict criteria for case definition which

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[4] The term 'morbidity' is used to refer to the extent or the frequency of disease or illness within a group or a population (Radley, 1994)

is not always easy to achieve with indicators based on perceptions or health-related quality of life. There is also a crucial need for discriminating between types of condition as they often require different interventions and may respond to a different degree to programme action. For these reasons, the development of health interview questionnaire tools should probably focus, in the first instance, on medical conditions which present clear signs and symptoms and where subjective assessment of illness and objective biomedical assessment of diseases have the potential to overlap to a considerable degree.

A key assumption to the adoption of a bio-medical framework for survey measurement is that most diseases or conditions present distinct features (Chandramohan, 1994). These features typically include physical signs and clinical symptoms, together with analytical elements such as the duration and sequence of signs and symptoms. Regarding maternal health, a key element of diagnosis is the timing or onset of symptoms of ill-health during pregnancy. Thus, pregnancy trimester and timing vis-a-vis labour can be particularly important in determining the cause of an haemorrhage, for example in differentiating between placenta praevia and retained placenta. One major limitation to community measurement of maternal morbidity is that several conditions, such as anaemia and pre-eclampsia, can only be detected through laboratory tests or functional measures. It is unlikely that health-interview surveys provide an accurate measurement of these conditions. More complex survey designs with clinical examination and prospective follow-up of pregnant women are required and can mainly be envisaged in the context of intervention trials.

Focusing on severe morbidity could have the very important methodological advantage of providing information with the least observation bias, and thus, with improved validity. There is evidence that the more severe the morbidity, the more likely it is to be recognised through symptoms (Alonso et al, 1987) and the less the variation between individuals reporting the illness in the community (Kroeger, 1988b). Similarly, individuals who experienced a severe

illness may also be able to report the circumstances of their illness with a higher degree of accuracy or completeness than those less affected, and for a longer recall period (Kroeger, 1983; Kroeger, 1988a). This was demonstrated by Martin in a study conducted in the UK (1987), where most discrepancies between women and medical records were related to minor complications such as spotting in early pregnancy and mild hypertension, as they were either not indicated in the records or not reported by the women[5].

1.5 OBJECTIVES OF PHD

The thesis reports on the results of a research project conducted in South Benin. The objectives of this research project were to adapt the near-miss approach to provide information on severe maternal morbidity at sub-national levels in developing countries and to evaluate the potential of individual interview surveys for collecting this information at the community level. Our hypotheses were that severe morbidity or near-miss indicators are a useful proxy for maternal death events to inform Safe Motherhood programmes, that they are more frequent than deaths and that women would remember severe complications more accurately than mild complications in the context of health-interview surveys. Previous validation studies have so far shown mixed results of self-reports of obstetric morbidity compared to medical records (Stewart and Festin, 1995; Ronsmans et al, 1997b) but were focussing on less severe episodes of ill-health. We therefore conducted a field trial to validate interview-based near-miss and non-near miss diagnoses of four major obstetric complications (dystocia, haemorrhage, eclampsia and infections) against medical records information from three hospitals in South Benin.

The thesis has the following plan. Chapter 2 reviews the literature on previous validation studies in obstetrics. Chapter 3 gives an overview of the specific objectives of the study and

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[5] Chapter 2 provides further detail on this study.

the materials and methods used for the research activities. This is followed by a brief presentation of the characteristics of the sample in Chapter 4. Validity results are then presented for the 4 major complications of interest in Chapters 5, 6, 7 and 8, after a brief review of their clinical definition and incidence. Elements of success and factors affecting accuracy of reporting are discussed in Chapter 9. This chapter ends with a reflection on alternative options for outcome measurement in safe motherhood and the conclusion.

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CHAPTER 2. PREVIOUS VALIDATION STUDIES IN OBSTETRICS

This chapter presents an overview of the main results of previous validation studies in obstetrics, grouped into high income and low income countries. Investigations in high income countries are conducted on different premises from low income countries. They generally focus on less severe events and asked questions to women familiar with medical matters. Questionnaire data are normally used with the objective of complementing routine health system information rather than providing a substitute for it. In contrast, validation studies in low income countries typically concentrate on life threatening complications, with the objective of finding an alternative to routine data for estimating prevalence.

Several of the validation studies considered here, particularly those conducted in developing countries, had not been published when the study started.

2.1 VALIDATION STUDIES IN HIGH INCOME COUNTRIES

In high income countries several studies have investigated the accuracy of women's reporting of pregnancy/childbirth events compared to medical records. These are either nested in case control studies focussing on childhood illnesses (for examples, Olson et al, 1997; Joffe and Grisso, 1985) or validation studies in their own right (Bryant et al, 1989; Casey et al, 1992; Martin, 1987; Oakley et al, 1990). They frequently consider bleeding during pregnancy, hypertension or pre-eclampsia, and sometimes labour, among other events. The morbidity considered is generally quite mild and except for one study (Joffe and Grisso, 1985), sensitivity is always well below specificity. Sometimes sensitivity is extremely low (sensitivity was 0% for both 'significant medical problem' and malpresentation in one of the studies (Casey et al, 1992)), while specificity is usually over 95%. Most discrepancies appeared to be due to the

mis-reporting or mis-recording of minor events. Relevant results from these studies are summarised below[1].

- In the context of an American case-control study in childhood leukemia, Olson and colleagues (1997) compared data on pregnancy complications from medical records and telephone interviews. Interestingly, two types of definition were generally used to identify complications: definitions using standard diagnosis criteria applied *a posteriori* and definitions just using mentions of complications in medical records. By and large, results show low validity and reliability except for gestational diabetes and toxaemia/ pre-eclampsia when using strict diagnostic criteria. For pre-eclampsia/toxaemia interview results were very good with a sensitivity of 100% and a specificity of 96%, when compared to strict medical definitions (Diastolic blood pressure > 100mmHg on 2 occasions and proteinuria 3 plus or more), and sensitivity of 65% and 98% when using looser definitions. The authors also found significant differences in Kappa statistics when looking at time interval since the event. For pre-eclampsia/toxaemia, kappa statistics were 0.88 for an interval 1-1.9 years, 0.65 for an interval of 2-4 years, 0.47 for an interval of 4 years or more. Time between delivery and interview ranged from 0 to 8 years. Explaining some of the poor concordance, the authors remarked that the complications considered were 'more a condition than an event'. In other words, congruence might be improved for acute conditions.

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[1] The majority of these studies use sensitivity and specificity and kappa statistics to assess their results. Sensitivity is the proportion of gold standard cases correctly classified with the condition of interest by the questionnaire while specificity is the proportion of gold standard non-cases correctly classified as without the condition. Kappa statistic is a measure of reliability. It determines the extent of the agreement between the two approaches to data collection taking into account agreement occurring by chance alone. A value of 0 indicates that agreement occurred only by chance while 1 is perfect agreement. Negative values are also possible. Further discussion on these concepts can be found in chapters 3 and 8.

- Strong evidence of recall deficits (or deficient survey methodology) was found in a sample of 65 women attending a well-child clinic in the USA (Casey et al, 1992). There was only one report of a complication from a false positive and all true positives "failed to report any of the significant medical problem during pregnancy or malpresentation during delivery documented in their medical records" (sensitivity was 0% for both medical problem and malpresentation and specificity was 100% for medical problem and 98% for malpresentation). The interview schedule was composed of open ended questions. The authors indicate that more direct and specific questions may have been more appropriate.

- Oakley et al (1990) compared three sources of data (hospital records, home interview, postal questionnaire) for 467 women in the context of a randomised control trial of social support in high risk pregnancy. Calculation of sensitivity and specificity results from the published data is not possible. However, hospital records contained more records of bleeding than reported[2] and women report duration of labour longer than recorded in hospital by 2 hours[3]. The labour results are explained in terms of definitions. Women defined from their own experience of physical signs while hospital records use time at admissions.

- Bryant et al (1989) documented considerable discrepancy on health at peri-conception between women's report during prenatal and postnatal interviews and medical reports. Kappa statistics for vaginal spotting and bleeding only reached 0.14, while sensitivity and specificity were 10% and 99% respectively. Interestingly febrile illness such as cold and flu was reported more by women than recorded by doctors. The authors conclude

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[2] Could indicate increased sensitivity at the expense of specificity.

[3] Could indicate increased specificity at the expense of sensitivity.

that early and short term illnesses such as spotting are not deemed worth reporting by women during interviews while staff only record problems known to be dangerous to pregnancy.

- Martin (1987) assessed the performance of a postal questionnaire on pregnancy, labour and delivery against medical records. Questions on high blood pressure/toxaemia reached a sensitivity and a specificity of 72% and 94% respectively while those on vaginal bleeding during pregnancy had a sensitivity of 62% and a specificity of 97%. Most discrepancies were for minor events, for example mild hypertension and light vaginal bleeding early in pregnancy. Labour questions focussed on procedures during delivery (induction, acceleration, pain relief) and type of delivery and showed excellent agreement for type of delivery and moderate agreement for procedures except for epidural and general anaesthesia. The author concluded that 'the issue was not so much whether a symptom was present, but how much of a problem it was' and that there was no clear pattern as to which source of data 'reported' minor events with more accuracy.

- In a case-control study on low birth weight, Joffe and Grisso (1985) interviewed women who had recently delivered and compared information on vaginal bleeding with medical records. Sensitivity was 86% and specificity 87%, with most disagreement centred on the first trimester.

- In Australia, Oates and Forrest (1984) investigated the concordance of women's reports of birth and neonatal problems with obstetric record data. A group of 47 women of a low socio-economic group who had experienced early child-rearing problems were included in the sample, and interviewed on average 5.6 years after delivery. Sensitivity and specificity of reports of abnormal delivery were 78% and 72% respectively. Normal

delivery was defined as a vertex presentation, with a labour of less than 24 hours and delivery without the help of instruments. Abnormal delivery was the converse. The authors remarked that women appeared to over-report problems, attributing this phenomenon to their child-rearing problems (in other words, alluding to recall bias), but with no data to support this assertion.

2.2 VALIDATION STUDIES IN LOW INCOME COUNTRIES

In the early nineties, several research groups engaged in experimental uses of survey instruments for measuring the population-based prevalence of obstetric morbidities in poor countries. Some of these studies were done in the context of a programme evaluation, others simply to document prevalence. Most had a questionnaire validation component. Results from six validation attempts are described below. Table 2.1 presents the case definitions used in 4 validation studies focussing on direct obstetric morbidity and table 2.2 a selection of the main sensitivity and specificity results[4].

- Family Health International study in Egypt

The Egyptian Fertility Care Society (1995) conducted a survey on maternal morbidity prevalence as part of the Family Health International "Maternal Morbidity Network". A total of 4522 women with a birth in the past five years was interviewed at home using a structured questionnaire. Altogether, 50% of women reported a problem in the antepartum period, 18% in the intrapartum and 46% in the postpartum. Women reporting chronic symptoms (indicative of stress incontinence/vesico-vaginal fistula, recto-vaginal fistula (RVF), prolapse, dyspareunia and haemorrhoids) were invited for a physical examination at a hospital with an obstetrician.

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[4] These results were selected applying our criteria sensitivity and specificity. These criteria are presented in chapter 3.

Table 2.1: Case definitions for four questionnaire validation studies on direct obstetric morbidity in developing countries*

	Stewart and Festin, 1995 **Philippines (N=230)**	Ronsmans et al, 1997 **Indonesia (N=204)**
haemorrhage	haemorrhage: women having an estimated blood loss > 500 ml and a reported diagnosis of haemorrhage, or those with a diagnosis of retained placenta who had a manual extraction of the placenta, or those with a diagnosis of postpartum haemorrhage on the chart	haemorrhage: estimated blood loss of more than 500 ml during or after labour with either shock or retained placenta or uterus atony or ruptured uterus or cervical laceration or perineal laceration or placenta praevia
dystocia	dystocia: women who had a caesarean section delivery after a trial of labor where surgical delivery was indicated because of obstructed labour. Obstructed labour included those diagnosed with cephalopelvic disproportion, transverse lie, and no progress of labour	dystocia: no progress of labour as diagnosed by the partograph or vacuum extraction because of prolonged second stage of labour or cesarean section delivery because of cephalo-pelvic disproportion or ruptured uterus or transverse lie or frank or footling breech
sepsis	sepsis: women having a temperature greater than 38 C during labor and delivery or after the first 24 h after delivery, and a sign of infection. Signs of infection included positive culture of the blood, endometrium, placenta, or endocervix, or an infection of a laceration or surgical wound; or an upper or lower reproductive tract infection, or a foul smelling discharge	sepsis: temperature greater than or equal to 39 C and uterine tenderness on exam or temperature greater than or equal to 39 C and purulent drainage from wound infection (cesarean section, episiotomy, tears)
eclampsia	eclampsia: women having at least one sign of pre-eclampsia during pregnancy or labour and delivery, and at least one eclamptic seizure during pregnancy or labour and delivery. Signs of pre-eclampsia included severe generalized oedema (3-4+), albuminuria (3-4+),or hypertension (>140/90). Women with a history of seizures outside pregnancy were excluded.	eclampsia: observed convulsions or history of convulsions with profound lethargy or difficulty being aroused and high blood pressure (>140/90) and albuminuria or generalized edema
healthy comparison group	non-case: women admitted for delivery who may or may not have had other complications, but which did not meet the criteria for any of the conditions of interest	normal labour and delivery: women who did not meet the criteria for the conditions of interest and cephalic presentation and spontaneous vaginal delivery and placenta delivered within one-half hour

Note: * using exact transcription of published definitions in most cases

Table 2.1: Case definitions for four questionnaire validation studies on direct obstetric morbidity in developing countries [continuation]

	Seoane et al, 1998 **Bolivia (N=685)**	Amoaful et al, 1996 **Ghana (N=340)**
haemorrhage	postpartum haemorrhage: women with a documented blood loss of > 1000 cm^3 or who had reported a postpartum haemorrhage at home in conjunction with either a clinically diagnosed retained placenta or cervical lacerations	antepartum haemorrhage: vaginal bleeding >28 and <= 42 weeks postpartum haemorrhage: >500 ml intrapartum or postpartum blood loss measured or estimated by clinician
dystocia	labour disorders: women who were monitored for at least 2 h by partograph and who dilated <1cm h^{-1}, bore down (pushed) for > 2 h, or had a uterine rupture without having had a previous c-section malpresentation: women with an infant in a non-vertex presentation	dysfunctional labour: <1cm progress dilatation /hour in active phase, or no progress to delivery despite several hours of pushing afer full dilatation, or transverse lie, or clinical diagnosis of dysfunctional or prolonged labour or CPD
sepsis	sepsis: women with a body temperature > 38 C and either uterine pain or purulent discharge	sepsis: positive cultures (blood, wound, or cervical swab), or temperature >38 C on admission with elevated white blood count (>8.5), or clinician's diagnosis of septic shock or sepsis with elevated white blood count (>8.5), or pelvic inflammatory diseases on initial exam, or clinician's diagnosis of septic infection, laceration or surgical wound
eclampsia	eclampsia: women with clinically observed convulsions without a history of non-pregnancy-related convulsions	eclampsia: women with high blood pressure (>140/90) and proteinuria and non-epileptic convulsions, regardless of oedema
healthy comparison group	women admitted to the hospital who had a normal labour, delivery and postpartum period, and meeting the following criteria: >38 weeks pregnancy, no elevation of temperature > 37.5 C, no blood pressure reading >140/90, a blood loss < 500 cm^3, and no symptoms of shock or unconsciousness	not specified

Table 2.2: **Summary of published results of questionnaire validation studies on direct obstetric morbidity in developing countries (applying the Benin criteria which lay emphasis on high specificity[#])**

	Stewart and Festin, 1995			Ronsmans et al, 1997		
	Philippines (N=230)			**Indonesia (N=204)**		
	Sensitivity	Specificity	Question topic	Sensitivity	Specificity	Question topic
haemorrhage	53%	90%	'lost a lot of blood' around delivery	44%	100%	abnormal bleeding during labour and delivery and delayed delivery of placenta
dystocia	69%	97%	labour followed by c-section for obstructed labour	44%	95%	duration of labour > 1day and 1 night a problem according to women/ person assisting
sepsis	56%	99%	'foul vaginal discharge or pus' postpartum (*)	NA	100%	very high fever during labour &/or delivery (**)
eclampsia	44%	96%	convulsions during pregnancy or around delivery	75%	96%	convulsion during pregnancy (*)

Nota Bene:
Comparison groups are all other women for Bolivia, Philippines and Indonesia data. Unclear for Ghana data.
(*) based on 10 diagnosed cases or less; (**) no case was diagnosed, (***) not calculated because of small number of sepsis case (N=3)
these criteria are discussed in chapter 3

Table 2.2: **Summary of published results of questionnaire validation studies on direct obstetric morbidity in developing countries (applying the Benin criteria which put emphasis on high specificity[#]) [continuation]**

	Seoane et al, 1998			Amoaful et al, 1996		
	Bolivia (N=685)			**Ghana (N=340)**		
	Sensitivity	Specificity	Question topic	Sensitivity	Specificity	Question topic
haemorrhage	69%	89%	bled so much she fainted	50%	97%	antepartum: bleeding between 5 months and delivery (*)
				50%	93%	pph: excessive bleeding according to most qualified person present at delivery (*)
dystocia	21%	90%	extended pushing	50%	94%	duration of labour > 1day and 1 night a problem according to women/ person assisting
	36%	95%	malpresentation identified before delivery			
sepsis	NA	99%	thought she had an infection (***)	50%	88%	very high fever during labour &/or delivery (*)
eclampsia	50%	99%	any seizures	NA	99%	convulsion during pregnancy (**)

Nota Bene:
Comparison groups are all other women for Bolivia, Philippines and Indonesia data. Unclear for Ghana data.
(*) based on 10 diagnosed cases or less; (**) no case was diagnosed, (***) not calculated because of small number of sepsis case (3)
these criteria are discussed in chapter 3

A sample of women without problems matched by age and residence was also invited as a comparison group. Results of the validity analysis were used to recalculate prevalence in the overall sample[5]. Overall, poor combinations of sensitivity and specificity, the highest specificity being for recto-vaginal fistulas but combined with a 0% sensitivity were obtained. This generated considerable differences in recalculated prevalence for prolapse (31% calculated prevalence vs 11% in initial survey reports), dyspareunia (18% vs 2%) and RVF (0.2% vs 1.3%), stress incontinence or vesico-vagina fistula (10.0% vs 6.2%), and haemorrhoids (10.7% vs 12.5%).

This study was part of a network of studies conducted in Egypt, Bangladesh, India and Indonesia using a standardized questionnaire (Fortney and Smith, 1996)[6]. Differences in prevalence exist between the four countries. Women in Bangladesh reported considerably more morbidity than Egypt, Indonesia and India, especially with respect to bleeding and fever. For example, intrapartum excessive bleeding ranged from 19.6% in Bangladesh to 0.9% in India. The authors explained these findings by differences in uptake of care during pregnancy and at delivery, Bangladesh being a country where women were less likely to seek care. Other likely explanations include cultural variation in interpretations of questionnaires and in acceptability of positive responses in addition to problems of translations.

- Demographic and Health Survey study in the Philippines

Stewart and Festin (1995) conducted a validation study in the Philippines to test a questionnaire to be applied in other settings by the Demographic and Health Surveys (DHS) programme. The

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[5] This interesting validation strategy can be used only for chronic obstetric diseases, as acute obstetric complications are too rare events to be found in sufficient number at the time of a survey contact.

[6] Bangladesh, India and Indonesia did not include a validation component.

discharge register of a hospital in Manilla was used to identify a sample of women with complications (eclampsia, haemorrhage, dystocia and infections) and controls. A total of 632 medical records was abstracted and 230 women interviewed: 48 dystocia, 53 haemorrhage, nine infections, 16 eclampsia and 114 non-cases. The low number of puerperal sepsis was attributed to the low prevalence of the condition while a random sample of dystocia cases had to be selected. By and large, haemorrhage cases were postpartum and dystocia cases were women with obstructed labour who had a c-section. Recall period span was between 0 to 4 years. Best sensitivity and specificity results are presented in table 2.2 together with questionnaire items. The best balance of sensitivity and specificity (69% and 97% respectively) was for dystocia. These good results can be attributed to the fact that only women with obstructed labour who underwent c-section were interviewed. The authors concluded that obstetric morbidity surveys could be conducted with acceptable levels of under and over-reporting.

The safe motherhood questionnaire tested in this study was subsequently applied in several countries. Wide ranges of results were obtained partly leading the DHS programme to abandon it (Carine Ronsmans, personal communication). The percentage of births for which a complication was reported varies between 9% in Namibia to 59% in Central African Republic among 14 countries (Stewart et al, 1997). Convulsions during pregnancy which is usually believed to be under 1% prevalence, varied from 1% in Egypt to 12% in Guatemala (Stewart et al, 1997).

- Mothercare studies

Ronsmans et al (1997) report on a validation study conducted by MotherCare in Indonesia as a prelude to the inception of an evaluation framework. A prospective design was used to recruit 169 women with obstetric complications (dystocia, haemorrhage, eclampsia and pre-eclampsia)

and 115 normal women in three urban hospitals. No cases of infection could be identified. Morbidity experienced by cases appeared broadly moderate, although case definitions include serious events[7]. Haemorrhage cases were mostly postpartum. Several questionnaire items were based on the DHS model. Although very high specificity was found (above 95%), reported sensitivity was generally quite low (below 50%), except for eclampsia for which very good results were obtained (sensitivity 75% and specificity 96%) (table 2.2). Some of the best questionnaire items were based on spontaneous reports because of the high specificity they induced.

With a similar aim, Seone and colleagues (1998) also carried out a prospective study in two referral hospitals in Bolivia. A total of 1027 women was interviewed on the day they left hospital. Information from the partograph was used to define labour disorder and hospital physicians were trained in its application. A group of 257 women fulfilled the criteria for complications, 428 women for normal controls, and 342 women were excluded from the analysis because they did not fit either case-definition. Labour disorder (106 women) and malpresentation (106 women) were the most frequent complications, followed by 34 postpartum haemorrhage cases and 22 eclampsia. Only 3 cases of sepsis could be identified despite moderately severe criteria included in the case definition. However, there was insufficient information to determine sepsis in more than a third of the total sample. Information was analysed using sensitivity, specificity positive predictive value and percentage agreement[8]. The highest agreement obtained was for eclampsia (96% percentage agreement), with an excellent specificity (99%) although the sensitivity was low (50%).

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[7] For example, cases selected for dystocia include 13 prolonged labour, 13 prolonged second stage of labour, 27 frank or footling breech, 5 transverse lie and 20 caesarean section for cephalo-pelvic disproportion. There were no cases of ruptured uterus.

[8] Percentage agreement simply calculates how many exact agreement occurred between the two sources.

- Other studies

In a similar study, Amoaful et al (1996) also used a variant of the DHS questionnaire in a Population Council intervention setting in Ghana for a prospective validation of a structured questionnaire. A total of 340 women presenting between seven months pregnancy and 42 days postpartum at a rural hospital was recruited. Among these, eight were diagnosed with antepartum haemorrhage, 50 with dysfunctional labour, 10 with postpartum haemorrhage and four infections. No cases of eclampsia were found. Case definitions in this study appear less rigid than for those already mentioned. Balanced combinations of sensitivity and specificity could not be found for any of the conditions. High specificity (greater than 90%) was obtained at considerable cost for sensitivity which was never raised more than 50%. The best results were for antepartum haemorrhage (sensitivity 50%, and specificity 97%). Interestingly, the best questions for duration of labour and postpartum bleeding are those which specify that the woman or another person present thought that it was a problem.

In the aftermath of a CDC survey, Danel et al (1996) validated obstetric morbidity reports for a sub-sample of women who had delivered in public hospitals in Ecuador. Complications investigated include prolonged labour, intense bleeding, convulsions, loss of consciousness, fever and foetal malpresentation. Complications were more likely to be reported by the respondents than to be recorded in case notes. Kappa statistics were extremely low for all complications, often well below 40%. The authors ascribed this to the poor quality of recording especially for mild complication and to the poor behaviour of kappa statistics for very rare or very common conditions. The authors did not use sensitivity and specificity because of the poor quality of the gold standard[9]. There was a trend of better agreement for women with

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[9] This is linked to the validation strategy of first identifying women in the community and then searching for their medical records. There is little control on the quality of medical records.

better education but, except for intense bleeding, loss of consciousness and fever, the effect was generally minor.

2.3 SUMMARY OF FINDINGS

Findings in high income countries suggest that severity and acuteness of events are important for a good congruence between women's recall and medical records. Developing country studies tend to concentrate on acute life-threatening events.

In Bolivia and Indonesia, the most reliable results were obtained for eclampsia (Ronsmans et al, 1997; Seoane et al, 1998). These results are underscored to some extent by the only developed country study which looked at pre-eclampsia (Olson et al, 1997). Useful results were also obtained for dystocia in the Philippines (Stewart and Festin, 1995). Postpartum sepsis was usually found in too small a number to calculate sensitivity with confidence.

Except for eclampsia, the case definitions for direct obstetric complications vary greatly between studies (table 2.1). In addition, severe and less severe entities are mixed for the other complications, particularly for dystocia. Unfortunately, the articles do not always allow assessment of the extent to which the samples contained serious cases. Our study attempts to distinguish further between severe and less severe complications.

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CHAPTER 3. MATERIALS AND METHODS

3.1 SPECIFIC OBJECTIVES

The objective of the study is to test whether women accurately report the signs and symptoms of severe and less severe obstetric complications for retrospective health-interview based diagnosis of maternal morbidity in the community. The ultimate goal of the study is to develop a practical tool for informing Safe Motherhood Programmes on their needs and achievements.

To achieve this purpose, the study had the following specific objectives:

1. to develop diagnostic criteria for hospital diagnosis of near-miss morbidity for four obstetric complications (dystocia, haemorrhage, eclampsia, and infections)
2. to translate these diagnostic criteria into operational definitions of near-miss and non near-miss morbidity for collection in the community
3. to conduct retrospective individual interviews in the community, with cases and non-cases of near-miss morbidity who had been previously identified through hospital record review
4. to assess the sensitivity and specificity of women's reports of near-miss and non near-miss morbidity with diagnoses contained in medical records, according to types and date of occurrence of conditions and women's characteristics

3.2 STUDY SITE

3.2.1 Benin

Benin is a French-speaking West-African country on the Gulf of Guinea, covering an area of 112,622 km^2 and with a total population projected at a little more than 5 million (the exact number in 1992 according to census results was 4,915,555). The country is divided into 6 departments (Atacora, Atlantique, Borgou, Mono, Ouémé, Zou) (figure 3.1). The three southern departments (Mono, Ouémé and Atlantique) hold more than half of the population (53%) in 1/10 of the total area. A quarter of the total population of Benin lives in the two Atlantique towns, Cotonou and Porto Novo (approximately 600,000 and 200,000 respectively). DHS shows that 40% of women aged 15-49 lived in urban areas in 1996.

The country's demographic regime is characterised by a high fertility level (total fertility rate of 6.3 children per woman[1]) and a mortality in regression, though still elevated (the life expectancy for women is estimated at 56 years) (Kodjogbe et al, 1997; INSAE, 1994a). Many women still die in pregnancy or childbirth. Results from the national census show a maternal mortality ratio of 473 maternal deaths per 100,000 live births (INSAE, 1994a). The recent demographic and health survey confirms this result with a sisterhood method estimate of 503 maternal deaths per 100,000 live births (Kodjogbe et al, 1997). However, estimates based on a mathematical model developed by WHO and UNICEF bring this ratio even higher to 990 per 100,000 live births (WHO and UNICEF, 1996).

With a gross national product (GNP) of 420 dollars per capita (UNICEF, 1996), Benin spends less than a pound per person on health from public funds. The budgetary deficit and the policy

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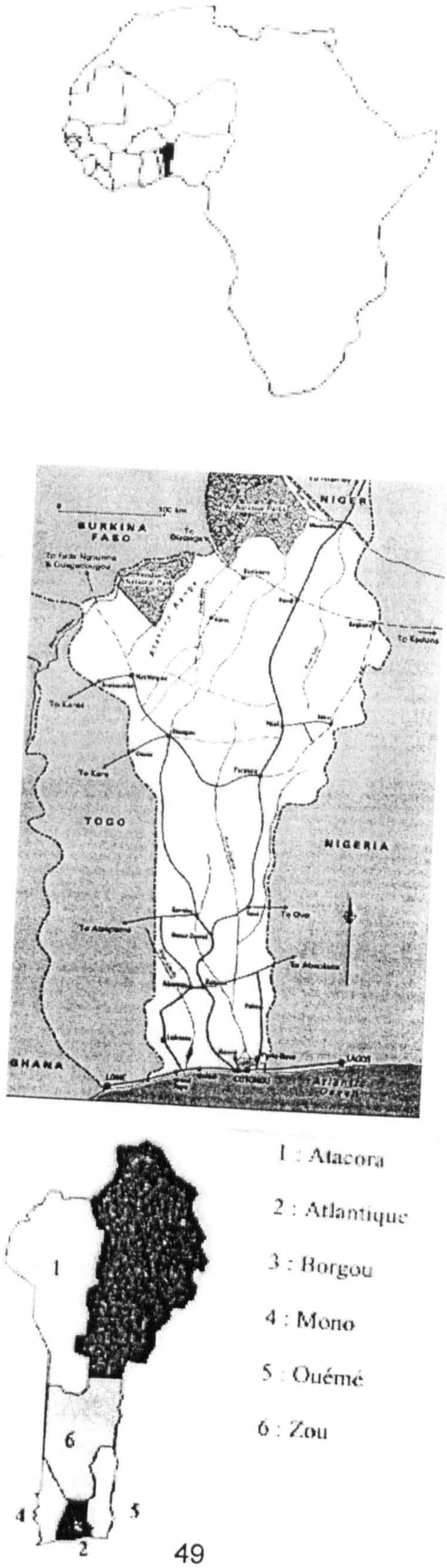
[1] Calculated for women aged 15-49.

Figure 3.1
Maps of Benin



of structural adjustment means that little money has been invested by the government on health infrastructures and that the public sector stopped all health staff recruitment from 1986 to 1996. Family planning is essentially unavailable, unsafe abortion is common, and around a third of deliveries take place outside the health system (Kodjogbe et al, 1997).

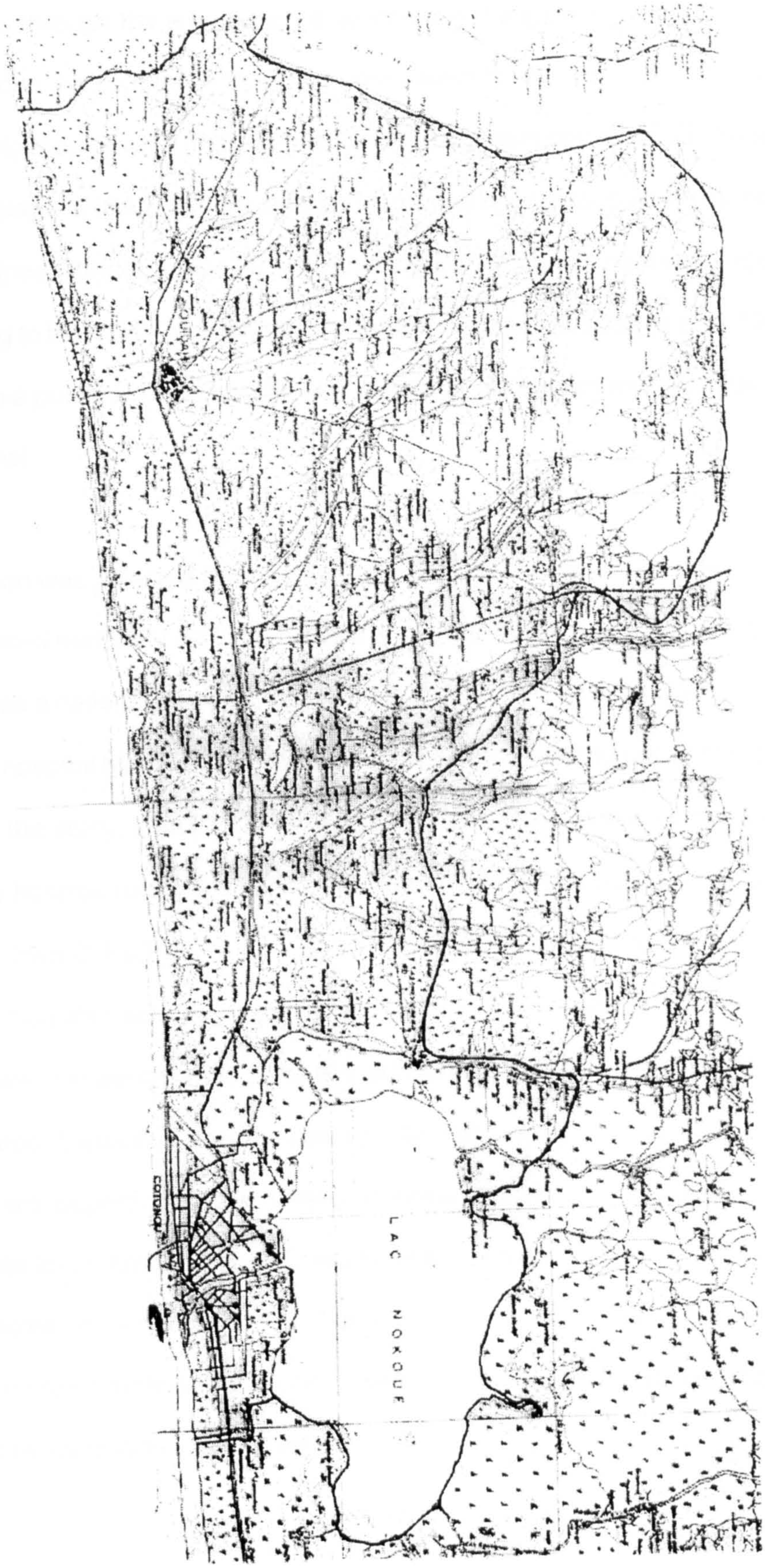
By customary laws, women and their bodies are submitted to men's decisions (Hadonou-Amoussou, 1991), and although a striking proportion of women (25%) are heads of household in urban areas, this is often associated with considerable poverty (République du Bénin, 1994). Men play an important role in the decision to use and the choice of maternity services. They pay for these services, even when a woman has her own resources, and this is the way husbands acknowledge that they are the father of the unborn child.

One of the most prominent cultural features of Benin is the voodoo belief which Beninese slaves exported to other parts of the world, for example in Northern Brazil and Haiti. This belief still dominates every aspect of life with adverse health events primarily attributed to witchcraft or the world of spirits.

3.2.2 study area

The study took place in two administrative areas, or *"circonscriptions"*, of the Southern Department "Atlantique", which is also the most developed and populated part of the country: the *"circonscription"* of Cotonou, the main town of Benin (600,000 inhabitants), and its immediate surroundings; and the *"circonscription"* of Ouidah, which embraces the little town of Ouidah (65,000 inhabitants) and adjacent rural areas (figure 3.2). These rural areas are often difficult to access, especially during the two rainy seasons (which take place between May and July, and September and October). The international highway linking the major cities on the

Figure 3.2
Map of Study Area,



Gulf of Guinea goes through the area, which is bordered in the south by the Ocean. In 1992, these *"circonscriptions"* had a total of 153,875 women aged 15-49; less than a third of women of all ages are able to read or write (INSAE, 1993). Three quarters of the population speak Fon or an affiliated language (INSAE, 1994b), although Cotonou is a cosmopolitan city, regrouping the majority of Beninese ethnic groups, Fon still dominates. Maternity care coverage appears very high: according to the 1996 Demographic and Health Surveys (Kodjogbe et al, 1997), 92% of women deliver in a public or private facility and almost all (97%) received prenatal care from a health professional.

The study population was selected from women who had visited one of three health facilities:

- the specialised maternity clinic of the sole university hospital in Benin (CUGO/CNHU) which acts as a national referral centre and conducts approximately 2500 deliveries per year. This hospital tends to receive the most severely-ill among complicated cases. At the time of the study, it had 70 beds, 6 qualified obstetricians and 42 midwives.
- a maternity hospital run by the Ministry of Health (Maternité Lagune), long established and busier than CUGO (more than 4000 deliveries per year) and more affordable to patients, which also acts as a referral and training centre (some medical students in obstetrics and gynaecology do parts of their training there). At the time of the study, it had 124 beds, 5 qualified obstetricians and 42 midwives.
- the obstetrics department of a 'district' hospital (*hôpital de sous-préfecture*) at the intermediate level (Ambulance de Ouidah), which acts as a first referral point for many health centres in and outside the "*circonscription*" and department Atlantique. It conducts approximately 800 deliveries a year. At the time of the study, it had 23 beds, 2 qualified obstetricians and 7 midwives.

3.3 STUDY DESIGN

This is a hospital-based validation study of a morbidity questionnaire, with identification of a cross-sectional sample of women at hospital level and retrospective interviews in the community. Interview-based reports of complications are compared with hospital case-note diagnoses. The sensitivity and specificity of women's reports to questions or combinations of questions (algorithms) are determined for each diagnosis of interest, and according to level of severity, to assess validity.

3.4 IMPLEMENTATION OF STUDY DESIGN

3.4.1 definition of near-miss morbidity

In this study, a ***near-miss maternal death event*** was defined as ***a severe life-threatening obstetric complication necessitating an urgent medical intervention in order to prevent the likely death of the mother.***

The notion of risk of maternal death is central to our definition of near-miss condition or severity. This risk is clearly dependent on setting and varies according to the level and nature of the health services, and criteria used in developed countries, whether based on signs/symptoms or treatment, may not be readily applicable to developing countries. For example, an initially asymptomatic condition such as placenta previa, is likely to carry a higher risk of death in settings where ultrasound is not routinely used and access to emergency health services is inadequate than in areas with a more developed infrastructure. Placenta previa may then be considered a near-miss death event in Benin whereas it would not be a near-miss in Britain. On the other hand, where severe cases of morbidity are numerous and resources are scarce, the

threshold risk for deciding emergency interventions might be placed higher. In Benin, for example, obstetricians may wait for several fits to occur before operating on cases of antepartum eclampsia, whilst caesarian sections will be considered at the occurrence of the first eclamptic fit in western countries.

An important question is whether severity should be measured in terms of risk/poor prognosis for the mother alone or for the mother and the child or foetus. This is particularly relevant for conditions such as prolonged and obstructed labour or eclampsia which affect the survival of both. Ultimately, this will depend on the purpose of the measurement. In the context of quality of care audit, it is often difficult to separate the two, and interventions are made with both in mind (Paterson et al, 1991). On the other hand, where the rationale of Safe Motherhood interventions is primarily to promote women's health, a notion of risk based on the survival of the foetus might be too unspecific for differentiating a maternal life-threatening condition, and so the definition of maternal near-miss status, or severe illness, has to be made principally in relation to maternal risk (WHO, 1994). In our study, we decided to evaluate severity in terms of risk for the mother alone.

Because the main purpose of the study was to develop a tool suitable for application in the community, the study focussed on severe conditions with clinical symptoms denoting severity that the women themselves could identify. Consequently, cases of serious, life-threatening morbidity presenting no clear clinical manifestations but physical signs only were excluded from the study. Exclusions included cases of complete placenta previa identified through ultrasound during pregnancy where no bleeding occurred before intervention took place; or cases of contracted pelvis already identified during a previous pregnancy delivered by elective caesarian section.

3.4.2 choices of cases and non-cases according to specific objectives

'Non-cases' or comparison groups were necessary in order to determine the accuracy of recognition of symptoms of abnormally severe morbidity, *vis-à-vis* less severe morbidity or absence of morbidity, during health interview surveys. Accordingly, for each category of near-miss morbidity, one or two types of 'non-cases' were defined: ***morbidity non-cases*** and ***healthy non-cases***. ***Morbidity non-cases*** are women with a less severe complication for the same overall diagnosis; they will enable us to assess whether women are able to report/recognise the severity of a complication. ***Healthy non-cases*** are women without complications; they will enable us to assess whether women are able to report/recognise the occurrence of a morbidity whether mild or severe.

3.4.3 medical conditions of interest

The study focussed on severe direct obstetric complications related to hypertensive disorders of pregnancy; external haemorrhage in the third trimester, delivery and the puerperium; obstructed and prolonged labour; and postpartum infections. These problems are important causes of maternal mortality in Benin and elsewhere (they accounted for more than two thirds of maternal deaths in 67 maternity centres throughout Benin in 1987 (AbouZahr and Royston, 1991), and in particular, a large proportion of deliveries were complicated by prolonged and obstructed labour (Ministère de la Santé, 1994)); and, they are relevant to safe motherhood programmes.

Conditions which were considered because of their high prevalence in Benin and later excluded are:

i. Anaemia: This is a contributing factor associated with a number of complications in pregnancy, adding to the likelihood of a fatal outcome. In this study, it is included as one of the definition criteria for near-miss cases of haemorrhage of the third trimester, delivery and the puerperium. The main reason for exclusion of the overall diagnosis of anaemia was poor case-definition in medical records. Haemoglobin level was not routinely recorded, and criteria for diagnosis were absent (frequently, anaemia was noted without any further sign or symptoms). Anaemia is often diagnosed in Benin by looking at the colour of the pupil, which is a poor diagnostic tool if an adequate screening test (Shulman et al, 1999).

ii. Early pregnancy haemorrhage (abortion or ectopic pregnancy): This was mainly considered for inclusion because of an apparent high incidence of ectopic pregnancy in the research population. All cases of recognised ectopic pregnancy who survived are near-miss by definition, as they require emergency surgery to do so. Focus group discussions conducted during the pilot stage of this study showed that this condition is, moreover, well-recognised by the population with a local appellation of "*grossesse dans le vide*" or "pregnancy in emptiness". However, it is not easy to find 'control' groups for ascertaining the ease of formulating differential diagnosis of ectopic pregnancy in the context of retrospective interviews on morbidity of the first trimester. Early pregnancy 'controls' would have to be identified in antenatal clinics. In Benin, only a small proportion of women attend antenatal care clinic in early pregnancy. More importantly, the study validates a retrospective questionnaire on past pregnancies, thus controls would have had to finish pregnancy and, by definition, women whose pregnancy terminates in the first trimester are either abortion or ectopic pregnancy; those who continue to the third trimester cannot be ectopic pregnancies.

iii. Post-abortum sepsis: Unsafe abortion is common in Benin (Denakpo, 1994) and most cases of sepsis at CUGO appear to be linked to it. It was, however, excluded as the main methodological issue with individual interviews on abortion complications is not so much the recognition of degree of severity, but rather the report of pregnancy occurrence and that action had been taken to stop it. Induced abortion is notoriously difficult to ascertain (Barreto et al, 1992). Comparing reports of women admitted for complications of induced abortion with those admitted antenatally without an abortion would not illuminate the debate on under-reporting on induced abortion. Furthermore, for early pregnancy haemorrhage, there are also difficulties in finding the appropriate comparison group.

3.4.4 criteria for selection of cases and non-cases

a) cases

To help ensure that near-miss cases and morbidity non-cases form a homogenous group, strict diagnostic criteria were prepared for the 4 chosen conditions (eclampsia, haemorrhage of the third trimester, delivery, and the postpartum, dystocia and postpartum infections of women delivered or operated on), taking into account the nature of information contained in CUGO, Maternité Lagune and Ambulance de Ouidah medical records. Algorithms were developed based on published algorithms for verbal autopsies of maternal deaths, text book descriptions of life-threatening conditions and local clinical expertise in obstetrics. They were prepared by a multidisciplinary team of six persons, including three physicians with experience in obstetrics and gynaecology (Dr Timothée Gandaho, Dr Paul Santos, Prof Eusèbe Alihonou), one of them Professor of Ob/Gyn at GUGO (Prof Alihonou), a physician with expertise in verbal autopsy for maternal death (Dr Carine Ronsmans), a senior midwife employed at GUGO (Mrs Capo-chichi)

and a demographer (Ms Véronique Filippi). These algorithms primarily use criteria related to timing during pregnancy, physical signs, clinical symptoms and information on interventions or treatment when this is unavoidable. They are constructed in a hierarchial fashion and usually start with an essential element, either a clinical sign or a circumstance, which should be present amongst all patients with the diagnosis of interest. They can be found in Appendix 1.

b) morbidity non-cases

The algorithms were prepared for selecting not only cases but also morbidity non-cases. Morbidity non-cases were selected for all conditions, except for haemorrhage. This was because blood loss, the principal clinical manifestation of haemorrhage, is also present in women who have a normal delivery. Although there is an internationally recognised cut-off-point where blood loss becomes haemorrhage (500ml), this threshold is still highly contentious, especially in countries such as Benin where a large proportion of women is likely to be anaemic (WHO, 1990). Considering the practical difficulties in measuring accurately the amount of blood loss, even at health facility level, further differentiation between various degrees of severity of haemorrhage based on amount of blood loss appeared problematic (Brant, 1967; Stones et al, 1993). In the three study hospitals, case-notes rarely included volume measurement, but rather reported verbal estimation of amount of blood loss (e.g. "massive", "a lot", etc). Moreover, women themselves could not be expected to be able to distinguish between physiological bleeding, severe and non-severe abnormal bleeding. The algorithm development group therefore decided to opt for a single category of near-miss haemorrhage morbidity, identified through signs of shock or type of interventions carried out to stop the bleeding or its adverse consequences[2].

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[2] Chapter 6 will return to these points.

The group also had considerable debate as to whether morbidity non-cases should be selected for eclampsia. Although degrees of severity of eclampsia can be defined based on the timing and the number of fits, as shown in Appendix 1, the annual number of cases of eclampsia in CUGO, Maternité Lagune and Ambulance de Ouidah seemed *a priori* too small to obtain a sufficiently large sample. Furthermore, such degree of differentiation is probably of little interest for Safe Motherhood programmes, as they usually consider a single eclamptic fit as a very serious event in itself. Nevertheless in the results section (chapter 5) we will present data for both severe and non-severe groups, as it reveals valuable information on factors influencing recall.

c) healthy non-cases

Our working definition stated that a healthy non-case was a woman who did not present any signs or symptoms used for the identification of cases of near-miss and morbidity non-cases. Thus, she was a woman who delivered vaginally after seven months of pregnancy, without the help of instruments, who did not show any signs or symptoms of hypertensive disorders during pregnancy or after delivery, nor of infections after delivery (puerperal or not, the key symptom being fever) and who did not have any abnormal blood loss during the third trimester, during delivery or after delivery.

Consequently, she was a woman for whom there should be information in medical records on the third trimester of pregnancy, the delivery and the period immediately following the delivery. In practice, however, it was very difficult to find healthy non-cases for whom the medical records contained sufficient information on the postpartum period, as the majority of healthy women appeared to leave the hospital within 24 hours of delivery and did not return to the facility for

a postnatal check-up. We therefore had to include among healthy non-cases, a large number of women for whom we did not have information beyond a day after delivery.

3.4.5 sample size requirements

In selecting the sample size for the number of medical records extracted and individual interviews, a balance between statistical desirability and feasibility had to be struck. We calculated that samples of 61 hospital confirmed cases of cause-specific near-miss, and 61 morbidity non-cases would enable the study to estimate a sensitivity of 80% with 95% confidence that the true sensitivity results would lie between 70% and 90%. Because the main purpose of the study was to develop a valid tool for identifying cases of near-miss in the community, achieving a high specificity of at least 90% becomes important. Lower specificity for conditions with expected prevalence of less than 15% would lead to considerable over-estimation of survey prevalence, as the many false positives would unbalance the total number of survey positives (Ronsmans, 1996). In order to measure a specificity of at least 90% accurately, we estimated that a sample of at least 138 healthy women should be interviewed.

Thus, assuming a 20% loss to follow-up, the objectives were to select a total number of 690 women distributed as follows:

dystocia

* 75 near-miss cases for ruptured uterus and pre-rupture
* 75 near-miss cases for transverse lie and general pelvic contraction
* 75 morbidity non-cases with prolonged labour

puerperal infections

* 75 near-miss cases for puerperal infections
* 75 morbidity non-cases for puerperal infections

haemorrhage

* 75 near-miss haemorrhage cases

eclampsia

* 75 near-miss and morbidity non-cases eclampsia

normal women

* 165 healthy non cases

Women with several conditions could contribute to more than one group of morbidity. We decided to take two groups of near-miss cases for dystocia because of the heterogeneity of the clinical presentation of these conditions.

3.4.6 record extraction and sample selection procedures

Medical record extraction is a difficult and time-consuming procedure. Experience in developed countries shows that records are often difficult to find and they may contain conflicting evidence or be difficult to interpret (Martin, 1987; Joffe and Grisso, 1985).

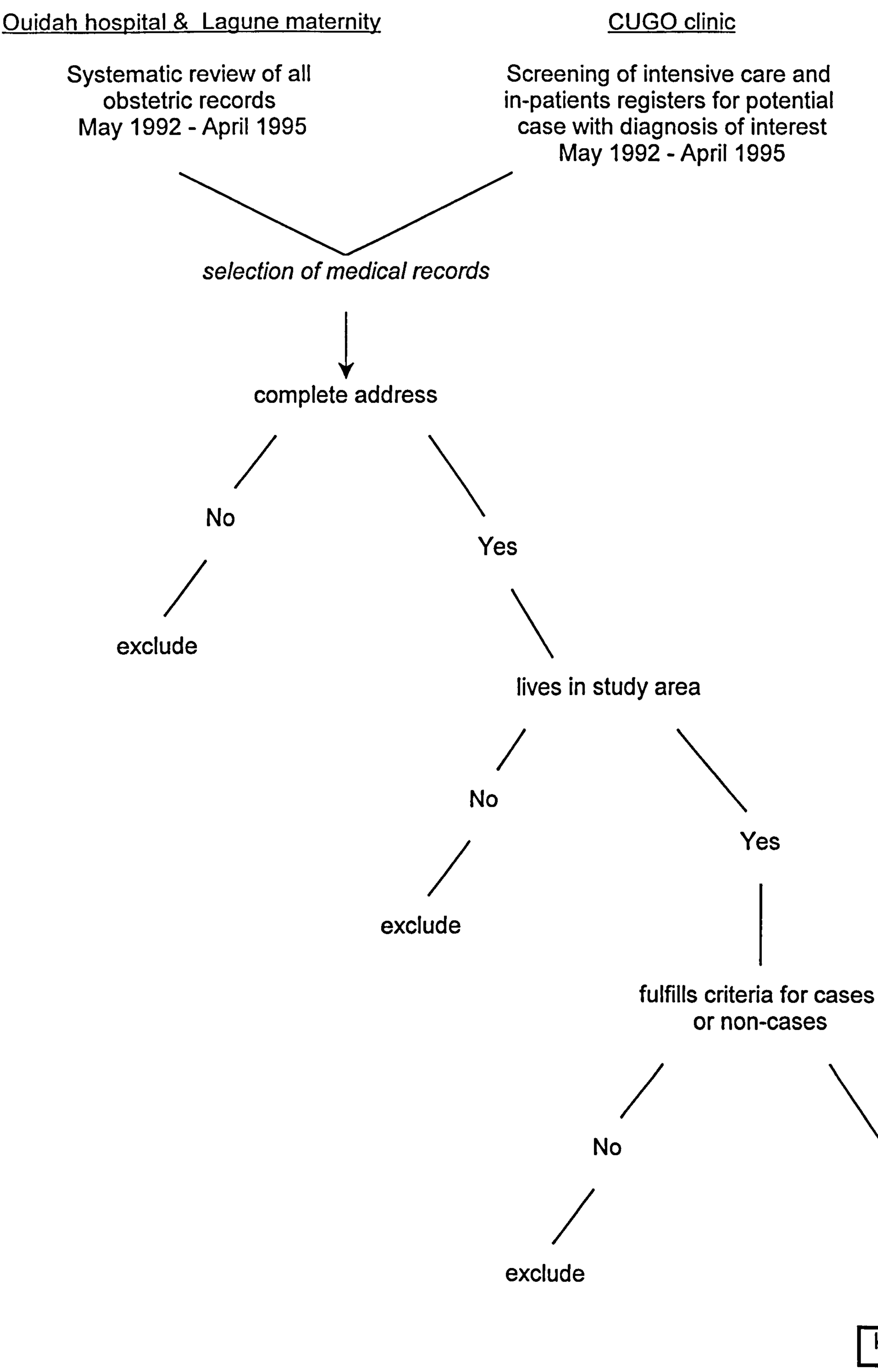
Women in our study were identified by a systematic review of all medical records for the period of reference in Ambulance de Ouidah and Maternité Lagune, and first through a screening of

'hospitalisation' and 'intensive care' registers for the diagnoses of interest (as indicated at entry or discharge) in the university hospital of Cotonou (CUGO) (figure 3.3). Medical records and registers could easily be located and were kept in good order at CUGO and the district hospital of Ouidah. Identifying records for the period of reference was laborious in Maternité Lagune where the filing system was under review and medical records arranged in disorderly piles.

The selection of medical records of cases and non-cases was done by three recently qualified physicians from May 14 to July 14. The selection timing criteria covered the 36 months preceding the extraction period from May 1992 to April 1995. Medical records were excluded when there was no address or the address appeared incomplete, when the address was outside the study area, and at a later stage, when the case-note information did not fit the definition criteria expressed in the algorithms (figure 3.3). A subset of medical records (8%) selected at random was extracted twice by different physicians for quality control of extracted information and overall diagnosis. Extraction was time-consuming with an estimated duration of 1 to 2 hours of work required for each successfully retained woman.

The group of healthy non-cases was "matched" according to hospital of selection and date of selection for near-miss cases and morbidity non-cases, at a maximum of 3-day interval, for every third woman belonging to the morbidity sample already selected in each hospital. The matching procedure was introduced to take into account the effect of recall and to ensure that the overall socio-demographic characteristics of the women in the healthy group were as comparable as possible with the other groups.

Figure 3.3 Selection Procedures for Hospital Sample



3.4.7 data collection instruments

a) medical extraction forms

A special form was prepared for facilitating the extraction of the necessary information from the medical records. Information on symptoms and signs used in the algorithms was collected for all the women, including cases and morbidity and healthy non-cases. This form also contains information on socio-economic and demographic variables and time of referral, admission, treatment and duration of stay. The form is presented in Appendix 2.

b) individual questionnaire

The individual questionnaire (Appendix 3) was developed on the basis of published questionnaires and guidelines, in particular from the London School of Hygiene and Tropical Medicine and from the Demographic and Health Survey (DHS). A total of 5 focus groups were also conducted in the Pahou Primary Health Care intervention area to document the vocabulary and images used by the population for describing complications. These focus groups were led by a Beninese sociologist and conducted among young and older women, young and older men, and trained traditional birth attendants. They uncovered useful disease descriptions such as "*maladie d'enflement*" (swelling disease) for oedemas or "*kaun kaun*" for convulsions. Enquiries with medical practitioners also confirmed these findings.

The morbidity sections of the individual questionnaire attempt to incorporate the diagnostic signs which most frequently occur with the condition of interest, matching those included in the medical records extraction forms. Information on treatment and health care seeking behaviour and personal assessment of the severity of the conditions was also collected. Both open and

close-ended questions were used to elicit detailed information about the presence of signs and symptoms. Thus, to enable the respondent to recollect her memory, each woman was first asked in an open question to describe freely what happened during her pregnancy and delivery. Her answer was written down using her own words (verbatim). Responses to this open question also proved useful as a means of checking internal consistency of information. The open question was followed by 4 highly structured sections, one each for the 4 conditions of interest. Except for dystocia, a screening question (for example, on any bleeding) always played a central role with a positive response usually leading the interviewer to ask further details on the illness episode, whereas a negative answer would suggest that the interviewer skips to the following section of the questionnaire. Information on socio-economic status and utilisation of maternity services was also collected at the beginning of the interview to establish the woman's background.

The questionnaire was translated and back-translated in Fon, the language spoken by the majority of people living in the study area, and pretested on a purposive sample of healthy or with complications recently-delivered women. Utilisation of the questionnaire in Fon was complicated by the fact that a special alphabet is needed to write it, that very few persons can read it, and that the special printer required to print the Fon characters broke down in the Cotonou headquarters. Each interviewer received a copy of the questionnaire in Fon and was asked to memorise it if they were not proficient in reading it. During fieldwork, the questionnaire in French was used to record answers and practice sessions were conducted at regular intervals to ensure that all interviewers were asking the same questions in Fon.

3.4.8 Fieldwork

a) interviewers, supervisors and address team

Interviews were conducted by 8 women interviewers with a high level of education (above A levels or "*baccalauréat*"), and without medical or midwifery training. They received two weeks training and were supervised by two experienced female field workers, with a similar educational profile. Two additional persons were also employed to locate the women in the community, introduce the purpose of the survey and secure their approval for the visit of the interviewers, according to strict consent guidelines. These two persons were male and medically qualified. Members of the survey team were not informed of diagnosis group to which the respondents belonged.

b) fieldwork organisation

The fieldwork duration was 3 months, starting on 26 July 1995 and finishing on 21 October 1995, during the short dry season. A pilot study to test the survey organisation and procedures was conducted in Ouidah at the beginning of the field work (from July 26 to August 18), using women from the sample selected at hospitals. Results of this pilot study are included in the overall analysis as the selected sample was too small to 'spare' women.

Field procedures included first the localisation of women's addresses by the "address" team (originally the two male physicians, later joined by two interviewers to speed up the process in Cotonou), with presentation of the purpose of the survey to secure approval and appointment date for interview. Respondents (and their husbands or parents who were often present at this first visit) were told that their names and addresses had been obtained from hospital registers,

that the purpose of the surveys was to help future actions to improve the health of women during pregnancy and delivery, and that they were free to stop answering questions at any time or decline participating in the study. Appointments were generally taken for interviews the following day.

A wide range of quality control measures was implemented, including: re-interview or contact by supervisor, regular meetings between interviewers and supervisory staff, and unannounced field visits by supervisory staff to observe field interviewers at work. Each questionnaire was checked twice by the supervisor and one of the main investigators before data entry. When recorded answers were unclear, interviewers were asked to return to the field.

Professor Maria de Koninck, a Canadian sociologist with funding from Université Laval, joined the study team in June to conduct in-depth unstructured interviews with 19 of the women selected by the project to investigate their personal experience of pregnancy and obstetric services. These interviews were conducted with women who delivered in 1995, 13 of whom had complications, and provide insights for the interpretation of the survey data.

3.5 STRATEGIES FOR ANALYSIS AND STATISTICAL METHODS

All data entry and editing was done in the study headquarters in Cotonou by two experienced data entry clerks under the supervision of the data manager of CERRHUD. IBM computers and Clipper Software were used. Data editing with range and consistency checks was done in Cotonou before the return of the principal investigator (VF) to London in November 1996. Possible errors were systematically checked against the original medical records or medical records data extraction forms and the questionnaires.

Data analysis was primarily conducted with Epi-Info 6, utilising measures of sensitivity and specificity to compare how well individual questionnaire responses agree with medical records information. Sensitivity is the proportion of women with the complication of interest, according to the medical records, who have been identified as such by the questionnaire. Specificity is the proportion of women who did not have the complication who have been identified as non-cases by the questionnaire. Our aim was to computerise the question or group of questions which would be most able to identify a complication correctly (sensitivity) while omitting the other obstetric complications almost entirely (see below) from the group of suspected cases (specificity). Individual questionnaire data were also analysed using a more qualitative approach (verbal diagnosis), with 3 physicians attributing diagnoses independently, using all the information contained in the questionnaires, including verbatim answers to the open question where women were asked to recount their pregnancy. The procedure of verbal diagnosis is used to take into account the diversity in combination of reported symptoms for the same type of complications.

The sensitivity and the specificity were assessed for each diagnosis using two groups of cases (all women with the diagnosis of interest, and when possible women who qualify as a near-miss case for the diagnosis of interest), using as a comparison group either all women without the diagnosis of interest or healthy women only. Comparison of results for each diagnosis using all cases or only near-miss cases allows us to assess whether women with severe complications better recall the event than those with a less severe morbidity. Contrasting the results for healthy women versus all other women enables us to evaluate whether specificity increases when healthy women alone are interviewed. Bearing in mind that the sample for this study over-represents women with complications, specificity results for healthy women may be closer to the results that would be obtained in a representative population survey.

Figure 3.4: Basic tabulation for the calculation of sensitivity, specificity and reported prevalence in the sample

Questionnaire results	medical records (gold standard)		
	Positive	Negative	Total
Positive	a *[true positive]*	b *[false positive]*	a+b *[estimated number of women with condition according to questionnaire]*
Negative	c *[false negative]*	d *[true negative]*	c+d
Total	a+c *[number of women with condition]*	b+d	n *[total sample]*

Sensitivity (SE) expressed as a percentage is 100 x a/a+c

In other words, it is the number of women with the condition according to the gold standard, which has been identified as such by the questionnaire, divided by the total number of women with the condition according to the gold standard

Specificity (SP) expressed as a percentage is 100 x d/b+d

In other words, it is the number of women without the condition according to the gold standard, which has been identified as such by the questionnaire, divided by the total number of women without the condition according to the gold standard

The **reported prevalence** **in the sample** is a+b/n

The smaller the number of women with the disease in the sample population, the bigger the number of women without disease according to medical records, and any shifts down in specificity which would bring women from true negative to false positive would greatly affect the estimated number of women with the disease (a+b)

The reported prevalence of a condition during survey not only depends on the sensitivity and specificity of the questionnaire tool, but also on the true prevalence of the disease in the population. For the accurate measurement of relatively rare conditions, a combination of both high sensitivity to detect as many cases as possible and very high specificity to avoid overestimation is needed. Figure 3.4 presents the basic tabulation required to derive measures of sensitivity and specificity, and reported and true prevalence, from information on medical diagnosis (gold standard) and women's reports. The rarer the disease the more important the weight of negative diagnoses becomes in this tabulation, and accordingly the role of specificity. In the analysis, we are generally aiming for the best combinations of questions generating a specificity above 95% and a sensitivity not lower than 70%. Although, for very rare conditions such as eclampsia, a specificity of 99% is actually required, and the sensitivity will play a very minimal part in the accuracy of the reported prevalence. Appendix 4 illustrates this phenomenon with a tabulation of estimated prevalence, according to degrees of specificity and sensitivity and for a certain level of true prevalence (as presented by Ronsmans (1996)).

In the result chapters, sensitivity and specificity of the 'best' questions are also analysed in relation to women's and interviewers' characteristics and the length of the recall period.

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CHAPTER 4. CHARACTERISTICS OF SAMPLE

4.1 HOSPITAL-BASED APPROACH TO VALIDATION AND SELECTION BIAS

This chapter describes the characteristics of hospital and community samples, and investigates sources of selection biases which may affect the generalisation of the study findings to other populations.

Hospital validation of survey instruments is the preferred option for complications which are relatively rare and acute such as the major direct obstetric complications (eclampsia, haemorrhage, dystocia) and thus difficult to capture in sufficient number at one point in time (chapter 1). An important drawback, however, is that it introduces selection biases[1] which affect the generalisation of study findings for application to general populations (Hennekens and Buring, 1987). Health services users are likely to present different socio-economic characteristics and morbidity profiles (both in terms of pattern and severity) from non-users (selection bias 1). They may also recognize or recall symptoms of complications differently from the population of interest in the community, because they are exposed to medical "language", and generally told of their diagnosis (Kalter, 1992). The fact that they sought care also reflects a minimum level of recognition of the problem.

Increased biases may have occurred in this study, in view of the rigour of the sample selection procedures with fieldwork conducted only among hospital users with good addresses and sufficient amounts of information in their medical records (selection bias 2). Differences in proportions of women lost to follow-up (from migration, poor address, refusal or death) among

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[1] Errors emanating from the mechanisms put in place to identify the study population (Hennekens and Buring, 1987)

the comparison groups, if related in any way to the signs or symptoms of interest, may also be associated with additional selection bias; for example, women with particularly healthy or serious illness experiences might decline participating in a health survey, because of its lack of immediate benefits or for fear of being reminded of difficult moments.

The group of healthy users who came of their own free will to deliver in referral hospitals, may finally present a different socio-economic or health care seeking behaviour profile to those with complications. It is important to document these differences as far as possible, as they may be associated with differential report patterns.

This chapter has the twin objectives of describing the study population and the likelihood of selection bias. It is structured in two parts. In the first section, we describe briefly the hospital sample (sub-section 4.2.1), and consider the degree to which the selection of medical records for inclusion in the study may have introduced selection bias by assessing (i) the rate and reasons for exclusion of medical records and (ii) the differences between excluded and included morbidity cases (sub-section 4.2.2). In the second section, we present the characteristics of the final sample of interviewed women (sub-section 4.3.2), explore whether loss to follow-up has introduced further selection bias (sub-section 4.3.3), and display the key socio-economic and demographic differences between healthy non-cases and near-miss cases and morbidity non-cases which may interfere with the way they report maternity events (sub-section 4.3.4).

4.2 HOSPITAL SAMPLE

4.2.1 characteristics of hospital sample

A total of 546 medical records was selected: 333 in CUGO (61% of the total sample), 130 in Ambulance de Ouidah (24%) and 83 in Maternité Lagune (15%). Years of selection range from 1991 to 1995 with a majority of women selected for 1993 (table 4.1, column 1).

a) morbidity profile

Among those included, 255 women contributed to the sample as near-miss cases, 89 as morbidity non-cases, 34 were both near-miss cases and non-cases for different conditions and 168 were women with a normal delivery. There was a total of 304 near-miss events (27 eclampsia, 80 haemorrhage, 188 dystocia, 8 infections) and 137 non near-miss events (table 4.1, column 1). A fifth of all morbidity cases (16%), and three-quarter of postpartum infections cases (73%), received more than one diagnosis, with postpartum infections often diagnosed in combination with dystocia (61%).

The sample did not reach the targeted number of 690 women with deficits among eclampsia cases, near-miss cases for infections, and morbidity non-cases for dystocia. The most important deficit was in the number of women with a near-miss death condition linked to postpartum infections. We could identify 8 women only who nearly died because of postpartum infections over the three-years period prior to the study. This suggests that although the incidence of infections in the postpartum period is common (altogether there are 71 women selected for infections in the sample), their clinical progression is either well-controlled through

Table 4.1: Selection characteristics of women sampled in hospitals and successfully interviewed in the community

Characteristics	Women selected in hospitals (N=546)		Women successfully interviewed in community (N=381)		Women interviewed as percent of women selected in hospitals	
	N	%	N	%	(%)	p-value *
Place of selection						
CUGO	333	61.0	220	57.7	66.1	
Lagune	83	15.2	60	15.7	72.3	
Ouidah	130	23.8	101	26.5	77.7	0.0432
Year of selection						
91	11	2.0	8	2.1	72.7	
92	123	22.5	78	20.5	63.4	
93	190	34.8	139	36.5	73.2	
94	162	29.7	112	29.4	69.1	
95	60	11.0	44	11.5	73.3	0.4298
Place of residence						
Cotonou	320	58.6	220	57.7	68.7	
Ouidah & Pahou	137	25.1	100	26.2	73.0	
Limitrophe	89	16.3	61	16.0	68.5	0.6387
Referral status						
yes	232	42.5	157	41.2	67.7	
no	313	57.3	224	58.8	71.6	0.3272
Morbidity status[1]						
eclampsia						
near-miss	27	4.9	17	4.5	63.0	
other	25	4.6	16	4.2	64.0	0.9381
near-miss haemorrhage	80	14.7	56	14.7	70.0	
dystocia						
near-miss	188	34.4	125	32.8	66.5	
other	49	9.0	35	9.2	71.4	0.5109
infections[#]						
near-miss	8	1.5	4	1.0	50.0	
other	63	11.5	37	9.7	58.7	0.9276**
healthy non-cases	168	30.8	126	33.1	75.0	0.0766

Note:

* P-values calculated to show significant differences in loss to follow-up for selection characteristics

** Using Yates corrected chi-square test

1. Some near-miss cases and morbidity non-cases were selected for more than one condition. Because of the lack of independence between categories, separate p-values were determined for each condition comparing loss to follow-up among near-miss cases and morbidity non-cases, and at a broader level, loss to follow-up for healthy non-cases versus all women with complications.

\# in Chapter 8, one of these women will be excluded from analysis because of ambiguity over her case-definition

antibiotics[2], and/or the case-fatality for postpartum infections once near-miss status is reached is very high[3],[4]. Lastly, there is also a deficit in the number of morbidity non-cases for dystocia, whereas we had to stop recruitment early in the near-miss category for the same condition. This deficit is probably linked with too stringent algorithm criteria[5].

b) hospitalisation

Analysis of information on the medical records indicates that two-thirds of the selected sample (66%) arrived in hospital during the active phase of labour, and that a considerable proportion (43%) were referred from another public or private facility. A fifth of the sample (16%), and a quarter of the morbidity cases (24%), were either unconscious or semi-conscious on arrival or at a later stage during their hospital stay, an indication of the considerable weight of severity in our sample. The duration of stay in the hospitals averaged 7 days. Those diagnosed with infections stayed longest (16.5 days), followed by eclampsia (11.0 days), dystocia (10.4 days) and haemorrhage cases (7.3 days). Healthy non-cases left the hospital premises very rapidly after delivery with an average duration of stay of 1.3 days only. 53% of the sample were delivered through Caesarean section, but very few (1%) had an instrumental delivery (forcepts, ventouse) (table not shown).

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[2] In this setting, prophylactic antibiotics are routinely provided to women undergoing Caesarean; 98% of women with Caesarean in the hospital sample were prescribed with this remedy.

[3] This hypothesis was confirmed to some extent by the findings of a subsequent hospital study of near-miss cases using our definitions in CUGO. This study found a case-fatality rate of 21% for postpartum infections, higher than for haemorrhage (9.2%), eclampsia (4.7%) and dystocia (3.6%) (Mukantaganda, 1996).

[4] One possible explanation for this high case-fatality might be that the case definition for sepsis has been so strict that few such cases could be expected to survive.

[5] These criteria will be discussed in details in Chapter 8.

c) socio-economic and demographic characteristics

The hospital sample is mostly urban with a considerable proportion of selected women (77%) providing an address in the towns of Cotonou or Ouidah at the time of their hospital visit, higher than the corresponding census statistics for women 15-44 in Atlantique (63%) (INSAE, 1993). Table 4.2 (first column) shows that their main occupational activities were in trade (31%), craft industry such as hairdressing or dressmaking (17%), or in the modern sector (office clerks, learned professions, managers, scientists) (10%). The largest proportion, however, declared that they were unemployed or housewives (36%). The considerable percentage of husbands or partners working in the modern sector (38%) compared to official statistics (10%) confirms that our sample tends to over-represent well-off women (INSAE, 1993), while the small number of women married to farmers (11%) is explained in part by the weight of users of the two Cotonou referral hospitals in the sample. Selected women in Ambulance de Ouidah show a very different profile, with a substantial proportion in union with a farmer or a fisherman (40%) (table 4.5), above the census statistics for Atlantique (35%) (INSAE, 1993).

Women in the sample are young with a mean age of 27.3 years old (range 15-45) (standard deviation 5.7) (table 4.3, column 1), standing two years below the mean age at birth for Atlantique (29.1) (INSAE, 1994). Their age distribution shows the typical bell shape of age-specific fertility pattern with three-quarters of the sample aged between 20 and 35 years, and a ceiling in the 25-29 age group. They have experienced an average of 3.2 pregnancies, have already given birth to 2 children, and 1.6 of their liveborn children have survived to the time of the hospital contact. The mode is for parity 0. Beyond the fact that first births are always in bigger number, this finding is in line with the 1996 Benin DHS survey evidence indicating that first births are more likely to be delivered in health facilities than subsequent births (Kodjogbe

Table 4.2: Occupational characteristics of all women in hospital sample, and those interviewed and not interviewed using medical record information

Characteristics	All women in hospital sample (N=546)		Interviewed women (N=381)		Non-interviewed women (N=165)		
	N	%	N	%	N	%	p-value
Women's occupation							
white collar	55	10.3	41	11.0	14	8.6	
trade	165	30.8	113	30.3	52	31.9	
farmers	5	0.9	5	1.3	0	0	
skilled labour/other	95	17.4	69	18.1	26	15.9	
unemployed/ housewives	193	36.0	129	34.6	64	39.3	
students/ apprentices	23	4.3	16	4.3	7	4.3	0.6731*
[Total]	[536]		[373]		[163]		
Husbands' occupation							
white collar	200	37.8	143	38.6	57	34.7	
trade	33	6.2	19	5.1	14	8.8	
farmers & fishermen	60	11.3	46	12.4	14	8.8	
skilled labour	110	20.8	76	20.5	34	21.4	
others	103	19.5	70	18.9	33	20.8	
unemployed	7	1.3	5	1.3	2	1.3	
students/ apprentices	16	30.2	11	3.0	5	3.1	0.5274*
[Total]	[529]		[370]		[159]		

Note:

* Levels of significance in differences between interviewed and non-interviewed women. Because of the very small numbers in certain cells, farmers and skilled labour and others were grouped to perfom the chi-square test for women's occupation; for husbands' occupation, we grouped unemployed and students/apprentices together

Table 4.3: Demographic and reproductive characteristics of all women in hospital sample, and those interviewed and not interviewed, using medical record information

Characteristics	All women in hospital sample (N=546)		Interviewed women (N=381)		Non-interviewed women (N=165)		
	N	%	N	%	N	%	p-value
Age							
<20	45	8.6	22	6.1	23	14.1	
20-24	119	22.8	73	20.3	46	28.4	
25-29	171	32.7	128	35.6	43	26.5	
30-34	122	23.4	88	24.4	34	21.0	
35-39	57	10.9	42	11.7	15	9.3	
40+	8	1.5	7	1.9	1	0.6	0.0046
[Total]	[522]		[360]		[162]		
Mean age	27.3		27.8		26.1		0.0015
Number of Pregnancies							
1	142	26.5	90	23.7	52	31.7	
2-4	258	47.5	183	48.3	75	45.7	
5+	143	26.3	106	28.0	37	22.6	0.1223
[Total]	[543]		[379]		[164]		
Mean pregnancy	3.2		3.3		3.0		0.0833
Parity							
0	172	32.0	112	29.9	60	37.0	
1-3	239	44.5	167	44.5	72	44.4	
4+	126	23.5	96	25.6	30	18.5	0.1204
[Total]	[537]		[375]		[162]		
Mean Parity	2.0		2.1		1.8		0.1046
Living children							
0	196	36.9	123	33.2	73	45.3	
1-3	248	46.7	184	49.7	64	39.7	
4+	87	16.4	63	17.0	24	14.9	0.0280
[Total]	[531]		[370]		[161]		
Mean Children	1.6		1.7		1.4		0.0679
Previous abortion							
None	396	74.3	276	74.4	120	74.1	
At least one	137	25.7	95	25.6	42	25.9	0.9381
[Total]	[533]		[371]		[162]		

Note:
Levels of significance in differences between interviewed and non-interviewed women calculated using F-test for means and chi^2 test for proportions

et al, 1997). The mean age for women with a first pregnancy is 22.6 years old. One in four (26%) women reported an antecedent of spontaneous or induced abortion.

4.2.2 bias introduced at the medical records extraction stage

Selected women present different characteristics from the Atlantique female population: they are fairly young parturients, essentially living in urban areas and often better-off. How far they are representative of hospital users, given the rigour of our sample selection criteria (figure 3.3), is another of our questions. Using a data collection form developed for this purpose, information on reasons for exclusion and characteristics of excluded morbidity cases was compiled in Maternité Lagune in parallel with the extraction of medical records for selected cases. In CUGO and Ambulance de Ouidah, this information was collected *a posteriori*, with a systematic review of all medical records with potential diagnosis of interest for a six-month period from January to June 1993. However, medical record information was **not** collected for excluded healthy women in view of time and budgetary constraints. Because healthy women are essentially those willing to pay for hospital services, socio-economic differences between included and rejected cases may be less pronounced in this category.

a) rate and reasons for exclusion of morbidity cases

Table 4.4 shows that a very high proportion of medical records with diagnosis which appeared suitable at first glance, were excluded in Lagune (88%), followed by CUGO (68%) and Ouidah (42%). The main reasons for exclusion vary according to hospital of selection. In Maternité Lagune, they were incomplete address (67%) and outside study area (20%); in CUGO, exclusion was also due, to a large extent, to a problem of incomplete address (46%), followed

Table 4.4: **Reasons for excluding medical records for potential morbidity cases during hospital selection of sample**

		CUGO		Lagune		Ouidah	
		Proportion of medical records excluded:	68%	Proportion of medical records excluded:	88%	Proportion of medical records excluded:	42%
		N	%	N	%	N	%
Reasons for exclusion							
1.	incomplete address	55	45.8	284	66.8	8	14.3
2.	outside study area	21	17.5	86	20.2	27	48.2
3.	does not fit definition criteria	40	33.3	36	8.5	11	19.6
4.	not enough medical information	1	0.8	12	2.8	10	17.9
5.	other[1]	3	2.5	7	1.6	0	0
Total		120	100	425	100	56	100

Note:
1. other causes for exclusion include reasons such as foreign nationality of patient and medical records misplaced (CUGO only)

by "did not fit medical criteria" (33%); and, in Ambulance de Ouidah, "outside study area" (48%) and "did not fit medical criteria" (20%) were the main causes.

The high rate of exclusion did not affect any type of complication in particular (table not shown). It suggests, however, that the study hospital sample is unlikely to be representative of hospital users, except maybe for Ambulance de Ouidah.

To a large extent, Maternité Lagune was affected by the address criteria, the first stage of the selection procedures, because its catchment area includes Akpakpa, a large and popular part of town on the eastern side of Cotonou's lagoon where compounds have not been numbered. In urban areas, because few roads have names, a personal address was considered incomplete, when there was no compound number, and there were no other indications which could have help the address team in finding the woman, such as her own or her husband's place of work. For rural areas, the names of villages suffice, hence the small proportion of exclusions for this reason in Ouidah hospital.

Living outside the study area, the second step in the selection procedure, explains half of the rejection of medical records in Ambulance de Ouidah. Ouidah has a catchment area which goes beyond the departmental administrative boundaries towards the border with Togo into the department of Mono, where referral facilities fail to provide on a continuous basis key elements of emergency obstetric care such as blood transfusion or Caesarean section (Filippi et al, 1997).

The extraction strategy adopted in CUGO, where the starting point was the diagnosis indicated in hospital registers rather than the medical records themselves, explain the large proportion of rejection for definition criteria in this hospital.

b) comparison of included and excluded case characteristics

Table 4.5 shows that morbidity cases selected in CUGO and to a striking extent in Lagune, tend to belong to a higher occupational group than those excluded. In Lagune, for example, included morbidity cases are considerably more likely to be white collar professionals and less likely to be involved in petty cash activities than excluded cases. In CUGO, there are no significant differences according to women's occupation; among included cases, however, fewer husbands are farmers or fishermen and more belong to the "other" category, which in this hospital includes policemen and soldiers whose wives were referred from the near-by military hospital, and selected because their husbands' place of work would be easy to find if the home address became insufficient. There are no significant differences in occupational characteristics between included and excluded cases in Ouidah, bearing in mind that the sample of excluded cases is very small.

While women using CUGO appear naturally well-off (overall proportions of 31% white collar husbands among rejected cases and 36% among included cases) the rigour of the sample selection procedures dramatically increased the bias toward higher socio-economic status in Maternité Lagune, which normally attracts users from the poorest sections of the urban population because of its low and fixed fees.

There are, moreover, significant demographic and reproductive differences between selected and excluded cases (table 4.6). Selected morbidity women in Lagune are slightly older (mean age 26.4 vs 25.5, with a skewed distribution towards older age) and have experienced fewer pregnancies (mean pregnancy 2.3 versus 2.8) with a considerable proportion in their first pregnancy (53%). Average age at first pregnancy is also older among included cases (23.7 vs 21.6, p=0.02, not in table), probably a consequence of the socio-economic bias with better-off

Table 4.5: Occupational characteristics of rejected and selected morbidity cases according to hospital of selection

Characteristics	CUGO		Lagune		Ouidah	
	Rejected (N=120)	Selected (N=230)	Rejected (N=417)	Selected (N=58)	Rejected (N=56)	Selected (N=90)
	%	%	%	%	%	%
Woman's occupation						
white collar	10.5	10.3	2.0	21.1	3.6	4.5
trade	32.5	26.0	46.3	28.1	37.5	31.8
farmer	2.6	0.4	1.7	1.8	3.6	3.4
skilled labour/other	11.4	18.4	12.3	15.8	0	11.4
unemployed/ housewives	36.0	39.9	33.4	28.1	55.4	48.9
students/ apprentices	7.0	4.9	3.7	5.3	0	3.4
[Total]	[114]	[223]	[406]	[57]	[56]	[88]
p-value		0.1975		<0.0001*		0.2057*
Husband's occupation						
white collar	30.6	35.9	16.8	50.0	9.8	7.2
trade	9.3	5.8	8.5	5.4	7.8	4.8
farmer	18.5	8.5	16.5	3.6	33.3	39.8
skilled labour	21.3	22.9	37.1	23.2	33.3	24.1
other	9.3	22.4	15.3	8.9	11.8	20.5
unemployed	4.6	1.3	1.2	1.8	2.0	1.2
students/ apprentices	6.5	3.1	4.5	7.1	2.0	2.4
[Total]	[108]	[223]	[399]	[56]	[51]	[83]
p-value		0.0013**		>0.0001**		0.6277**

Note:

* In view of the small number of cases in some cells, chi-square tests were calculated grouping farmers with skilled labour, and unemployed/housewives with students/apprendices, for women's occupation at Lagune and Ouidah

** For husbands'occupation, unemployed were grouped with students/apprendices at Lagune, Ouidah and Cugo, prior to calculation of the chi-square tests of significance.

Table 4.6: **Demographic and reproductive characteristics of rejected and selected morbidity cases according to hospital of selection**

Characteristics	CUGO		Lagune		Ouidah	
	Rejected (N=120)	Selected (N=230)	Rejected (N=425)	Selected (N=58)	Rejected (N=56)	Selected (N=90)
	%	%	%	%	%	%
Age						
<20	10.7	6.6	16.0	13.0	25.0	26.4
20-24	25.9	22.3	30.3	24.1	30.0	34.7
25-29	29.5	36.7	28.9	25.9	25.0	11.1
30-34	22.3	21.0	16.5	29.6	12.5	19.4
35-39	9.8	12.2	6.7	5.6	7.5	5.6
40+	1.8	1.3	1.7	1.9	0	2.8
[Total]	[112]	[229]	[357]	[54]	[40]	[72]
p-value		0.4791*		0.2406*		0.4016*
Mean age	26.9	27.5	25.5	26.4	24.2	24.4
		0.3448		0.3468		0.8518
Number of pregnancies						
1	34.2	23.6*	36.7	52.6	32.7	37.1
2-4	44.2	52.4	43.3	42.1	41.8	33.7
5+	21.4	24.0	20.0	5.3	25.5	29.2
[Total]	[117]	[229]	[420]	[57]	[55]	[89]
p-value		0.1092		0.0398		0.6181
Mean pregnancy	2.8	3.2	2.8	2.3	3.1	3.2
		0.1741		0.0634		0.8148
Abortion						
none	75.0	70.4	82.7	89.5	83.0	77.1
one or more	25.0	29.6	17.3	10.5	17.0	22.9
[Total]	[116]	[226]	[415]	[57]	[53]	[83]
p-value		0.3653		0.1934		0.4058
Mean abortion	0.3	0.4	0.2	0.1	0.3	0.3
		0.3504		0.2920		0.9934
Referral						
yes	66.0	62.0	66.7	44.6	78.8	67.8
no	34.0	38.0	33.3	53.4	21.2	32.2
[Total]	[106]	[229]	[420]	[58]	[55]	[90]
p-value		0.4768		0.0027		0.1578

Note:

Level of significance of differences between rejected and selected morbidity cases were calculated using F-test for means and chi-square test for proportions.

* Age groups 35-39 and 40+ were grouped together for the calculation of the chi-square tests in view the small number in the 40+ age groups

women starting their reproductive life later. Women with first pregnancies are an interesting group as having a single experience may influence recall. Selected morbidity cases at CUGO are also older but fewer are experiencing their first pregnancies (24%) than excluded cases (34%).

Finally, in Maternité Lagune, excluded morbidity cases are also significantly more likely to have been referred to maternity services than included cases (45% vs 67%, p=0.001), presumably because of difficulties in taking good addresses during emergencies or because many referred women come from outside the study area (table 4.6). However, this biases Lagune morbidity cases towards health conscious women who had planned and had the means to deliver in a well-equipped health facility.

Thus, the sample presents a high socio-economic profile and is not entirely representative of the general population of Atlantique or hospital users, except maybe for the group of women selected in Ambulance de Ouidah. This is largely explained by selection biases introduced by the type of study design (selection of sample in hospitals because of acuteness of conditions of interest) and the sample selection procedures (incomplete addresses, which were not necessarily related to bad record keeping procedures but rather to the absence of street names and compound numbers in parts of Cotonou). A bias towards higher socio-economic status may affect the estimated accuracy with which women report their morbidities because better occupational status is likely to be linked to higher education, and thus more articulate or expressive women. How far these potential biases are enhanced or reduced by loss to follow-up in the community is our next question.

4.3 SURVEY SAMPLE

4.3.1 women found and lost to follow-up

A total of 381 women (70% of the sample selected in hospitals) were interviewed in the community and 165 were not. There were four refusals, two of these took place during the interview and contribute to parts of the analysis. Four deaths were also encountered, all for maternal causes; for each death, verbal autopsy interview were conducted, with the person present at the time of the event or a close relative, to establish the medical cause and investigate whether the death was related to the motive for hospitalisation. The majority (95%) of the remaining 159 women could not be traced in the community because of bad addresses (74%) despite efforts from the address team, or migration outside the study area (21%). Others (5%) were either not found at home after several visits or their relatives were unwilling to disclose where their daughter or wife was living.

The two partial refusals include a non near-miss dystocia case who owed a considerable sum of money to the health services because of an emergency c-section and was clearly concerned that her whereabouts would be reported to CUGO hospital administration - she stopped answering the questionnaire in section 2 when she was asked to confirm where she had delivered; and, a near-miss case for dystocia who blamed the poor quality of obstetric services for the loss of her uterus (her uterus ruptured while she had come directly to the hospital to deliver there). She stopped answering questions in the section on prolonged/obstructed labour when she was asked whether her uterus got torn. The two complete refusals were a near-miss dystocia for transverse presentation and a non-near miss infection case for endometritis complicated by malaria and anaemia.

All four maternal deaths occurred at home after leaving hospital. Three were directly related to the index pregnancy, and include:

- a near-miss case of infection (salpingitis with shock) who died 7 days after discharging herself from Ambulance de Ouidah;
- two non near-miss eclampsia cases selected in CUGO, one with persistent high blood pressure after delivery who died 10 days after discharge in the car on her way back to hospital; the other a CUGO 'escapee'[6] with eclampsia complicated by infections of unclear origin who died approximately 1 month after discharge.

The fourth woman passed away suddenly three days after a subsequent pregnancy terminated by a stillbirth at Ambulance de Ouidah; she had been selected in the study as a non near-miss case for dystocia after giving birth vaginally to a large baby (4200g) who died during labour (a fresh stillbirth).

Women were interviewed on average 23 months after their entry in hospital with a recall period ranging from 3.5 to 52 months. Interview duration was 1 hour and 27 minutes on average, and slightly shorter for healthy women (1 hour and 15 minutes) than for women with morbidity (1 hour and 33 minutes). Most interviews were conducted in Fon (84%) or in French (14%), and in very few instances in another language (English, Minan). About 86% of the respondents were interviewed at home and 14% in their place of work or the house of a relative. For all, interviewers tried to achieve privacy by keeping at bay curious husbands, mothers or older children.

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[6] A direct translation of the local terminology of "évadée". Women who cannot afford to pay their hospital bill often leave unnoticed or "escape" before official discharge.

4.3.2 characteristics of survey sample

a) socio-economic characteristics

Table 4.7 shows the socio-economic characteristics of interviewed women (last column). Two-thirds (67%) of the sample live in urban areas. 81% of women interviewed at home lived in houses with cement floors, a mark of general affluence. Education level is high for an African setting with 67% of the respondents having attended school for a year or more, 55% of these reached secondary level (37% of the whole sample). Altogether, 89% of women stated that they had a professional occupation, and 62% of the overall sample (68% of those with a profession) had worked for cash in the previous four weeks, mostly in trade (67%). Only a third (33%) of the 24 women who declared that their main occupation was farming, had worked for cash in the previous four weeks.

Only 39% reported that they had access to transport for emergency at any time of the day or night, usually a motorcycle (70%), the main mean of transport in South Benin. Most (84%) declared that they need the permission of their husband (75%) or someone else to visit a health facility when they have health problems, although the interpretation of "permission" may have been loose in the field (ie include forms or manifestations of politeness) (data not shown). A large proportion of respondents (69%) reported that it was their husband who provided the funds for maternity care, 18% said that it was the couple and another 10% other relatives or a combination of persons. Only 3% indicated that they were solely responsible for paying the cost related to the uptake of maternity care services.

Table 4.7: Socio-economic characteristics of women in survey sample according to morbidity status

Characteristics	Near-miss cases & morbidity non-cases (N=255)		Healthy non-cases (N=126)		All women in survey sample (N=381)		
	N	%	N	%	N	%	p-value
Woman's occupation							
white collar	25	9.8	17	13.5	42	11.0	
trade	143	56.1	60	47.6	203	53.3	
farmer	19	7.5	5	4.0	24	6.3	
skilled labour/ other	44	17.3	26	20.6	70	18.4	
unemployed	9	3.5	12	9.5*	21	5.5	
student/ apprentice	15	5.9	6	4.8	21	5.5	0.0749
Husband's occupation[1]							
white collar	58	24.8	56	45.5	114	31.9	
trade	9	3.8	7	5.7	16	4.5	
farmer	43	18.4	4	3.3	47	13.2	
skilled labour	58	24.8	27	22.0	85	23.8	
other	54	23.1	28	22.8	82	23.0	
unemployed	9	3.8	1	0.8	10	2.8	
student/ apprentice	3	1.3	0	0	3	0.8	>0.0001*
Schooling[2]							
none	89	35.0	36	28.6	125	32.9	
primary	83	32.7	31	24.6	114	30.0	
secondary and above	82	32.3	59	46.9	141	37.0	0.0212
Work for cash in the previous 4 weeks							
yes	157	61.6	81	64.3	238	62.5	0.6063
Access to transport in emergency							
yes	89	34.9	61	48.4	150	39.4	0.0111
Live in urban area							
yes	150	58.8	105	83.3	255	66.9	>0.0001
House with cement floor[3]							
yes	166	75.8	96	90.6	262	80.6	0.0016

Note: 1.information missing for 24 single women (3 of these selected as non-cases; 21 as cases)
2.information missing for 1 woman; 3. information missing for 56 women (53 of these were interviewed outside their home); overall denominator is 325 women, 219 for near-miss cases and morbidity non-cases and 106 for healthy cases.
* unemployed and student/apprendice were grouped together for the chi-square test of significance

b) cultural characteristics

The majority of the sample (65%) were Fon or belonged to an affiliated ethnic group, and a quarter (25%) were Adja, which is the dominant ethnic group in the department Mono (table 4.8). These figures lay in the same order of magnitude than those reported for Atlantique in the 1992 census (70% and 15% respectively), although the Adja are more represented in our sample. Remaining women were Yoruba, belonged to ethnic groups from the North of Benin, or were long-term immigrants from Nigeria or Togo.

When asked which religion they belong to, the majority of the respondents (79%) reported that they were christians, mostly catholics. Traditional religions are often practised in combination with imported monotheistic religions such as Christianity, and are not always reported spontaneously as such in the context of interview surveys (UNICEF et République du Bénin, 1996). A small proportion of the respondents professed a traditional religion (4%), and few were Moslems (5%), non-believers (4%) or belonged to another religion (7%).

c) demographic characteristics

A very high proportion of the respondents (94%) were married at the time of the interview or in a union with a man. When they were asked whether they live under the same roof as their partner, 74% responded positively. Almost a third of the respondents (29%) were in a polygamous union. This figure can be compared with the 1992 census statistics which show that 26% of married men in Atlantique were polygamous (INSAE, 1993). Evidence shows that, of the major ethnic groups in Benin, Adja and Fon are among those who practise polygamy to the largest extent (Houedokoho, 1991).

Table 4.8: Cultural characteristics of women in survey sample according to morbidity status

Characteristics	Near-miss cases & morbidity non-cases (N=255)		Healthy non-cases (N=126)		All women in survey sample (N=381)		
	N	%	N	%	N	%	p-value
Ethnic group							
Fon	170	66.7	77	61.1	247	64.8	
Adja	65	25.5	29	23.0	94	24.7	
Other	20	7.8	20	15.9	40	10.5	0.0553
Religion							
christian	198	77.6	105	83.3	303	79.5	
moslem	8	2.1	7	5.6	15	5.5	
traditional	34	13.3	8	6.3	42	3.9	
other	15	2.1	6	4.8	21	11.0	0.1375

The women were on average 30.2 years old[7], with a mean number of pregnancies of 3.7. A sixth (16%) of the respondents declared spontaneously that they had undergone at least one induced abortion, in spite of the fact that induced abortion is illegal in Benin except for health reasons (table 4.9).. 74 respondents had one or more pregnancies since the index pregnancy for which they were selected and 33 of these women were pregnant at the time of the survey.

The women reported on morbidity events surrounding the gestation or birth of 420 infants including 19 pairs of twins. A total of 60 children were not alive at the time of the survey with 29 stillbirths (stillbirth rate of 69 per 1000 total births) and 31 liveborn who died between the time of their birth and the survey (mortality risk of 79 per 1000).

d) use of maternity services

Respondents were also asked questions on use of maternity services for the index pregnancy. Uptake of antenatal care approaches 100% with only one woman declaring that she did not see anyone for an antenatal check (table 4.10). This is not entirely surprising given the high level of antenatal care use reported in the DHS survey (97%), and the high proportion of routine hospital users in our sample. Half of the first visits was made in the first trimester of pregnancy and the majority of women (69%) first came for a preventive reason to check that everything was alright or to get an injection. A much smaller proportion (42%) declared that they had seen someone for postnatal care during the six weeks following their hospital departure after delivering their baby. Altogether 91% delivered in the 3 study hospitals, but only 51% intended to deliver there (data not shown). 46% planned their delivery in other public and private

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[7] The questionnaire mean age corresponds closely to the mean age obtained from the medical records when adding the length of the recall period. For all 360 women with age information in medical records, the mean age plus recall was 29.7; the corresponding mean age for surveyed women using questionnaire data is 30.1 years old.

Table 4.9: Demographic characteristics of women in survey sample according to morbidity status

Characteristics	Near-miss cases & morbidity non-cases (N=255)		Healthy non-cases (N=126)		All women in survey sample (N=381)		
	N	%	N	%	N	%	p-value
Living with a man							
yes	165	64.7	98	77.8**	263	69.0	0.0094
Age							
<20	12	4.7	0	0	12	3.2	
20-24	54	21.2	12	9.5	66	17.3	
25-29	59	23.1	35	27.8	94	24.7	
30-34	70	27.5	45	35.7	115	30.2	
35-39	39	15.3	25	19.8	64	16.8	
40+	21	8.2	9	7.1	30	7.9	0.0051*
Mean age	29.6		31.2		30.2		0.0236#
Number of pregnancies							
1	67	26.3	11	8.7	78	20.5	
2-4	111	43.5	63	50.0	174	45.7	
5+	77	30.2	52	41.3	129	33.9	0.0003
mean pregnancies	3.5		4.2		3.7		0.0111#
Previous induced abortion[1]							
0	220	86.6	99	78.6	319	83.9	
1+	34	13.4	27	21.4	61	16.1	0.0444
Previous spontaneous abortion[1]							
0	203	79.9	95	75.4	298	78.4	
1+	51	20.1	31	24.6	82	21.6	0.3123
Living children							
0	11	4.3	1	0.8	12	3.1	
1-3	186	72.9	78	61.9	264	69.3	
4+	58	22.7	47	37.3	105	27.6	0.0035
Index child dead[2]							
yes	51	20.0	8	6.3	59	15.5	0.0006

Note: 1.information missing for 1 woman
2. At time of interview. The analysis is woman-based (1 morbidity woman had both of her twins dead, so 51 cases had 52 dead children). The 19 women with twins contribute to the numerator when at least one of the two twins died. Include stillbirths as well as infant or child deaths.
* The age groups <20 and 20-24 were grouped for the calculation of the chi-square test of significance
# Levels of significance calculated using F-test

Table 4.10: Maternity care characteristics of women in survey sample according to morbidity status

Characteristics	Near-miss cases & morbidity non-cases (N=255)		Healthy non-cases (N=126)		All women in survey sample (N=381)		
	N	%	N	%	N	%	p-value
Uptake of prenatal care							
yes	254	99.6	126	100	380	99.7	
Timing of first visit[1]							
median month	3		3		3		
Reasons for first visit[1]							
preventive	178	70.1	83	65.9	261	68.7	
health problem	76	29.9	43	34.1	119	31.3	0.4053
Number of visits[1],*							
mean	6.3		6.8		6.5		0.2221**
Uptake of postnatal care							
yes	119	46.7	41	32.5	160	42.0	0.0086
Person paying for maternity care[2]							
husband/partner	171	67.6	88	71.0	259	68.7	
couple	40	15.8	27	21.8	67	17.8	
other relative/other	31	12.3	7	5.6	38	10.1	
herself	11	4.3	2	1.6	13	3.4	0.0654

Note:
1. Exclude 1 morbidity case who did not receive prenatal care
1,*. Also exclude 1 woman with missing information and 3 don't know
2. Exclude 4 women with missing information (2 morbidity cases, 2 healthy women)
** Levels of significance calculated using F-test

facilities and very few declared that they wanted to deliver at the home of a traditional birth attendant (2%) or in their own home (1%). Half of the sample (52%) reported that they were delivered through Caesarean.

e) current health characteristics

Only 27% of the sample said that they were able to resume their normal housework immediately after they left hospital, and 69 women (18%) added that they were not yet completely back to their normal health (table not shown). This was not associated with duration since index pregnancy, affecting to a similar degree women with a recall period superior and inferior to 2 years (17% and 19% respectively, p=0.6906).

4.3.3 bias introduced by loss to follow-up

Analysis using hospital record information shows that women interviewed were on average slightly older, had experienced more pregnancies and had more living children than non-interviewed women at the time of their hospitalisation (table 4.3). There are no significant differences with respect to socio-economic background (table 4.2), but loss to follow-up is more important among women selected in CUGO (66%) than in Ouidah (78%) or Lagune (72%) (table 4.1, p=0.0432). Healthy women, near-miss haemorrhage cases and women acting as morbidity non-cases for dystocia were also more likely to be traced in the community, than most of the women with very poor signs (near-miss eclampsia, near-miss dystocia and near-miss infections) for the index pregnancy (table 4.1, not stastically significant).

Addresses may have been given with more accuracy by healthier women who did not undergo massive user charges because of the length of their stay in hospitals (infections, eclampsia), or because of operative delivery or unforeseen delivery in CUGO.

Loss to follow-up did not significantly affect any year in particular. Although fieldwork was slower and more difficult in Cotonou because of intra-urban migration, both hospital and survey samples have similar proportions of women living in Cotonou (58% (survey) vs 59% (hospital)).

4.3.4 bias introduced by differences between healthy and morbidity women

There is very strong statistical evidence that the distribution of women according to husband occupational categories is different among healthy and morbidity women ($p<0.0001$) (table 4.7). While 45% of healthy women's husbands are white collar and only 3% are farmers, the corresponding number for morbidity cases are 25% and 18%. Healthy women are also more likely to be educated and have gone to school beyond secondary level (p-value= 0.0212). They have a more ready access to emergency transport too (p-value=0.0111).

In addition, healthy women are significantly older ($p=0.0051$) (average age 31.2 versus 29.6 years old), and with a larger number of pregnancies ($p=0.0003$) (on average 4.2 versus 3.5) and living children ($p=0.0035$) (3.2 versus 2.4) (table 4.9). They are also more likely to have experienced at least one induced abortion (21% versus 13%, $p=0.0444$) and more likely to live with a man (78% versus 65%, $p=0.0094$) (table 4.9).

In other words, healthy non-cases are more articulate and rooted in life than near-miss cases and morbidity non-cases.

Tragically, near-miss cases and morbidity non-cases are considerably more likely to have experienced the death of the index child at the time of the interview (20% with index child dead compared to 6% for healthy non-cases cases, p=0.0006) (table 4.9) than healthy cases.

4.4 SUMMARY

This chapter has briefly reviewed the major demographic, socio-economic and morbidity characteristics of the study population. The basic data show that women in the final sample are relatively well off, and in the majority urban women, educated, Fon, Christian, economically active, married and very good users of maternity services except for postnatal care. There are indications that the sample is not entirely representative of the population of hospital users, and by extension the general population, at least on two counts: occupation and education. Loss to follow-up did not introduce significant bias except for demographic characteristics. Socio-economic differences between the group of healthy women and those with complications may introduce differential reporting although whether more educated/richer women would report better, especially with respect to specificity, is debatable (Murray and Chen, 1992).

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CHAPTER 5. ECLAMPSIA

5.1 WHAT IS ECLAMPSIA?

5.1.1 diagnosis

Eclampsia is an hypertensive disorder specific to pregnancy. It is defined as the occurrence of one or more convulsions for the first time during pregnancy in association with the syndrome of pre-eclampsia (Eclampsia Trial Collaborative Group, 1995; Walker, 1997). Common causes of convulsions to be eliminated when making the diagnosis of eclampsia include meningitis, cerebral malaria and epilepsy (Driessen, 1991). ***Pre-eclampsia*** is defined as the development of hypertension in pregnancy associated with significant proteinuria (excessive protein excretion in the urine of 300 milligram or more in 24 hours) in a previously normotensive non-proteinuric woman (Walker, 1997). ***Hypertension*** is usually diagnosed in a pregnant women "when the B/P is 140/90 or greater, or there has been a rise of 30mmHg systolic or 15mmHg diastolic over baseline values on at least 2 occasions, six or more hours apart" (WHO, 1994; Walker, 1997).

Signs and symptoms which can be found in association with pre-eclampsia and eclampsia include oedema (in particular generalised oedema), severe headache, vision problems (blurred vision, spots before the eyes), upper abdominal pain and vomiting, although some of these are not specific to the disease.

5.1.2 epidemiology

Eclampsia usually occurs after 20 weeks gestation and within 2 days of delivery. Its aetiology is complex and involves placental and vascular dysfunctions. It is most common among

primigravidae and a normal first pregnancy can be seen as "protecting" women from pre-eclampsia and eclampsia in subsequent pregnancies. However, for multigravidae women who are having a new pregnancy with a different partner, the risk appears to increase to that of primigravidae. Immunological factors may play a role in explaining the onset of the disease, with some form of maternal and foetal incompatibility linked to a rejection of paternal antigens displayed by the foetus. First pregnancies would enable women to become "immunised" against any future pregnancy with the same partner (Walker and Dekker, 1997). There is also evidence that eclampsia and pre-eclampsia are hereditary, with daughters of women who had eclampsia more likely to suffer from the disease themselves.

Eclampsia is a severe disease associated with adverse pregnancy outcomes, in particular maternal deaths primarily due to cerebral haemorrhage, other types of cerebral damage and renal or liver failure; increased risk of foetal/perinatal deaths due to placental failure; and neonatal deaths due to asphyxia or prematurity (Driessen, 1991; Walker and Gant, 1997). Eclampsia is also associated with increased risk of postpartum haemorrhage, premature placental separation (abruptio placentae) and low birth weight babies. Although effective treatments exist for eclampsia management[1] and are widely available, documented case-fatalities in developing country hospitals show wide variations ranging from 5% to 30% (see for example, Bassaw et al, 1994; Lopez-Llera, 1992; Moodley and Daya, 1993; Mwinyoglee et al, 1996; Obed et al, 1994; Swain et al, 1993; Taner et al, 1996)[2]. For comparison, the case fatality in UK hospitals nowadays is about 1.8% (Douglas and Redman, 1994).

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[1] In particular magnesium sulphate, now the drug of choice for controlling convulsions (Eclampsia Trial Collaborative Group, 1995)

[2] Data quality, especially in relation to case-ascertainment, and sample size issues, may partly explain the variation in case-fatality

Eclampsia and severe pre-eclampsia are still responsible for a large number of maternal deaths in Western countries; in the UK for example, where fewer women are dying from sepsis and haemorrhage, they are the second most important cause of maternal death after thrombosis and thromboembolism (Department of Health, 1998). Eclampsia is nevertheless a relatively rare condition. Its prevalence in Europe and other developed countries is estimated at around 1/2000 deliveries (Douglas and Redman, 1994). It seems to be more common in developing countries where important differences in magnitude have been reported between 1 case in 100 to 1 case in 1700 deliveries, but where incidence does not exceed 1% (Bergstrom et al, 1992; Bo-YIng et al, 1982; Dixian, 1995; Eclampsia Trial Collaborative Group, 1995; WHO Collaborative Study, 1988). The higher incidence in certain geographical areas has been explained by a variety of environmental factors such as diet, genetic factors, extreme climates, differences in case ascertainment and in preventive and curative care (Walker and Dekker, 1997). Information from historical populations prior to the 1930s, at a time when care for eclampsia was less effective, show that the "natural" incidence of eclampsia lay between 0.2-0.5% and that the case fatality was typically between 25-30% (Loudon, 1992).

5.2 DESCRIPTION OF ALGORITHM

Appendix 1 presents the algorithm for selecting near-miss cases and non near-miss cases for eclampsia. "Eclamptic seizure" was chosen as an absolute symptom for the diagnosis of eclampsia; it is defined as a tonic-clonic seizure accompanied by a documented blood pressure superior to 140/90, and evidence of proteinuria greater than "+" or oedema greater than "+" (allowing for the fact that protenuria may not be mentioned in women's records). The distinction between near-miss and non near-miss cases is based on the timing of the seizure (before, during or after labour), the number of convulsions (one or more), and vital signs or symptoms of epileptic state and coma. A near-miss case for eclampsia is therefore:

i. any woman who presented one or more eclamptic seizures before the beginning of labour

ii. a woman with more than one seizure during or after labour and who reached epileptic state (seizures in rapid succession)

iii. a woman with more than one seizure during or after labour and who has experienced deep coma of stage 2 or more.

Conversely, a non near-miss case for eclampsia is defined as:

i. a woman who experienced only one seizure during or after labour

ii. a woman who experienced several seizures during or after labour but who did not reach epileptic state or deep coma stage 2.

The inclusion of a timing criteria for identifying severe cases was a suggestion from the Beninese physicians, based on their clinical experience. A hospital-based study conducted by Lopez -Llera (1992) investigating the clinical characteristics of 990 eclampsia cases over 22 years in Mexico confirmed the pertinence of this criteria. The 620 antepartum cases were significantly more likely to die (16.8%) than the 187 intrapartum (10.2%) or 160 postpartum cases (9.4%) (p=0.0117). The highest mortality was found in the 54 "early eclampsia" cases, prior to 28 weeks gestation (22%). Antepartum cases, and especially early antepartum cases, also experienced more complications including brain haemorrhage (12.3% vs 7.8%), disseminated intravascular coagulation (14.0% vs 9.5%), acute renal failure (11.9% vs 6.9%), premature placental separation (7.9% vs 4.9%) and cardiac arrest (6.1% vs 4.9%). Perinatal mortality was furthermore highest among antepartum cases (31.4%), followed by intrapartum (12.8%) and postpartum cases (7.9%) (p-value<0.0001). Similar results in relation to timing of eclamptic seizure have also been reported in incidence studies in the UK and Sweden (Douglas and Redman, 1994; Möller and Lindmark, 1986)

Walker and Gant (1997) argue that prior severity of pre-eclampsia is another key factor for explaining adverse outcomes of eclampsia. Nelson (1955a, b) found that "all the baby deaths associated with eclampsia occurred in patients with severe pre-existing pre-eclampsia, and none where the severe pre-eclampsia was mild" (quote from Walker and Gant, 1997). Nelson went further by deducing that "a case of eclampsia occurring with mild pre-eclampsia was probably less dangerous for the mother and the baby than a case of severe pre-eclampsia with no convulsions" (quote from Walker and Gant, 1997). Our algorithm does not consider the underlying hypertension and protenuria in determining severity. As observed by Walker and Gant (1997), "even with modern methods of blood pressure measurement, it is often eclampsia that brings a woman to the attention of medical care". Medical records in referral hospitals are unlikely to contain antenatal information on health status during pregnancy for women arriving in emergency which makes it difficult to use pre-existing pre-eclampsia as a definition criteria for near-miss cases.

5.3 SIGNS AND CHARACTERISTICS OF THOSE SELECTED FROM MEDICAL RECORDS

The sample contains 27 near-miss cases and 25 non near-miss cases for eclampsia (table 5.1). Among the near-miss group, the majority (24 women) were included because convulsions occurred before labour; the other 3 cases were intrapartum and postpartum cases with indication of epileptic state or deep coma stage 2. Among the non near-miss cases for eclampsia, 6 were selected because they had one seizure only during or after labour, and 19 had more than one seizure during or after labour, without a deterioration of their condition to epileptic state or coma.

Table 5.1: Case definition criteria for eclampsia cases in the hospital sample (N=52)

Case definition criteria	Number of women with criteria
near-miss eclampsia	
eclamptic seizure before labour	24
eclamptic seizure during or after labour with more than one seizure and epileptic state	1
eclamptic seizure during or after labour with more than one seizure and deep coma stage>=II	2
non near-miss eclampsia	
eclamptic seizure during or after labour with only one seizure	6
eclamptic seizure during or after labour with more than one seizure but without epileptic state or deep coma stage>=II	19

Further analysis of signs shows that the recorded numbers of eclamptic fits in case notes range from 1 to 8 fits for 36 women; an additional 10 women had multiple fits without the exact number being recorded. For 6 women, there was not enough information to determine whether they had one or more fits. Documentation of presence of proteinuria was incomplete in the medical records with information available only for 17 women who all had proteinuria. Because of the way the medical records are filled, it is possible that a significant proportion of those with "missing information" had in fact no proteinuria. Information on oedema was better recorded, with 28 women with evidence of oedema, 20 without and only 4 missing values. Reported systolic blood pressure (BP) measures ranged from 120 to 260mmHg with a median at 180 while diastolic BP were from 80 to 150mmHg with a median at 115 (no missing value).

Six women with eclampsia were also selected for another diagnosis, including: (i) an haemorrhage due to lacerated cervix, (ii) an haemorrhage for an unknown reason, (iii) one near-miss dystocia with uterine retraction ring, (iv) one near-miss infection with endometritis and evidence of anaemia and respiratory distress, and (v) 2 non-cases for infection, the first one for endometritis complicated by anaemia, the other for a wound infection. As expected, the stillbirth rate was high (17%) with 10 documented stillbirths for 58 foetuses[3], compared to 10% for other morbidities and 1% for healthy women. Eclampsia cases were significantly younger than other women in the sample (24.3 years old versus 27.1 (other morbidity) and 28.5 (healthy women), (p-value<0.0001), and were more likely to be in their first pregnancy (44% versus 29% (other morbidity) and 15% (healthy women), (p-value<0.0001) (table not shown). Most of these women (69%) were seen at CUGO, and comparatively few were selected at Ambulance de Ouidah (11%). Slightly less than two-thirds (65%) were referred from another health facility

[3] There were 6 twin pregnancies among women with eclampsia

compared to 60% for other morbidity (not significant, p=0.6195). Almost half (46%) gave birth by caesarian section[4] (table not shown).

5.4 SYMPTOMS REPORTED BY WOMEN IN INTERVIEW

5.4.1 brief description of questions

Questions related to eclampsia were asked in section 4 immediately after the open-ended question and can be found in Appendix 3 (questions 401 to 431). There were two types of questions: (i) questions related to diagnostic procedures on presence of proteinuria and high blood pressure during pregnancy, and (ii) questions related to symptoms of oedema and convulsions. The central question was on the occurrence of convulsions with the index pregnancy. If the woman responded positively, a question was added as to whether similar fits occurred before pregnancy to improve specificity and eliminate cases of epilepsy. These were followed by three questions matching the severity criteria in the algorithm on timing of first fit, number of fits and loss of consciousness. Local terminology were used when possible: salts in the urine for proteinuria, swelling disease for oedema, and *kaun kaun* disease for convulsions.

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[4] Delivery is the only sure way of eliminating the disease. The method of delivery depends on the circumstances, but "difficult" vaginal deliveries are to be avoided, and caesarians are hence very common for patients with eclampsia

5.4.2 frequency of reports of symptoms

Table 5.2 shows a frequency distribution of the symptoms reported by all 380 women[5],[6] who answered this part of the questionnaire. The symptoms most frequently reported by the whole sample were oedema[7] (31%) chiefly concentrated on legs and feet, followed by proteinuria (19%) and high blood pressure (11%). Convulsions were reported by 7% women; one of these women told the interviewer that she had experienced a similar event before pregnancy.

56% of the women who replied positively to the question on fits occurrence indicate that the first fit was before delivery, and 64% said that they had only one (data not shown). Almost all (96%) reported that they lost consciousness because of the convulsions.

5.5 QUESTIONNAIRE PERFORMANCE

5.5.1 analysis using closed questions

Tables 5.3a-d present sensitivity and specificity results for eclampsia and near-miss eclampsia cases versus healthy women and all other women. Given the rarity of the disease, a question or a combination of questions was considered as reliable when it reached a specificity of at least 99% and a sensitivity of at least 70%.

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5 One woman had already asked to stop the interview

6 Among these, 33 (9%) had been included in the sample for eclampsia

7 Lower than the documented prevalence of physiological oedema in pregnant women in the West which is around 80% (Redman, 1995)

Table 5.2: Frequencies tabulation of responses to selected questions on signs and symptoms associated with eclampsia (N=380)

Questions	Number of positive answers	%
Was told that she had salts in the urine (proteinuria) (q401)	71	18.6
Was told that her blood pressure was high (q402)	43	11.3
Had oedema (swelling disease) during pregnancy (q403)	119	31.2
Swelling affected face (q404a)	7	1.8
Swelling affected legs/feets (q404b)	117	30.7
Swelling affected hands (q404c)	2	0.5
Swelling affected other areas (q404d)	0	0
Swelling affected every part of the body (q404e)	3	0.8
Had fits (kaun kaun disease) during pregnancy, delivery or after delivery (q407)	25	6.6
Had similar convulsions when she was not pregnant (q408)	1	0.3
Had first fit (q409)		
before delivery	14	3.7
during delivery	5	1.3
after delivery	6	1.6
Number of convulsions (q410)		
One	16	4.2
2-9	8	2.1
Don't know	1	0.3
Lost consciousness because of convulsions (q411)	24	6.6
Was told that she had a c-section because of fits (q217h)	11	2.9

A single question on the ***occurrence of a convulsion with pregnancy*** achieved best results. The specificity was very high (99.7%-100%) with only 1 false negative among the morbidity controls and none among healthy women[8]. Sensitivity is lower (72.7%) with almost a third of eclampsia cases not reporting convulsions. Severity of the condition increased the sensitivity to 88.2% (tables 5.3c-d) suggesting that women who experienced a near-miss eclampsia reported it with more accuracy than other eclampsia cases. Adding a question on ***occurrence of convulsions outside pregnancy*** did not improve the accuracy of the reported information. The sensitivity was reduced to 69.7%, because the one woman who reported convulsions outside pregnancy had a diagnosis of eclampsia (data not shown).

Reports of ***unconsciousness on arrival at hospital*** achieved a good combination of sensitivity and specificity when compared to healthy women (sensitivity was 75.8% for all eclampsia cases and 94.1% for near-misses; specificity was 99.2%). However, the specificity decreased when all other women were taken as the comparison group (87.8% for all eclampsia and 85.9% for near-misses). Adding ***absence of bleeding*** (question 502a,b,c) to the algorithm was the only question to improve the specificity for this comparison group but to insufficient levels (96.0% for all eclampsia and 94% for near-misses).

The best sensitivity results were for '***thought she was going to die***' (90.9% (all eclampsia) - 94.1%(near-miss eclampsia)), indicating that eclampsia women were well-aware of the seriousness of their condition, but the specificity results were poor especially when the comparison group was all other women (48.7% (all eclampsia) and 47.1% (near-misses)). It is worth noting that 21 women with a normal delivery also thought they were going to die.

Accounts of ***oedema during pregnancy*** detected 78.8% of all eclampsia cases and 76.5% of

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[8] This respondent had in fact answered "don't know" to the question on convulsions. Don't know answers were handled as negative responses in the sensitivity-specificity analysis

near-miss cases, unfortunately with very poor specificities with 27-30% of all other women and 23% of healthy women also reporting oedema. Information on whether the respondent got ***in touch with the health services because of oedema*** increased specificity, but to inadequate levels (80.1%- 88.1%) and at the expense of sensitivity.

Extremely high specificity results were obtained for '***swelling affected hand, face or every part of the body***' whether the comparison group was all other women (99.2% (near-miss) - 99.7% (all eclampsia)) or healthy women(100%). But this question only identified 24.2% of all eclampsia cases and 35.3% of near-miss eclampsia.

Diagnosis questions on ***salts in the urine*** and ***high blood pressure*** reached insufficient levels of sensitivity and specificity for all combinations.

5.5.2 physicians' analysis of questionnaires

Physicians' interpretations of the verbatim reports in conjunction with the closed questionnaire yielded very similar results to the "best" question identified through quantitative computer analysis. Specificities were identical (99.7%) and sensitivities slightly raised for 2 physicians (78.8% and 75.8%) (physician 1 identified two additional true positives, and physician 3 one more). The inter-physician reliability appears remarkable with complete agreement for the distribution of non-cases among true and false negatives, and very close agreement for cases. Physicians 1 and 3 both identified two additional cases (the same women) as true positives, but physician 3 misclassified a third true positive identified by the computer and the other doctors.

The *kappa statistic* has a very high value (0.91)[9]. Use of verbatim reports on their own were

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[9] The formula for the calculation of *Kappa statistics* when there are more than 2 observers was obtained from Siegel and Castellan (1989). Diagnoses were divided into two categories (yes/no) for measuring agreement concerning the

less successful with a decrease in sensitivity for physicians 2 and 3 to 69.7% (one less case each classified as a true positive). Physician 1 obtained better results with the verbatim than his counterparts (sensitivity 75.8%, specificity 99.7%), and the quantitative computer analysis, mainly because he was less likely to classify cases and non cases as don't know[10]. Agreement between physicians in the interpretation of the verbatim reports is not as strong: while 7 cases are classified by all three physicians as false negatives, there is disagreement for 6 other cases (5 of these because of "don't know"). Nevertheless the *kappa statistic* for the verbatim reports appears good at 0.68 .

5.5.3 explanatory variables

Sensitivity and specificity of reports of convulsions were analysed according to key interview and women characteristics (table 5.5). Although there is variation in sensitivity for all variables, type of interviewer is the only one which approaches significance (p=0.0466), with cases interviewed by experienced fieldworkers[11] more likely to report eclampsia than other women.

5.6 SUMMARY

Eclampsia is a rare disease with a predominant characteristic: the occurrence of convulsions. Although extremely high specificity is required from questions to establish prevalence through survey methods, very good results were achieved with a single question. Doctors' qualitative interpretation of questionnaires did not provide better results than a quantitative computer

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overall physicians' diagnosis, and three categories (yes/no/don't know) for the analysis of the verbatim answers on their own.

[10] Automatically handled as negative responses. See note 6

[11] Experienced fieldworkers are those who participated to surveys prior to the near-miss study

analysis of the closed questionnaire. Type of interviewer may influence women's willingness to report eclamptic fits.

Table 5.3a: Sensitivity and specificity of questions on symptoms of eclampsia: 33 eclampsia cases vs 348 all other women

Symptoms for eclampsia	cases		non-cases				
	true posi -tive	false nega -tive	true nega -tive	false posi -tive	N	Sensitivity	Specificity
was told that she had salts in the urine during pregnancy	10	23	286	61	[380]	30.3	82.4
was told that her blood pressure was high	12	21	316	31	[380]	36.4	91.1
had oedema during pregnancy	26	7	254	93	[380]	78.8	73.2
swelling affected legs and feet	24	9	254	93	[380]	72.7	73.2
swelling affected hands, face or every part of her body	8	25	346	1	[380]	24.2	99.7
got in touch with health services because of this oedema	20	13	285	62	[380]	60.6	82.1
had a convulsion or fit during pregnancy, delivery or after delivery	24	9	346	1	[380]	72.7	99.7
lost consciousness because of these fits	23	9	346	1	[379]	71.9	99.7
thought she was going to die	30	3	168	177	[378]	90.9	48.7
was inconscious on arrival in hospital	25	8	303	42	[378]	75.8	87.8
was inconscious on arrival in hospital and did not have abnormal bleeding	22	11	332	14	[378]	66.7	96.0

Table 5.3b: Sensitivity and specificity of questions on symptoms of eclampsia: 33 eclampsia cases vs 126 healthy women

Symptoms for eclampsia	cases		non-cases				
	true posi -tive	false nega -tive	true nega -tive	false posi -tive	N	Sensitivity	Specificity
was told that she had salts in the urine during pregnancy	10	23	112	14	[159]	30.3	88.9
was told that her blood pressure was high	12	21	121	5	[159]	36.4	96.0
had oedema during pregnancy	26	7	97	29	[159]	78.8	77.0
swelling affected legs and feet	24	9	97	29	[159]	72.7	77.0
swelling affected hands, face or every part of her body	8	25	126	0	[159]	24.2	100.0
got in touch with health services because of this oedema	20	13	111	15	[159]	60.6	88.1
had a convulsion or fit during pregnancy, delivery or after delivery	24	9	126	0	[159]	72.7	100.0
lost consciousness because of these fits	23	9	126	0	[158]	71.9	100.0
thought she was going to die	30	3	105	21	[159]	90.9	83.3
was inconscious on arrival in hospital	25	8	125	1	[159]	75.8	99.2

Table 5.3c: Sensitivity and specificity of questions on symptoms of near-miss eclampsia: 17 cases of near-miss eclampsia vs 364 all other women

Symptoms for near-miss eclampsia	cases		non-cases				
	true posi -tive	false nega -tive	true nega -tive	false posi -tive	N	Sensitivity	Specificity
was told that she had salts in the urine during pregnancy	6	11	298	65	[380]	35.3	82.1
was told that her blood pressure was high	9	8	329	34	[380]	52.9	90.6
had oedema during pregnancy	13	4	257	106	[380]	76.5	70.8
swelling affected legs and feet	12	5	258	105	[380]	70.6	71.1
swelling affected hands, face or every part of her body	6	11	360	3	[380]	35.3	99.2
got in touch with health services because of this oedema	10	7	291	72	[380]	58.8	80.2
had a convulsion or fit during pregnancy, delivery or after delivery	15	2	353	10	[380]	88.2	97.2
lost consciousness because of these fits	14	3	352	10	[379]	82.4	97.2
thought she was going to die	16	1	170	191	[378]	94.1	47.1
was inconscious on arrival in hospital	16	1	310	51	[378]	94.1	85.9
was inconscious on arrival in hospital and did not have abnormal bleeding	15	2	341	21	[378]	88.2	94.2

Table 5.3d: Sensitivity and specificity of questions on symptoms of near-miss eclampsia: 17 cases of near-miss eclampsia vs 126 healthy women

Symptoms for near-miss eclampsia	cases		non-cases				
	true posi -tive	false nega -tive	true nega -tive	false posi -tive	N	Sensitivity	Specificity
was told that she had salts in the urine during pregnancy	6	11	112	14	[143]	35.3	88.9
was told that her blood pressure was high	9	8	121	5	[143]	52.9	96.0
had oedema during pregnancy	13	4	97	29	[143]	76.5	77.0
swelling affected legs and feet	12	5	97	29	[143]	70.6	77.0
swelling affected hands, face or every part of her body	6	11	126	0	[143]	35.3	100.0
got in touch with health services because of this oedema	10	7	111	15	[143]	58.8	88.1
had a convulsion or fit during pregnancy, delivery or after delivery	15	2	126	0	[143]	88.2	100.0
lost consciousness because of these fits	14	3	126	0	[143]	82.4	100.0
thought she was going to die	16	1	105	21	[143]	94.1	83.3
was inconscious on arrival in hospital	16	1	125	1	[143]	94.1	99.2

Table 5.4 Sensitivity and specificity of physicians' qualitative assessment of eclampsia: 33 eclampsia cases vs 347 all other women

	Physician 1		Physician 2		Physician 3*		Computer-based analysis (best results)**	
eclampsia cases vs all other women	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity
using verbatim	75.8	99.7	69.7	99.7	69.7	99.7	72.7	99.7
using verbatim and closed questions	78.8	99.7	72.7	99.7	75.8	99.7	72.7	99.7

Note:
* based on 380 women (one missing value)
** based on report of convulsion during pregnancy, delivery or after delivery (q407)

Table 5.5: **Sensitivity and specificity of women's reports of convulsions during pregnancy, delivery, after delivery, according to interview or respondent's characteristics: eclampsia cases vs all other women**

	Cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
recall length							
<2 years	11	5	185	0	[201]	68.7	100
>2 years	13	4	161	1	[179]	76.5 p=0.7080	99.4
type of interviewer							
experienced	13	1	151	1	[166]	92.9	99.3
not experienced	11	8	195	0	[214]	57.9 p=0.0466	100
school attendance							
yes	20	5	230	1	[256]	80.0	99.6
no	4	4	116	0	[124]	50.0 p=0.1695	100
first pregnancy							
yes	9	5	63	0	[77]	64.3	100
no	15	4	283	1	[303]	78.9 p=0.4421	99.6
age							
<25	11	5	61	0	[78]	68.7	100
>=25	13	4	285	1	[303]	76.5 p=0.7080	99.7
work for cash							
yes	16	4	217	1	[238]	80.0	99.5
no	8	5	129	0	[142]	61.5 p=0.4251	100

Note: p-value were calculated using Fisher exact test (2 tailed p-values) for differences between sensitivities

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CHAPTER 6. HAEMORRHAGE OF THE THIRD TRIMESTER, DELIVERY AND THE PUERPERIUM

6.1. DEFINITION AND EPIDEMIOLOGY

6.1.1 definitions

a) antepartum haemorrhage

Antepartum haemorrhage is defined as bleeding from the genital tract in the second half of pregnancy and before the birth of the baby[1]. Various gestation cut-off-points have been proposed at 22, 24 and 28 weeks (Driessen, 1991; Symonds, 1987; WHO, 1994). Causes for late antepartum bleeding can be divided into four broad groups: (i) placental abruptio (premature separation of the placenta); (ii) placenta praevia (placenta lies low in the uterus, in front of the presenting part of the baby); (iii) other obstetric causes such as rupture of the uterus and placental edge bleeding; (iv) bleeding due to local gynaecological causes such as cervical lesions (Driessen, 1991; Fraser and Watson, 1989)). However, in many cases, it is not possible to make a definitive diagnosis and bleeding of uncertain origin forms between 20-75% of all antepartum haemorrhage (Amoa et al, 1992; Fraser and Watson, 1989).

While external antepartum bleeding is a key symptom of an underlying pathology, it is absent in 20-35% of patients with abruptio placentae and 15% cases of patients with placenta praevia prior to delivery. In poor settings, placenta praevia and abruptio placentae are sometimes only

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[1] Bleeding earlier in pregnancy is usually defined as abortion, or threatened abortion.

detected during labour because of a sudden and massive haemorrhage (intrapartum haemorrhage)[2].

b) postpartum haemorrhage

Postpartum haemorrhage refers to excessive bleeding from the genital tract after childbirth. Medical texts distinguish between **primary postpartum haemorrhage**, occurring within 24 hours of the delivery of the baby, and **secondary postpartum haemorrhage** which is between 24 hours after the delivery of the baby and six weeks postpartum (Driessen, 1991; WHO, 1990).

A difficulty in the identification of **primary postpartum haemorrhage** is the need to establish a threshold at which normal physiological bleeding during childbirth becomes dangerous. The conventional cut-off-point for excessive bleeding is 500ml (WHO, 1990). Not all authors recommend this threshold for a variety of reasons. Therapeutic interventions are sometimes deemed necessary at a lower threshold for patients who appear to tolerate blood loss poorly, for example women with anaemia or heart disease (Driessen, 1991; WHO, 1990). Driessen (1991), for example, proposes 300 ml, in a manual for obstetricians working in developing countries. Other clinicians, however, suggest higher cut-off-points (Prendiville and Elbourne, 1989). Burchell (1980), for example, concludes that excessive bleeding should be put above 1000 ml after showing that the average blood loss for vaginal deliveries is 600 ml for singleton pregnancy and almost 1000 ml for twins (Prendiville and Elbourne, 1989). Craigo and Kapernick (1994) indicate that average blood loss is 700 ml. The evidence seems confused as some studies have found lower average blood loss (400 ml) in normal singleton pregnancies (Duthie

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[2] The antenatal diagnosis for placenta praevia and placental abruption often requires ultrasound, a facility which is not always available in developing countries; the diagnosis of placental abruption is otherwise confirmed retrospectively with the inspection of the placenta.

et al, 1991; Newton et al, 1961). In any case, because visual estimation of blood loss (the conventional method in clinical practice) tends to underestimate the true amount of bleeding, the threshold has been maintained at 500 ml by WHO for diagnostic purpose (WHO, 1994).

Principal causes for excess primary postpartum bleeding include failure of the uterus to contract (uterine atony), lacerations or tears in the vulva, vagina, cervix, perineum or uterus, retained placental tissues or membranes[3] and coagulation defects (Craigo and Kapernick, 1994). The main cause for **secondary postpartum haemorrhage** is endometritis originating from retained products which create infection and its main symptom is any bleeding getting heavier when it should get lighter; blood loss volume is not defined. In countries where access to hospitals is poor, ruptured uterus is also an important source for intrapartum or primary postpartum haemorrhage (Driessen, 1991).

In a health-facility study conducted in Harare, the capital of Zimbabwe (Tsu, 1993), the main causes for postpartum haemorrhage were vaginal lacerations and cervical tears (36%), followed by uterine atony (18%), retained placenta (8%) and a variety of other causes (14%). Findings were very similar in a Nigerian hospital, where the three main causes were uterine atony (36%), vaginal and cervical lacerations (24%) and retained placenta (12%). Significantly, in both studies, a cause could not be identified for a quarter of cases (Selo-Ojeme and Okonofua, 1997; Tsu, 1993).

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[3] By convention, **retained placenta** occurs when it is wholly or partly retained in the uterine cavity for more than one hour after delivery (WHO, 1990). There is disagreement over this time limit, however, with other authors suggesting a shorter duration. Retained placenta is not always associated with postpartum bleeding.

6.1.2 epidemiology

The decline in the number of cases and the fatality associated with haemorrhage since the 1930s has been considerable in high income countries, thanks mainly to blood transfusion, fluid replacement, Cesarean section for placenta praevia and the introduction of active management of third stage of labour and the use of oxytocic drugs (Fraser and Watson, 1989; Prendiville and Elbourne, 1989). While in the 1930s, antepartum and postpartum haemorrhage were responsible for 15-20% of maternal deaths in the United Kingdom, they account nowadays for 4% of direct and indirect maternal deaths (Loudon, 1992; Department of Health, 1998). In developing countries, however, hospital series suggest that haemorrhage still accounts for a large proportion of deaths, and that it is often the leading cause of death, with between 18% and 27% of hospital deaths attributed to it (Hoestermann et al, 1996; Martey et al, 1993; Moodley et al, 1996; Spies et al, 1995).

a) antepartum haemorrhage

Risk factors are reasonably well-established for placenta praevia and placental abruption, but to a lesser degree for other recognised or unrecognised causes of antepartum bleeding. Increasing age and parity, cigarette smoking, alcohol drinking, multiple pregnancy, previous abortion (placenta praevia), previous c-section (placenta praevia), previous placental separation (placental abruption) and hypertension (placental abruption) can be found among the most important factors for placenta praevia and placental abruption (Fraser and Watson, 1989; Pernoll, 1994). The biological mechanisms for abnormal implantation and early separation appear to be not fully understood however (Iyasu et al, 1993).

Table 6.1 shows that the population incidences of late antepartum bleeding (all causes) range from 2.5% to 5.2%. Reported incidences of placental abruption and placenta praevia vary between 0.5%-3% and 0.3%-5% respectively (Fraser and Watson, 1989; Iyasu et al, 1993). Placenta praevia, placental abruption and bleeding for indeterminate causes have different health consequences for mothers and babies. Placental abruption is the most serious of the three conditions with very high perinatal mortality. Figures ranging from 500 to 900 perinatal deaths per 1000 births have been found in recent studies in developing countries (Amoa et al, 1992; Fraser and Watson, 1989). Even in developed countries, perinatal case fatality rates appeared rarely under 300/1000, at least until recently (Fraser and Watson, 1989). Maternal case fatality rates are much smaller ranging from 0-18/1000 in developed countries (Fraser and Watson, 1989).

Placenta praevia carries less risk for mother and fetus with a thoroughly documented maternal case fatality rate at 0.3/1000 in the United States, and perinatal loss at 50-60/1000 in developed countries and 81/1000 in a developing country hospital (Amoa et al, 1992; Iyasu et al, 1993). Bleeding for unknown causes can have very serious consequences with perinatal mortality rates ranging between 35-157/1000 in various developed and developing countries (Amoa et al 1992; Fraser and Watson, 1989). What stands behind "unknown causes" is likely to differ greatly according to setting, however, and some of it may be attributable to placenta praevia or placental abruption to varying degrees.

b) postpartum haemorrhage

A variety of risk factors for postpartum haemorrhage have been reported in the literature including reproductive factors (high parity, advanced maternal age, multiple pregnancy),

Table 6.1 Incidences of biomedically defined antepartum and postpartum haemorrhage in selected population studies

Author, year and place	Case definition	Incidence (%)	Confidence intervals*
Antepartum haemorrhage			
Moutquin et al (1987) - Canada - Low risk women follow-up study	Placental abruptio and placenta praevia	1.6 (13/790)	[0.8 - 2.8]
Paintain (1962) - United Kingdom- married women with single pregnancies who delivered in Aberdeen between 1949-1958. Records review	External blood loss after week 24 and before delivery	3.0 (910/30383)	[2.8 - 3.2]
Roberts (1970) - United Kingdom - study quoted by Fraser and Watson (1989) and described as a 'community study'.	Unclassified antepartum haemorrhage	4.8 (NA)	Insufficient information
Sikorski et al (1996) - United Kingdom - Low risk women in randomised control trial of new antenatal care schedule	Antepartum haemorrhage	5.2 (144/2751)	[4.4 - 6.1]
Stones et al (1991) - United Kingdom- Norfolk and Norwich hospital obstetric records	Antepartum haemorrhage	2.5 (55/2164)	[1.9 - 3.3]
Stones et al (1993) United Kingdom - 1988 North West Thames Health Region obstetric records	Indeterminate antepartum haemorrhage and proven abruptio and praevia with bleeding	2.9 (1087/37334)	[2.7 - 3.1]
Postpartum haemorrhage			
Bo-Ying et al (1982) - China - barefoot doctors records in 2 communes	"Post partum haemorrhage" and retained placenta and laceration of cervix	3.2 (29/898)	[2.2 - 4.6]
Bullough et al (1989) - Malawi - randomised control trial with TBAs	Blood loss > 500ml during 3rd stage of labour or within 24h	8.1 (345/4271)	[7.3 - 8.9]
Conn et al (1941) - Canada - study quoted by WHO (1990)	Insufficient information	18.9 (NA)	Insufficient information
Prendiville et al (1988) - United Kingdom - Physiological group in randomised control trial on PPH	Clinical estimation of blood loss >= 500ml	17.9 (152/849)	[15.4 - 20.7]
	Clinical estimation of blood loss >= 1000ml	3.1 (26/849)	[2.0 - 4.5]
Rooks et al (1989) - USA - low risk women delivering in birth centers	Postpartum haemorrhage requiring transfer from birth center to hospital	5.4 (50/928)	[4.0 - 7.0]

Author, year and place	Case definition	Incidence (%)	Confidence intervals*
Saunders et al (1992) - United Kingdom - 1988 North West Thames Health region - Normal vaginal delivery obstetric records	Blood loss >= 500ml	5.5 (1385/25069)	[5.2 - 5.8]
Sikorski et al (1996) - United Kingdom - Low risk women in randomised control trial of new antenatal care schedule	Primary postpartum haemorrhage	9.9 (272/2748)	[8.8-11.1]
Stern et al (1992) - Australia - medical records of low risk women delivering in birth centers 1980-1989	Postpartum blood loss >600ml	3.1 (112/3614)	[2.6 - 3.7]
Stones et al (1991) - United Kingdom - Norfolk and Norwich hospital obstetric records	Primary postpartum haemorrhage following vaginal delivery and secondary postpartum haemorrhage	7.3 (158/2164)	[6.2 - 8.5]
Stones et al (1993) United Kingdom - 1988 North West Thames Health region obstetric records	Blood loss >= 1000ml in the 24h following delivery	1.3 (1498/37334)	[1.2 - 1.5]
Waldenström et al (1997) - Sweden - Low risk womenin a birth centre trial	Postpartum blood loss > 600ml	12.6 (212/1681)	[11.1-14.3]
Wiegers et al (1996) - Netherlands - Low risk women in a home vs hospital prospective study	Blood loss >= 1000 ml during labour and delivery	2.2 (40/1836)	[1.6-3.0]

Note:
* exact binomial 95% confidence intervals
NA data not available

predisposing medical conditions (prolonged labour, pre-eclampsia, maternal obesity, large birth weight, antepartum haemorrhage, previous postpartum haemorrhage, anaemia) and factors related to the management of delivery. The importance of grand multiparity remains disputed, with several epidemiological studies showing a lack of statistical significance in univariate and multivariate analyses (Selo-Ojeme and Okonofua, 1997; Stones et al, 1993; Tsu, 1993). Deficient management is clearly a major risk factor in both developed and developing countries. While, for example, non-use of oxytocics after vaginal delivery has been identified as an important risk factor in a case-control study in a Nigerian hospital (Selo-Ojeme and Okonofua, 1997), obstetric interventions such as induction of labour have been blamed for an apparent increase in incidence of postpartum haemorrhage in UK hospitals (Gilbert et al, 1987; Hall et al, 1985).

Postpartum haemorrhage appears more common than antepartum haemorrhage, though its reported population incidence shows wide variation from 1.3% to 18.9% (table 6.1). These variations are largely explained by differences in case definition, case ascertainment and case management. Using the same database for the population of North West Thames Health Region, Saunders and colleagues (1992) report an incidence of 5.5% (for blood loss >500ml) while Stones and colleagues (1993) found an incidence 1.3% for "major obstetric haemorrhage" (which they define as blood loss greater than 1000ml). In a randomised control trial of active *versus* physiological management to reduce postpartum haemorrhage, women in the control group who delivered with as little intervention as possible register a very high rate of postpartum bleeding greater than 500ml (17.9%) and a smaller rate for bleeding greater than or equal to 1000ml (3.1%) (Prendiville et al, 1988). In the active management group (administration of oxytocin-ergometrine, early cord clamping, and controlled cord traction), the corresponding figures were 5.9% and 0.8% respectively. Apart from demonstrating the importance of case

definition, the later figures show that significant blood loss is likely to be a common occurrence in settings where deliveries are often unattended or oxytoxics is unavailable or has little effect[4].

Little information exists on the case-fatality for postpartum haemorrhage. Tsu (1993) identified 1 maternal death and 5 perinatal deaths among 151 cases of postpartum haemorrhage. These figures correspond to a maternal case-fatality of 7/1000 and a perinatal case fatality of 33/1000.

6.2 DESCRIPTION OF THE ALGORITHM

Appendix 1 shows the algorithm for haemorrhage of the third trimester, delivery and the puerperium. External vaginal bleeding and the period of occurrence are the absolute symptoms. The algorithm uses information on therapeutic "emergency" interventions and occurrence of shock[5]. It does not use information on amount of blood loss, haemoglobin level and medical diagnosis, nor does it differentiate between near-miss and non near-miss cases[6]. Rather, given the seriousness of the criteria used, all identified cases can be considered as near-miss cases.

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[4] Ergometrine is unstable in high ambient temperatures.

[5] Haemorrhage death cases usually die from shock. The response of the body to blood loss has been described in such words by Driessen (1991): "In order to maintain the blood pressure during severe blood loss, the heart beats faster and the blood vessels contract. After a moderate loss the blood pressure stays stable but after 1000-1500ml has been lost, it drops suddenly to a systolic pressure of around 50 mm Hg. This level is the body's 'last ditch stand'. If bleeding continues and no intravenous fluids are given, there will be a second sudden drop of the blood pressure to zero and the patient dies." p144

[6] One of the main reasons for not differentiating between near-miss and non near-miss cases relates to the questionnaire validation objective of the study. Bleeding is a fundamental symptom for the interview, and women could not be expected to differentiate between very excessive/abnormal bleeding, abnormal bleeding and normal bleeding. Another reason relates to the use of information on therapeutic intervention in the algorithm which made it difficult to divide women into 3 severity groups.

Thus, a woman was selected as a near-miss haemorrhage case when there was recorded evidence that:

i. she had external vaginal bleeding in the antepartum, intrapartum and postpartum period and clinical signs of shock. The definition for shock can be found in figure B in appendix 1.

ii. she had external vaginal bleeding in the third trimester, during or after labour and a major therapeutic intervention to stop the bleeding. These interventions include: manual exploration of the uterus to remove remains of placenta, caesarian (mostly indicative of placenta praevia or placental abruption when instigated for bleeding), hysterectomy (mostly indicative of ruptured uterus or uncontrollable atony), blood transfusion >= 2 litre for acute anaemia or coagulation defects, suture of cervix or vagina.

In a setting such as Benin, intervention is only done in extreme circumstances, and the cases identified are certainly near-miss cases. It is possible, however, that some of the "normal" cases had more than physiological blood loss.

The two definitions used by Tsu (1993) for the prospective identification of postpartum haemorrhage cases in another African setting (Zimbabwe) are useful for comparison. The first definition was based on amount of blood loss (more than 600ml) with collection of blood in a basin and a visual estimation of blood on linen. The second used information on clinical signs, with women incorporated as cases when "heavy bleeding" was mentioned in their records for the first 24 hours after delivery and they had shock or a transfusion recorded or their haemoglobin was less than 8 g/dl. This later definition is in many ways similar to ours, using a mixture of information on signs, treatment and mention of excessive bleeding in case notes.

The main reasons for not including information on amount of blood loss and haemoglobin level in our algorithm relate to the retrospective nature of medical records extraction and to the lack of quantitative information on blood loss and haemoglobin level in the records, including those belonging to haemorrhage cases. Quantitative estimates of blood loss are in themselves prone to error. Several studies have shown that visual estimation is not only inaccurate compared to laboratory measurement, but that the extreme ends of the distribution of blood loss appeared particularly affected with overestimation below 150 ml and underestimation above 500 ml (Duthie et al, 1990; Newton et al, 1961; Ravzi et al, 1996). In the study conducted by Duthie and colleagues (1990), all 11 cases of postpartum haemorrhage (blood loss > 500 ml) were not identified through visual estimation of blood loss because of this phenomenon.

6.3 SIGNS AND CHARACTERISTICS OF THOSE SELECTED IN HOSPITALS

Using the algorithm, 80 near-miss haemorrhage cases were identified in the hospitals. A total of 18 women were selected because they had shock independently from information on treatment used (table 6.2). The remaining 62 women were chosen because they had an intervention to stop the haemorrhage. Among the latter group, half had a Caesarean section.

Abnormal external bleeding is reported to occur antenatally for 18 women (23%), and during or after labour for 24 (31%) and 40 (51%) women respectively[7]. Final diagnoses include placenta praevia (32 cases), placental abruption (3 cases), retained placenta (21 cases), cervical laceration (12 cases), uterine rupture (7 cases), lacerations or tears in vulva, vagina,

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[7] There is double counting: 3 women had bleeding reported during the antepartum and intrapartum period and 1 woman during the intrapartum and postpartum periods. For an additional 2 women, there was no information on the period of occurrence.

Table 6.2: Case definition criteria for near-miss haemorrhage cases in the hospital sample (N=80)

Criteria for case definition	Number of women with criteria
vaginal bleeding during 3rd trimester, during labour or after labour:	
with shock	18
without shock and with intervention to remove remains of placenta[1]	14
without shock and with caesarian to stop haemorrhage$_2$	31
without shock and with blood transfusion for acute anaemia or coagulation problem	12
without shock and with suture of cervix or vagina	5

1. 4 of these women also had a blood transfusion
2. The ceasarean sections were related to placenta praevia(N) and rupture uterine (N) in the majority of cases. 14 of these women also had a blood transfusion

Table 6.3: Haemorrhage diagnoses according to period of occurrence of bleeding

	placenta praevia (1)	placental abruption	retained placenta (2)	cervical lacerations	uterine rupture	other	no diagnosis	total women
ante-partum	15	2	0	0	0	0	1	(18)
intra-partum	19	1	1	0	3	0	0	(24)
post-partum (3)	0	0	20	12	4	5	6	(40)
missing	1	0	1	0	0	0	0	(2)
total women (3)	(32)	(3)	(21)	(12)	(7)	(5)	(7)	(80)

Notes:
(1) double counting for 2 women
(2) double counting for 1 woman
(3) double counting due to 6 women with 2 or more diagnoses for postpartum haemorrhage

and perineum (2 cases), uterine atony (2 cases) and coagulation defects (1 case). Table 6.3 shows the distribution of diagnoses according to the period of occurrence of bleeding. A total of 7 women did not receive a diagnosis and 6 women had more than one pathology for haemorrhage mentioned. Several near-miss haemorrhage cases were moreover selected for another obstetric complication, including two for eclampsia, seven for dystocia, and six for postpartum infections.

The haemoglobin level was recorded on 50 of the 80 cases of near-miss haemorrhage. The women's mean haemoglobin level was 7.3 g/dl, ranging from 2.2 to 11.0 g/dl. A total of 22 women (27%) had a documented systolic blood pressure under 90 mm Hg.

Treatments provided were blood transfusion (43 cases), Caesarean section (34 cases), and manual exploration of the uterus (37 cases) with indication of removal of remains of placenta in 17 cases. For 26 women, other forms of treatment were used such as tear repair and hysterectomy. A total of 52 women received more than one treatment. Almost all women (89%) received an oxytocic drug at some point during or after delivery.

Half of all near-miss haemorrhage cases (51%) reached hospital during labour and a third (33%) after the delivery. With respect to their reproductive characteristics, their parity and gravidity are similar to the group of healthy women, but quite different to other women with complications. For example, a fifth (19%) were in their first pregnancy, which was significantly less than for women with other complications (34%, p=0.0104), but very close to normal women (15% p=0.3900). There is however very little difference in age between the three groups (mean age of 27.4 *versus* 26.6 for women with other complications and 28.5 for healthy women, not significant).

Information was available on the survival status of 73 new borns, including 3 pairs of twins. Among these 13 were stillborn, corresponding to a stillbirth rate of 17.8%. The mean birthweight is low at 2523 grammes with a distribution ranging from 907 grammes to 4050 grammes.

6.4 SYMPTOMS REPORTED BY WOMEN IN INTERVIEW

6.4.1 brief description of questionnaire

Questions on symptoms and treatment of haemorrhage (referred to as *abnormal bleeding* in the questionnaire) were asked in section 5 of the questionnaire (Appendix 3, questions 501 to 505 and 521 to 524). Section 5 starts with a general question on whether abnormal bleeding occurred at any time during pregnancy, delivery or after delivery, followed by a more specific "screening" question on when bleeding started. When bleeding occurred during the period of interest, women were asked further discriminating questions on duration, abundance, and loss of consciousness. Questions on treatments specifically related to bleeding (Caesarean section, blood transfusion, tear repair, manual removal of placenta, injections) were placed towards the end of section 5, and were only asked to those who had been in touch with the health services for bleeding. All women who delivered vaginally were asked the last question in section 5 on length of time prior to the delivery of the placenta. Related questions on reasons for Caesarean section (asked to all women who reported a Caesarean section) and occurrence of ruptured uterus (asked to all women) can also be found in sections 2 and 6 of the questionnaire.

6.4.2 frequency of reports of symptoms

Table 6.4 shows a frequency distribution of responses to questions on symptoms and treatment associated with haemorrhage. A total of 380 women responded to these questions. Among these, 56 (15%) had been selected into the study because they were haemorrhage cases (9 antepartum, 16 intrapartum, 28 postpartum, and 2 ante and intrapartum).

Almost a third of all interviewed women (30%) reported abnormal bleeding during pregnancy, delivery or after delivery. For a quarter (26%), the bleeding was present during the period of interest (third trimester, delivery or after delivery), in particular during (10%) or after delivery (13%) (these categories are not mutually exclusive). A little less than a fifth (16%) reported that the bleeding was of short duration (less than one day) and/or that it was very abundant (13%). A further 13% declared that they lost consciousness because of bleeding. Responses to a checklist of questions on treatment for abnormal bleeding show that Caesarean section (9%), blood transfusion (9%) and "injections" (10%) were the most frequently mentioned, followed by tear repair (2%) and uterine revision (3%). Interestingly, a smaller number of positive answers (7%) were given to a question on reasons for c-section earlier in the questionnaire. Finally, 3% of all interviewed women reported that the placenta was delivered more than one hour after the birth of their baby.

6.5 QUESTIONNAIRE PERFORMANCE

6.5.1 analysis using closed questions

Tables 6.5a to 6.5f display the sensitivity and specificity results for all cases of near-miss haemorrhage, and according to time of occurrence. If we assume that the true population

prevalence of bleeding in late pregnancy and after delivery is above 5%, criteria for specificity are less stringent than for eclampsia, and a specificity of 95% can be safely considered as satisfactory.

a) all near-miss haemorrhage cases (tables 6.5a and b):

Whilst the "screening" question on **occurrence and timing of abnormal bleeding** achieves a high sensitivity on its own (83.9%), specificity is low for the purpose of the study (84.6%-85.7%) with more than a sixth of undiagnosed women declaring that they had abnormal bleeding. It is interesting to note that 9 women among the 56 diagnosed cases did not report abnormal bleeding to the interviewer. These were mostly postpartum cases (7 cases) with serious haemorrhage morbidity or concomitant illnesses[8].

The best combination of questions complements responses to the screening question by information as to **whether bleeding was very abundant** (sensitivity 60.7% and specificity between 94.8% and 95.2%). Interestingly, the differences in specificity between the two comparison groups (all other women and healthy women) is almost negligible with only 5% of undiagnosed women declaring very heavy bleeding. However, almost 40% of near-miss cases are not identified by this combination of questions.

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[8] The diagnoses were: 1 placental abruption with abundant haemorrhage in the antepartum; 3 uterine rupture (one of which escaped the hospital to avoid payment; another also had malaria after delivery); 3 cervical lacerations (one of with uterine retraction ring, another with "*éclatement du vagin*" (bursting of vagina), the third with antepartum and postpartum eclampsia); 1 with retained placental products and puerperal infection; 1 with postpartum haemorrhage for unknown reason and eclampsia. Questionnaire analysis shows that, while they did not mention external bleeding, two uterine rupture cases spontaneously reported a rupture or internal bleeding in the verbatim. The two eclampsia cases reported convulsions.

Considering other queries related to symptoms, responses to the question on duration of bleeding indicating that **bleeding lasted more than one day** reached adequate specificity (94.4%) but very poor sensitivity (25.0%). The question on **loss of consciousness because of bleeding** yields acceptable sensitivity (58.9%) and very good specificity results (94.8-96.8%); the question on abundance only did marginally better.

Turning to questions on treatment, answers to a **checklist of questions on treatment provided** (including Caesarean section, blood transfusion, tear repair, manual removal of placenta, and injections after the delivery of the placenta) provide better sensitivity results (78.6%) than the c-section question on its own (35.7%). However, the specificity lies under 90%, even when the comparison group is healthy women. Among the 13 healthy false positive, 11 women declared to the interviewer that they had received an injection after the placenta delivery to stop the bleeding, and 4 indicated that someone repaired a tear.

With sensitivity and specificity at 74.5% and 48.6%-83.3%, the question on **thought she was going to die** did not generate improved validity results when used in combinations of questions. A quarter of near-miss haemorrhage cases did not consider their life was at risk.

b) near-miss antepartum haemorrhage (tables 6.5c and 6.5d)

Results are very good for near-miss antepartum haemorrhage with responses to the elementary question on **whether abnormal bleeding occurred during the third trimester** achieving both very high sensitivity (90.9%) and specificity (94.3% and 99.2%). Only one near-miss antepartum case did not recall abnormal bleeding.

Responses to the question on duration of bleeding which indicated that **bleeding lasted <u>more</u> than one day** (in combination with general screening question on timing) yield adequate specificity (93.0%-95.2%) but poor sensitivity (45.5%). The specificity is lower when **bleeding was very abundant** (88.3%), except when compared to healthy women (95.2%), for a sensitivity at 72.7%.

Caesarean section for reasons related to bleeding (q217) yields good specificity (94.8%-100%) for antepartum bleeding. The sensitivity reaches satisfactory levels (81.8%), which was not the case for other types of haemorrhage. On balance, however, the elementary question on bleeding during the third trimester is a better question.

c) near-miss intrapartum and postpartum haemorrhage (tables 6.5e and 6.5f)

As for all near-miss haemorrhage cases, the general screening question on **timing** yields disappointing results with sensitivity and specificity at 81.3% and 82.5%-85.7% respectively. Focusing more specifically the question on **bleeding during and after labour** decreases the sensitivity to 60.4% with a specificity only marginally improved when the comparison group is all other women (84.6% and 85.7%). In addition to the 9 cases who did not recall any bleeding, a total of 10 women diagnosed with intrapartum or postpartum haemorrhage, declared that their bleeding occurred before delivery (not during or after). The specificity findings suggest that women find it difficult to recognise the threshold when physiological bleeding during and after labour becomes abnormal.

Combining information on whether **bleeding was very abundant** with the general question on timing greatly improves the specificity (93.1%-95.2%) with a drop in sensitivity to 58.3%. These findings are similar to those for all haemorrhage cases; the similarities of results are largely

explained by the large proportion of women with intra or postpartum bleeding in the overall sample of haemorrhage cases.

Responses indicating that **bleeding lasted less than one day** offer the best balance of sensitivity (64.6%) and specificity (90.7%-90.5%). However, the specificity might be somewhat insufficient for our purpose.

The **checklist of questions on treatment provided** yields a good sensitivity (75.0%). Unfortunately, the specificity lies under 90% even when the comparison group is healthy women (specificity 87.0%-89.7%).

d) retained placenta (table not shown)

Retained placenta is detected with reasonable accuracy among women with vaginal delivery by a combination of questions on **duration between delivery of baby and placenta superior to one hour and/or manual removal of placenta conducted** with a sensitivity of 58.8% and a specificity of 98.4%. The question on duration performs less well on its own with a sensitivity at 41.2% and a specificity at 98.2%.

6.5.2 physicians' analysis of questionnaires

Table 6.6 displays sensitivity and specificity results for physicians' analysis of questionnaires, with all types of near-miss haemorrhage combined together. The last column of the table shows for comparison two of the most interesting results from the quantitative computer analysis. They are those generated by combinations of questions on abnormal bleeding and timing, and on abnormal bleeding, timing and abundance.

Overall, physicians' interpretation of questionnaires as a whole reached a better balance of sensitivity and specificity than the quantitative computer analysis. Sensitivities are good (80.4-83.9%), attaining similar levels than to those generated by the elementary question on timing of bleeding (83.9%). Although specificities are lower (91.1-92.6%) than those obtained when the information on abundance of bleeding is used (94.8%), these levels might still be tolerable given the high expected prevalence of haemorrhage in the community.

Analysis of verbatim responses produce similar results, especially with respect to physician 1, though sensitivity increases slightly at the expense of specificity.

Once again, inter-physician agreement is very good with kappa statistics reaching 0.85 when diagnoses are based on the questionnaire in its integrity, and 0.84 when using verbatim responses only (table not shown). Physician 3 gave the most "unknown" responses for haemorrhage when analysing verbatim answers, without it affecting the validity results greatly as they were handled as negative responses and concerned the larger group of women without the condition.

6.5.3 explanatory variables

Length of time since delivery and type of interviewers both appear to affect the validity of questionnaire reports of bleeding, with a significant drop in sensitivity from 70% to 42% for a recall of more than 2 years (p=0.0410), and a significant reduction of specificity from 98% to 93% (p=0.0326) for inexperienced interviewers (table 6.7). In other words, the further away the event the less cases indicated bleeding and the less experienced the interviewer, the more non-cases reported the condition.

6.6 SUMMARY

Haemorrhage of the third trimester, the delivery and the puerperium regroups several medical conditions from defects in placental implementation to uterine dysfunction or injuries and blood related-disorders. It is probably common in developing country communities (above 5%). Women selected in the sample were mostly intrapartum or postpartum cases, identified because of the type of treatment provided, usually Caesarean section. A total of 56 cases were interviewed in the community but many more women (113) reported occurrence of abnormal bleeding. A simple question on occurrence of bleeding during the third trimester seems enough to identify antepartum haemorrhage with good accuracy. For bleeding overall, or bleeding during or after delivery, there is a need to add a question on abundance of bleeding to the basic question on timing. Even then, it is probably better to focus on a short recall period to improve the sensitivity. As for eclampsia, the type of interviewers significantly improve the validity of the results this time with respect to specificity. Questions on treatment do not yield sufficient specificity to be useful, except when focusing on antepartum haemorrhage cases and comparing answers with those of healthy women. Physicians appear able to bring a nuance in the interpretation of bleeding severity that is not brought by the more traditional computer-based analysis of the closed questions for the overall diagnosis of haemorrhage.

Table 6.4: Frequencies tabulation of responses to selected questions on symptoms and treatments associated with haemorrhage (N=380)

Questions	Number of positive answers	%
Had abnormal bleeding during pregnancy, during delivery or after delivery (q501)	113	29.7
Abnormal bleeding was		
during the 1st and 2nd trimester of pregnancy (q502a)	24	6.3
during the 3rd trimester of pregnancy (q502b)	31	8.2
during delivery (q502c)	37	9.7
after delivery (q502d)	51	13.4
Abnormal bleeding lasted (q503)		
less than one day	62	16.3
more than one day	32	8.4
Abnormal bleeding was (q504)		
not abundant	24	6.3
abundant	18	4.7
very abundant	51	13.4
Lost consciousness because of abnormal bleeding (q505)	50	13.2
Was provided with the following care or treatment to stop the haemorraghe/abnormal bleeding		
a ceasarean section was done to get the child quickly out (q521a)	34	8.9
someone gave her a blood transfusion (q521b)	33	8.7
someone repaired a tear after the child came out (q521c)	7	1.8
someone put his/her hand in her womb to get the afterbirth (q521d + autq521)	12	3.2
someone gave her an injection to stop the bleeding after the placenta came out (q521e)	38	10.0
Was told that she had a c-section because of bleeding or placenta praevia (q217i + autq217)	28	7.4
Time between delivery of baby and placenta was more than one hour (q524)	10	2.6

Table 6.5a: Sensitivity and specificity of questions on symptoms of near-miss haemorrhage: 56 near-miss haemorrhage cases vs 324 all other women

Symptoms of haemorrhage	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
Abnormal bleeding any time during pregnancy, delivery or after delivery	47	9	258	66	[380]	83.9	79.6
Abnormal bleeding during 3rd trimester of pregnancy &/or delivery &/or after delivery	47	9	274	50	[380]	83.9	84.6
Yes to 2nd question & bleeding lasted more than 1 day	14	42	306	18	[380]	25.0	94.4
Yes to 2nd question & bleeding was abundant or very abundant	40	16	295	29	[380]	71.4	91.0
Yes to 2nd question & bleeding was very abundant	34	22	307	17	[380]	60.7	94.8
Yes to 2nd question & lost consciousness because of bleeding	33	23	307	17	[380]	58.9	94.8
Yes to 2nd question & treatment was provided*	44	12	289	35	[380]	78.6	89.6
C-section for bleeding *(q217)*	20	36	316	8	[380]	35.7	97.5
Thought she was going to die	41	14	157	166	[378]	74.5	48.6

Note:

* treatment provided included c-section, blood transfusion, tear repair, injection to stop bleeding after delivery of the placenta, uterine revision

Table 6.5b: Sensitivity and specificity of questions on symptoms of near-miss haemorrhage: 56 near-miss haemorrhage cases vs 126 healthy women

Symptoms of haemorrhage	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
Abnormal bleeding any time during pregnancy, delivery or after delivery	47	9	102	24	[182]	83.9	81.0
Abnormal bleeding during 3rd trimester of pregnancy &/or delivery &/or after delivery	47	9	108	18	[182]	83.9	85.7
Yes to 2nd question & bleeding lasted more than 1 day	14	42	120	6	[182]	25.0	95.2
Yes to 2nd question & bleeding was abundant or very abundant	40	16	114	12	[182]	71.4	90.5
Yes to 2nd question & bleeding was very abundant	34	22	120	6	[182]	60.7	95.2
Yes to 2nd question & lost consciousness because of bleeding	33	23	122	4	[182]	58.9	96.8
Yes to 2nd question & treatment was* provided*	44	12	113	13	[182]	78.6	89.7
C-section for bleeding *(q217)*	20	36	125	0	[181]	35.7	100.0
Thought she was going to die	41	14	105	21	[181]	74.5	83.3

Note:

* treatment provided included c-section, blood transfusion, tear repair, injection to stop bleeding after delivery of the placenta, uterine revision

Table 6.5c: Sensitivity and specificity of questions on symptoms of near-miss antepartum haemorrhage: 11 near-miss antepartum haemorrhage cases vs 369 all other women

Symptoms of antepartum haemorrhage	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
Abnormal bleeding any time during pregnancy, delivery or after delivery	10	1	266	103	[380]	90.9	72.1
Abnormal bleeding during 3rd trimester of pregnancy &/or delivery &/or after delivery	10	1	282	87	[380]	90.9	74.2
Abnormal bleeding during 3rd trimester	10	1	348	21	[380]	90.9	94.3
Yes to 2nd question & bleeding lasted more than 1 day	5	6	343	26	[380]	45.5	93.0
Yes to 2nd question & bleeding was abundant or very abundant	9	2	309	60	[380]	81.8	83.7
Yes to 2nd question & bleeding was very abundant	8	3	326	43	[380]	72.7	88.3
Yes to 2nd question & lost consciousness because of bleeding	5	6	324	45	[380]	45.5	87.8
C-section for bleeding *(q217)*	9	2	350	19	[380]	81.8	94.8
Thought she was going to die	8	3	168	199	[378]	72.7	45.8

Table 6.5d: Sensitivity and specificity of questions on symptoms of near-miss antepartum haemorrhage: 11 near-miss antepartum haemorrhage cases vs 126 healthy women

Symptoms of antepartum haemorrhage	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
Abnormal bleeding any time during pregnancy, delivery or after delivery	10	1	102	24	[137]	90.9	81.0
Abnormal bleeding during 3rd trimester of pregnancy &/or delivery &/or after delivery	10	1	108	18	[137]	90.9	85.7
Abnormal bleeding during 3rd trimester	10	1	125	1	[137]	90.9	99.2
Yes to 2nd question & bleeding lasted more than 1 day	5	6	120	6	[137]	45.5	95.2
Yes to 2nd question & bleeding was abundant or very abundant	9	2	114	12	[137]	81.8	90.5
Yes to 2nd question & bleeding was very abundant	8	3	120	6	[137]	72.7	95.2
Yes to 2nd question & lost consciousness because of bleeding	5	6	122	4	[137]	45.5	96.8
C-section for bleeding *(q217)*	9	2	125	0	[136]	81.8	100.0
Thought she was going to die	8	3	105	21	[137]	72.7	83.3

Table 6.5e: Sensitivity and specificity of questions on symptoms of near-miss intrapartum or postpartum haemorrhage: 48 cases of near-miss intrapartum or postpartum haemorrhage vs 332 all other women

Signs and symptoms of intra- or postpartum haemorrhage	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
Abnormal bleeding any time during pregnancy, delivery or after delivery	39	9	258	74	[380]	81.3	77.7
Abnormal bleeding during 3rd trimester of pregnancy &/or delivery &/or after delivery	39	9	274	58	[380]	81.3	82.5
Abnormal bleeding during delivery &/or after delivery	29	19	281	51	[380]	60.4	84.6
Yes to 2nd question & bleeding lasted less than 1 day	31	17	301	31	[380]	64.6	90.7
Yes to 2nd question & bleeding was abundant or very abundant	32	16	295	37	[380]	66.7	88.9
Yes to 2nd question & bleeding was very abundant	28	20	309	23	[380]	58.3	93.1
Yes to 2nd question & lost consciousness because of bleeding	28	20	310	22	[380]	58.3	93.4
Yes to 2nd question & treatment was provided*	36	12	289	43	[380]	75	87.0
Thought she was going to die	34	14	158	173	[378]	72.3	47.7

Note:

* treatment provided included c-section, blood transfusion, tear repair, injection to stop bleeding after delivery of the placenta, uterine revision

Table 6.5f: Sensitivity and specificity of questions on symptoms of near-miss intrapartum or postpartum haemorrhage: 48 cases of near-miss intrapartum or postpartum haemorrhage vs 126 healthy women

Symptoms of intra- or postpartum haemorrhage	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
Abnormal bleeding any time during pregnancy, delivery or after delivery	39	9	102	24	[174]	81.3	81.0
Abnormal bleeding during 3rd trimester of pregnancy &/or delivery &/or after delivery	39	9	108	18	[174]	81.3	85.7
Abnormal bleeding during delivery &/or after delivery	29	19	108	18	[174]	60.4	85.7
Yes to 2nd question & bleeding lasted less than 1 day	31	17	114	12	[174]	64.6	90.5
Yes to 2nd question & bleeding was abundant or very abundant	32	16	114	12	[174]	66.7	90.5
Yes to 2nd question & bleeding was very abundant	28	20	120	6	[174]	58.3	95.2
Yes to 2nd question & lost consciousness because of bleeding	28	20	122	4	[174]	58.3	96.8
Yes to 2nd question & treatment was provided*	36	12	113	13	[174]	75.0	89.7
Thought she was going to die	34	14	105	21	[173]	72.3	83.3

Note:

* treatment provided included c-section, blood transfusion, tear repair, injection to stop bleeding after delivery of the placenta, uterine revision

Table 6.6 Sensitivity and specificity of physicians' qualitative assessment of near-miss haemorrhage: 56 near-miss haemorrhage cases vs 324 all other women

	Physician 1		Physician 2		Physician 3*		Computer-based analysis (most significant results)	
Haemorrhage cases vs all other women	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity
using verbatim#	85.7	91.3	85.7	87.0	87.5	90.0	83.9 60.7	84.6** 94.8~
using verbatim and closed questions	83.9	91.1	82.1	92.3	80.4	92.6	83.9 60.7	84.6** 94.8~

Note:

* based on 380 women only (1 missing value)

** based on report of abnormal bleeding during third trimester of pregnancy, delivery and after delivery

~ based on report of very abundant abnormal bleeding during third trimester of pregnancy, delivery and after delivery

excluding 2 women without verbatim

Table 6.7: Sensitivity and specificity of women's reports of abnormal and very abundant bleeding during pregnancy, delivery or after delivery, according to interview or respondent's characteristics: near-miss haemorrhage cases vs all other women

	Cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
recall length							
<2 years	26	11	155	9	[201]	70.3	94.5
>2 years	8	11	152	8	[179]	42.1 p=0.0410	95.0 p=0.8439
type of interviewer							
experienced	16	12	135	3	[166]	57.1	97.8
not experienced	18	10	172	14	[124]	64.3 p=0.5842	92.5 p=0.0326
school attendance							
yes	20	10	217	9	[256]	66.7	96.0
no	14	12	90	8	[214]	53.8 p=0.3272	91.8 p=0.1211
first pregnancy							
yes	4	4	68	1	[77]	50.0	98.6
no	30	18	239	16	[303]	62.5 p=0.6983	93.7 p=0.1360
age							
<25	6	7	60	4	[77]	46.1	93.7
>=25	28	15	247	13	[303]	65.1 p=0.2199	95.0 p=0.7537
work for cash							
yes	20	8	199	11	[238]	71.4	94.8
no	14	14	108	6	[142]	50.0 p=0.1007	94.7 p=0.9923

p-value were calculated using uncorrected chi-square, or Fisher exact test (2 tailed p-values) when an expected cell value was less than 5

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CHAPTER 7. DYSTOCIA

7.1. DEFINITION AND EPIDEMIOLOGY

Dystocia is the medical term for abnormal labour. This section will commence with a definition of normal labour, before describing dystocia and its epidemiology.

7.1.1. what is labour?

a) medical definition

In obstetrics, the term **"labour"** is used to describe the physiological process through which women deliver babies. In their chapter on the monitoring of labour, Crowther and colleagues (1989) defined labour as a process characterised by "the presence of regular uterine contractions, leading to progressive effacement and dilatation of the cervix, and ultimately to the delivery of the baby".

Labour is divided into three main stages. The first stage begins with the onset of regular painful contractions to terminate with the full dilatation of the cervix. The second stage is from full dilatation to expulsion of a baby. The third stage starts immediately after the birth of the baby and until the placenta comes out (Symonds, 1987). In addition, the first stage encompasses the latent phase (slow period of cervical dilatation from the onset of contractions to 3 cm dilatation) and the active phase (faster period of cervical dilatation from 3 cm to full dilatation). Dystocia mostly refers to events which take place during the first stage or second stage of labour.

b) women's diagnosis of labour

Pregnant women normally diagnose the onset of labour based on the presence of pain, the regularity of contractions, and sometimes the breaking of water or show of mucus or blood. Almost all women experience intense pain during labour but reactions to pains vary from culture to culture (Harrison, 1991; Sargent, 1984; Senden et al, 1988). A study conducted in Ireland showed that women's self diagnosis of the onset of labour was to a large extent accurate, with medical staff diagnosing false labour in only 10% of women who admitted themselves to the hospital; half of these were in active labour within 24 hours (O'Driscoll et al, 1973).

c) duration of labour

Crowther and colleagues (1989) indicate that normal labour usually finishes within 24 hours from the onset of contractions or 12 hours from the beginning of the active phase. Duration of labour is influenced by the conditions in which the delivery takes place (in particular professional support and clinical management) and by individual risk factors (such as gravidity) or factors related to the woman's health status. In an English population, 95% of women with vaginal deliveries completed the active phase within 10 hours and 90% completed the second stage within two hours (MacArthur et al, 1991). Recorded averages for the active phase of labour (using time at admission as a starting point) ranged from six to 11 hours among primigravidae and three to six hours among multigravidae in six hospital-based studies (Crowther et al, 1989). A randomised control trial of active management of labour among nulliparous women found that the average duration of first stage was 5.05 hours among the intervention group and 6.72 hours among the control group using traditional management. The average length of second stage was similar between the two groups at 1.4 hours (Lopez-Zeno et al, 1992).

d) parameters and tools for describing labour

Monitoring the progress of labour allows health professionals to determine whether labour is going according to plan or is 'on schedule'. It is even more important as dystocia proves difficult to predict antenatally (Hofmeyr, 1989). Compilations of statistics since the 1950s have enabled obstetricians to determine outliers (ie, to define the upper limits of normality) from statistical ranges on duration and velocity of labour[1]. Progress of labour can be described using several types of parameter; among these, total length of labour, time since onset, rate of cervical dilatation (expressed in centimetres (cm) per hour), and descent of the presenting part.

Information on **total length of labour** has limited clinical value for evaluating the normality of ongoing labour, as it can only be calculated once the baby has been delivered. Its primary use is in the retrospective assessment of dystocia. Assessments of **time since onset** and **progression in cervix dilatation** are, on the other hand, key components of clinical management. However, even where the delivery is institutionalised, the time of onset is often not known with accuracy. The time at admission is used in practice as an approximation for time of onset. But time of admission is very variable. Several studies have shown for example that multigravida come at a later stage in labour than primigravida (Crowther et al, 1989). Although diagnosis of labour is very often confirmed at admission, it is sometimes not the case. The most accurate clinical measure is therefore the rate of dilatation of the cervix. At least two clinical assessments of the cervix, assessed by vaginal examinations, are required to determine whether dilatation is occurring. A rate of one cm/hour in the active phase of labour is usually taken as the cut-off-point between normal and abnormal labour.

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[1] See in particular the pioneering work of Friedman (1955) on the pattern of progressive cervical dilatation in normal labour.

Detailed recording of information on labour is necessary to recognise problems early, and because several persons are sometimes involved in assisting a delivery. There are two approaches to recording information on progress of labour: a time-based diary of events or the partograph. Although the **diary method** allows the recording of detailed written information, these can be difficult to analyse and assimilate quickly. WHO therefore recommends the use of the **partograph** for monitoring progress, identifying women for whom labour is abnormally slow, and recording clinical observations on the woman and the fetus (WHO, 1988). The partograph is a single sheet of paper. Its central part is a graph where the rate of cervical dilatation is plotted, first at the time of admission and every four hours thereafter, together with information on the descent of the presenting part[2]. Alert lines and action lines (already plotted) are reached when cervix dilatation is less than 1 cm per hour and when the delay in progress lasts for more than four hours respectively. Progress is also deemed abnormal when a woman is admitted in labour in the latent phase (less than 3 cm) and remains in the latent phase for the next eight hours. WHO recommends referring women from peripheral units to hospitals when alert lines are crossed, and to maintain women under conservative management in referral hospitals until action lines are reached.

1.2 what is dystocia?

Dystocia is the term used to designate difficult or abnormal labour, defined more precisely as protraction and arrest disorders of labour (Herrera and Pernoll, 1994; Peaceman and Socol, 1996). The terms prolonged and obstructed labour are often used in the international literature. WHO defines **prolonged labour** as active labour lasting more than 12 hours in spite of good uterine contractions and good cervix dilatation. Other authors suggest 24 hours or make

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[2] There is also space to record observations on fetal and maternal conditions: fetal heart, liquor, maternal temperature, pulse and blood pressure, urinalysis.

differences between primigravida, who usually have longer active labour, and multigravida; for example, Symonds (1987) suggests 24 hours for primigravida and 16 hours for multigravida. **In obstructed labour,** progress is impaired by a mechanical barrier in the birth canal (WHO, 1994). Operational definitions include failure of progressive dilatation and/or failure of descent of the presenting part in spite of good uterine contractions (Abudu and Awonuga, 1989).

Dystocia is often attributed to insufficient uterine contractions, cephalopelvic disproportion, malposition and malpresentation; interestingly there are no standardised definitions for these syndromes (Peaceman and Socol, 1996). Herrera and Pernoll (1994) proposed three categories of reasons for abnormal labour. They are abnormalities of the passage (such as a contracted pelvis, masses in the reproductive tracts, and abnormal placental presentation), abnormalities of the passenger (for example, a large baby, a malpresentation such as a brow presentation, shoulder presentation or transverse lie, a fetal malformation or a multiple pregnancy), and abnormalities of the power (ie the uterus does not contract well (too much, too little, or not regularly enough)). Different types of abnormalities are often present together; for example, a malpresentation in a woman with a contracted pelvis. Although a lot of effort has been spent in trying to predict antenatally cephalopelvic disproportion, using, for example, foot measurement or x-ray pelvimetry, these have proved unsuccessful (Hofmeyr, 1989). Diagnoses of abnormalities of passage or of power are made if labour fails to progress in cases of vertex presentation of normal sized babies.

What happens when a woman stays too long in obstructed labour? The baby may be stuck in an awkward position and dies; after a few days, it may be delivered softened by maceration and decay. Prolonged pressure of the fetal presenting part on maternal soft tissues can lead to pressure necrosis and formation of a vesico-vaginal or rectum-vaginal fistulae. The woman

may also develop infections or bleeding. The contractions may fail to stop and the uterus eventually ruptures (Driessen, 1991).

7.1.3 incidence

Dystocia lacks generally applicable research definitions and this affects the calculation of incidence and the comparison of data. Herrera and Pernoll (1994) suggest that "failure to progress in labour" (a generic term which covers both abnormalities of passage and power) and malpresentation could be taken as tracer conditions. Table 7.1 presents information on the incidences of these two conditions as well as on the proportion of women reaching action line on partograph, women with prolonged first stage of labour and macrosomia.

Although loosely defined, the "failure to progress" indicator is probably the most suitable for developed country situations where interventions often take place before active phase of labour reaches predefined upper limits of normality (usually 12 hours). Table 7. 1 shows that the incidence of "failure to progress" ranges from **7%-10%** in four studies of low risk women booked for delivery in health centres in Western countries.

Useful information can also be obtained from partograph studies in developing countries. The WHO collaborative study on the usefulness of the partograph showed that about 20% of women reached the alert line and around **10-11%** the action line (WHO, 1994; WHO, 1996; Philpott and Castle, 1972). In Senegal, a lower proportion of women (**3%**) crossed the action line, even though the time lag between the alert and action lines was reduced to three hours[3] (Dujardin

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[3] The lower proportion of women crossing the action lines could be explained by differences in management for women who have crossed the alert line, The authors wrote: "We believe that the partogram has not been sufficiently evaluated, and opinions differ about the usefulness of the alert line and what to do if it is crossed. In Pikine, for example, when the alert line is crossed, labour

Table 7.1 Incidences of various indicators for dystocia in selected population studies

Author, year and place	Case definition	Incidence (%)	Confidence intervals*
Failure to progress in labour			
Davies et al (1996) - UK- Observational study of planned home births	Transfers for slow progress during first or second stage of labour	7.3 13/177	[4.0 - 12.2]
Rooks et al (1989) - USA - low risk women delivering in birth centers	Failure to progress in labour	10.5 (1236/11,814)	[9.9 - 11.0]
Stern et al (1992) - Australia - medical records of low risk women delivering in birth centers 1980-1989	Failure to progress in labour	8.4 (377/4476)	[7.6 - 9.3]
Waldenström et al (1997) - Sweden - Low risk women in a birth centre trial	Failure to progress in labour (including 24h of ruptured membranes without regular contractions)	9.9 (88/890)	[8.0 - 12.0]
Action line on partograph crossed			
Dujardin et al (1992) - Senegal - observational study in 4 maternity clinics	Action line crossed in all pregnant women arriving before expulsion stage	3.4 (35/1022)	[2.4 - 4.8]
Philpott and Castle (1972) - Zimbabwe - before-after study testing partograph tool in hospital	Action line crossed in primigravidae (excluding women with APH, eclampsia, multiple pregnancies and malpresentation)	10.9 68/624	[8.6 - 13.6]
WHO (1994) - Indonesia, Thailand and Malaysia - Before-after study testing partograph tool in hospital	Action line crossed in all eligible women	9.9 (NA/8689)	Insufficient information
Prolonged duration of first stage of labour			
Wiegers et al (1996) - Netherlands- Low risk women in a home vs hospital delivery prospective study	Duration of first stage > 10 hours among primiparous women	23.8 (200/840)	[21.0 - 26.8]
	Duration of first stage > 10 hours among multiparous women	4.6 (46/976)	[3.5 -6.2]

Author, year and place	Case definition	Incidence (%)	Confidence intervals*
MacArthur et al (1991). UK - review of cases notes for women participating in long term morbidity surveys	Duration of active phase > 10 hours for all women with vaginal deliveries	5.4 (511/9512)	[4.9 -5.8]
University of the West Indies (1989) - Jamaica - information collected during a population survey of perinatal mortality and morbidity (review of cases records and interview)	Duration of first stage > 12 hours	6.7 (NA/6889)	Insufficient information
Non-cephalic presentation			
MacArthur et al (1991). UK - review of cases notes for women participating in long term morbidity surveys	Breech presentations, lateral presentation and other atypical presentations (outside occipito-posterior)	7.8 (NA/11701)	Insufficient information
Stern et al (1992) - Australia - medical records of low risk women delivering in birth centers 1980-1989	Breech presentation and unstable lie necessitating antenatal exclusions, malpresentation necessitating intrapartum transfer	2.0 (108/5365)	[1.7 - 2.4]
University of the West Indies (1989) - Jamaica - information collected during a population survey of perinatal mortality and morbidity (review of cases records and interview)	Breech, face, brow and transverse presentation	2.6 (NA)	Insufficient information
Wiegers et al (1996) - Netherlands- Low risk women in a home vs hospital delivery prospective study	Non-cephalic presentation at birth among primiparous women	4.0 (34/840)	[2.8 - 5.6]
	Non-cephalic presentation at birth among multiparous women	1.9 (19/996)	[1.2 - 3.0]
Macrosomia			
Abudu and Awonuga (1989) - Nigeria - hospital based study	Non-malformed singleton baby delivered at term with a weight >= 4.1 kg	4.9 (312/6376)	[4.4 - 5.5]

Author, year and place	Case definition	Incidence (%)	Confidence intervals*
Gonen et al (1996) - Israel - hospital-based study	Infants with weight >= 4500 g	0.5 (23/4480)	[0.3 - 0.8]
Langer et al (1991) - USA - hospital-based study	Infants with weight >= 4000 g	7.9 (6002/75979)	[7.7 - 8.1]
Megafu and Ozumba (1988) - Nigeria - hospital based study	Baby weighting >= 4.5 kg	1.1 (145/12978)	[0.9.-1.3]

Note:
* exact binomial 95% confidence intervals
NA data not available

et al, 1992). The WHO trial of the partograph in South East Asia shows a reduction of prolonged labour (defined as labour longer than 18 hours) from **6% to 3%** after the introduction of the partograph (WHO, 1994). An earlier study among primigravidae in Zimbabwe[4] had shown that the incidence of prolonged labour was **13.0%** prior to the introduction of the partograph and 0.6% after introduction (Philpott and Castle, 1972).

Available information on prolonged first stage of labour (using various types of duration cut-off-points) shows an overall incidence of **5 to 7%** masking large differences between primiparous and multiparous women. Primiparous women appear five times more likely to experience a first stage of labour longer than 10 hours in a prospective study of home and hospital deliveries in the Netherlands (Wiegers et al, 1996). In Birmingham, they were three times as likely to have a first stage of 6 hours or more and four times as likely to experience a second stage of one hour or more (MacArthur et al, 1991). These differences could be partly explained by earlier arrivals of nulliparous women in hospitals when the length of labour is measured according to time of admission (Crowther et al, 1989)

The overall incidence for malpresentation, one of the causes for dystocia, is fairly low ranging from 2%-8%. The most common malpresentations are breech delivery (the baby's bottom, foot or feet present first instead of the head) and occipito-posterio position (a malpresentation of the baby's head). For example, in their review of medical records; MacArthur and colleagues (1991) found that 4% deliveries were complicated by breech presentations, 4% by occipito-posterio presentations, and 2% by lateral presentations. Other abnormal presentations were 1.5%. Breech presentation carries very little risk for the mother under normal vaginal delivery

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is closely monitored and if necessary specific action may be taken by the health professionals before reaching the action line." (Dujardin et al, 1992)

[4] Then Rhodesia.

circumstances, but risks can still be high for the neonate. A study in Spain, for example, shows a fourfold increase in perinatal mortality in breech deliveries (48 vs 12/1000 (Acien, 1995). Persistant brow presentation and transverse lie both lead to obstructed labour as the baby cannot be delivered vaginally unless it is very small or malformed. Risk factors for brow presentation and transverse lie include prematurity, multiparity, fetal and pelvic abnormalities.

Prevalence of macrosomia, which is associated with prolonged and obstructed labour (Turner et al, 1990), is between 0.5%-8% depending on the definition.

According to WHO (1994) prolonged and obstructed labour is responsible for 8% of direct obstetric deaths. In the UK, dystocia, or rather one if its consequences (uterine rupture), no longer appears as a category directly responsible for maternal deaths in the report on confidential enquiries into maternal deaths (Department of Health, 1998). A study of maternal mortality due to obstructed labour in a hospital in Zambia found 36 obstructed labour deaths out of 95 (38%). The primary cause of obstruction was cephalopelvic disproportion (89%). The proportion of uterine rupture among the deceased women was 81%; another 72% also suffered from sepsis and 58% were in shock (Nkata, 1997). In a hospital-based study in Nigeria, the most important complications following obstructed labour were puerperal sepsis (57%), postpartum haemorrhage (15%), uterine rupture (14%) and genital tract laceration (14%). Maternal case-fatality was 3% and perinatal mortality rate was 294/1000 (Ozumba and Uchegbu, 1991).

Uterine rupture has a low occurence, even in developing country hospitals (between 1 in 500 and 1 in 38 deliveries) (table 7.2). The maternal and perinatal case fatalities are however considerable with 2-21% of mothers and 32-73% of babies losing their life. Interestingly, in an Ethiopian rural hospital, where the frequency of occurrence of uterine rupture was very high

Table 7.2 Uterine rupture occurrence in developing countries hospitals

Source	occurrence	maternal case fatality	perinatal mortality rate
developing countries			
Chamiso (1995) - Ethiopia causes:shoulder + brow and face	2.6% (57/2185)	15.8%	NA
Elkady et al (1993) - Egypt	0.3%(126/46207)	21.4%	73.2%
El-Mansouri (1995) - Morocco	0.5% (220/10060)	NA	58%
Iloki et al (1994) - Congo	0.7% (60/8138)	6.7%	67.8%
Konje et al (1990) - Nigeria	0.6% (227/37313)	7.5%	62.0%
Rachdi et al (1994) Tunisia	0.2%	3.1%	46.9%
Vedat et al (1993) - Turkey	0.1%	2% (approx)	32.2%
Zanconato et al (1994) Mozambique	0.2%	7.3%	62.9%
Zine et al (1995) - Tunisia	1.5% (106/NA)	2.8%	37.7%
Developed country example			
Gardeil et al (1994) - Ireland	0.02% (15/65448)	0	20%

(2.6%), the main medical causes were shoulder presentation (63%), and brow and face presentations (30%) (Chamiso, 1995).

7.2 DESCRIPTION OF ALGORITHMS

The algorithm for dystocia prepared with Beninese physicians is shown in Appendix 1. The "entry" criterion is that women must be in the active phase of labour. This was understood in practice as cervical dilatation of two fingers or 3 cm by the physicians extracting the medical records. The previous section has shown the difficulties in differentiating normal and abnormal labour, and the key role that the partograph could play in facilitating this task. Unfortunately, partographs were not often used in the participating hospitals and progress of labour was recorded using time-based diaries of events with detailed documentation of maternal and fetal assessments. The inspection of such records is tedious and could explain the long length of time spent extracting medical information (typically 1-2 hour per record).

There are 5 case-definitions for a near-miss dystocia. A woman was a near-miss dystocia when:

- a diagnosis of uterine rupture, uterine retraction ring, transverse lie or brow presentation was made
- No such diagnoses were made, but recorded information indicated that there was no descent of presenting part and there was evidence of a contracted pelvis[5].
- The presenting part did not descend, the pelvis appeared normal, the uterine contractions were good and there was no mention of cord "too short"[6]. This

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[5] The criteria for contracted pelvis are presented in figure D Appendix 1.

[6] "Cord too short" was a concept introduced in the algorithms by the Beninese physicians who recognised it as a significant problem in Benin.

combination of signs was taken as suspected macrosomia which alone would explain the dystocia.

There are three case-definitions for a non near-miss case of dystocia. A woman was a non near-miss dystocia when:

- the presenting part was engaged and cervical dilatation stopped for more than two hours
- the presenting part did not descend, there was no sign of a contracted pelvis, and uterine contractions were weak (suspected uterine atony)
- The presenting part did not descend, there was no sign of a contracted pelvis, the uterine contractions were good and the cord was "too short".

Compared to the other three algorithms, the algorithm for dystocia is probably the most complex and ambiguous. Two concerns arise. The case-mix for non near-miss dystocia may have been misrepresented because women with a prolonged latent phase (below 3 cm cervical dilatation) who did not progress in the active phase because of a c-section were excluded. The doctors who extracted the medical records reported this as a common occurrence. Nevertheless, the consequences of prolonged latent phases for mothers and babies are poorly documented, and it is not clear how serious these are (Crowther et al, 1989). More important, we may have misclassified some cases of dystocia by including women with suspected cephalo-pelvic disproportion (ie no descent of presenting part, no evidence of contracted pelvis, good uterine contractions and no evidence of cord too short) as, given time, these women may have delivered a baby after a trial of labour. This is also true of women included in the near-miss category because their pelvis was described as "borderline" in medical records[7] (figure D, Appendix 1).

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[7] Presumably, after a trial of labour.

7.3 SIGNS AND CHARACTERISTICS OF THOSE SELECTED IN HOSPITALS

A total of 237 women fulfilled the dystocia criteria and were included in the hospital sample (table 7.3). Among them, 188 women were selected as near-miss cases and 49 women as non near-miss cases. Half of the near-miss cases (94 women) had a clear diagnosis of ruptured uterus, uterine retraction ring and transverse lie or brow presentation. The remaining 94 near-miss cases were included because of cephalo-pelvic disproportion (81 contracted pelvis and 13 suspected macrosomia). The majority of non near-miss dystocia were women with weak uterine contractions (45 women), followed by 2 cases of suspected cervical dystocia and 2 cases of "cord too short".

Out of the 81 women with contracted pelvis, 23 were selected because the diagnosis of "borderline pelvis" (12 women), or "generally contracted pelvis" (9 women) or other expressions with a similar meaning (two women) were written on their medical records, without other specifications. The remaining 58 women had at least one sign of poor clinical pelvimetry[8].

Forty-nine women with dystocia were also selected for another diagnosis. Among the near-miss cases, one was also a near-miss eclampsia, 7 were haemorrhage cases, 2 were near-miss infections, and 29 were non near-miss infections. Among the non near-miss cases, 12 women were selected as non near-miss infections.

Most of the women selected for dystocia were admitted to hospital during the active phase of labour (94%), another 5% arrived in the latent phase and 1% before labour (table not shown).

Dystocia cases admitted during labour delivered on average 7 hours and 21 minutes after

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[8] Two signs should have been documented according to figure D, Appendix 1, but this was not always the case in practice.

Table 7.3: **Case definition entry criteria for dystocia cases in the hospital sample (N=237)**

Case definition entry criteria	Number of women with criteria
near-miss dystocia	
ruptured uterus	18
uterine retraction ring	57
transverse lie or brow presentation (*)	19
no descent of presenting part with signs of contracted pelvis	81
no descent of presenting part, without signs of contracted pelvis, with good uterine contractions and without "cord too short" (1)	13
non near-miss dystocia	
good descent of presenting part with cervical dilatation stopping over a period of 2 hours (2)	2
no descent of presenting part, without signs of contracted pelvis and with weak uterine contractions (3)	45
no descent of presenting part, without signs of contracted pelvis, with good uterine contractions and with "cord too short"	2

Note:
(*) There are an additional 3 women with transverse lie or brow presentation. They were selected for ruptured uterus (1 woman) and for uterine retraction ring (2 women)
(1) suspected macrosomia
(2) suspected cervical dystocia
(3) suspected uterine atony

admission (range 0 to 52 hours 23 minutes, standard deviation 9 hours 30 minutes)[9]. Caesarean section was employed in 97% of the sample dystocias. Forceps were used unsuccessfully in two cases who ultimately gave birth by Caesarean section. Among the 6 women with vaginal delivery, none had instrumental delivery, two had an episiotomy, and 5 received drugs (antispamodic and/or uterotonic). There was no destructive operation (craniotomy).

Dystocia cases were of similar age (26.9 vs 26.5, not significant, p=0.5532) to women with other morbidity, with a slightly reduced gravidity (3.0 vs 3.1, not significant, p=0.6119), parity (1.7 vs 2.1, p=0.0445) and number of surviving children (1.3 vs 1.6, not significant, p=0.1340) (table not shown). A larger proportion had also undergone a Caesarean section in a previous pregnancy (12.4% vs 5.3%, p=0.0273). There is a significant difference between near-miss dystocia cases and non near-miss dystocia cases with respect to age (average age 26.4 vs 28.6, p=0.0209), near-miss cases being on average younger; they had furthermore a smaller number of pregnancies (2.9 vs 3.5, p=0.0978), children born alive (1.6 vs 2.1, p=0.0728) and surviving (1.2 vs 1.7, p=0.0902) although these differences were not significant (table not shown). A quarter of dystocia cases (26%) gave birth to an infant weighting 3500 grammes or more, which is significantly different to the group of healthy women (11%, p=0.0001) and women with other morbidity diagnosis (6%, p<0.0001). The stillbirth rate was high (8%) but lower than for women with other morbidity (15%, p<0.05). Most of the stillbirths were fresh stillbirths (90%), a higher proportion than for stillbirths of women with other morbidity (61% fresh stillbirths).

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[9] 38% delivered their baby 12 hours after admission and 8% delivered after 24 hours.

7.4 SYMPTOMS REPORTED BY WOMEN INTERVIEW

7.4.1 brief description of questionnaire

Our primary questions for eliciting information on dystocia focussed on duration of regular contractions[10] (questions 601 to 607, appendix 3) measured in hours (longer than 12 hours or 24 hours) or according to the day of the week and the time of the week that the labour had started and finished. Two questions tried to elicit information on uterine retraction ring and ruptured uterus by asking whether the contractions suddenly stopped and whether the uterus got torn. Women who reported a Caesarean section before the start of contractions were not asked questions 601 to 624. At the end of section 6, a checklist of questions (q625) on interventions was asked to women who said that something had been done to help them deliver their baby. This checklist included questions on injections, instrumental delivery, Caesarean section, episiotomy and craniotomy. Lastly, women were asked about the position of the baby prior to delivery, the part that came out first for vaginal delivery and the weight of the baby (three questions). Other related questions on reasons for Caesarean section were also asked to all women in section 2 of the questionnaire.

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7.4.2 frequency of reports of symptoms

Altogether, 380 women started and 379 women completed section 6 of the questionnaire. Responses to questions 601-609 are available for a woman who stopped the interview when asked whether her uterus got torn because of contractions. Thirty-two women declared that they were delivered by Caesarean section before the labour started and began section 6 at

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[10] We originally used the wording of "painful and regular contractions" in the questionnaire, but excluded the word "painful" after the pilot study, as several women in Ouidah told us that they did not feel undue pain during labour

question 625. Among the 380 women who answered questions on dystocia, 125 were included in the sample as near-miss dystocia and 35 non near-miss cases.

The commonest symptom reported by women was regular contractions persisting more than 12 hours[11] (46%) or delivery after the day contractions started[12] (52%). A quarter (25%) of the women indicated that contractions lasted more than 24 hours. Slightly less than half (45%) said that contractions lasted less than 12 hours. A small proportion (7%) reported that labour stopped after a period of prolonged and painful contractions and another 2% declared that their uterus was torn as a result of contractions. The question as to whether the baby was lying in a wrong position just before birth was answered positively by slightly less than a fifth of women (14%). Finally, a similar proportion (14%) reported that the baby was very big, and just over a half (52%) that it was big or very big (data not shown).

With respect to treatment, the most frequent positive responses were given to the questions on injections or perfusion to speed up labour (71%) and on Caesarean section performed because the baby could not come out by itself (47%). Altogether, 52% reportec that they had a Caesarean section (data not shown).

7.5 QUESTIONNAIRE PERFORMANCE

7.5.1 analysis using closed questions

Tables 7.5a-d provide sensitivity and specificity results for all dystocia cases (tables 7.5a and b) and near-miss dystocia (tables 7.5c and d). Because the documented prevalence of the

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[11] combination of responses to questions 601 and 602.

[12] combination of responses to questions 603-607

condition is relatively high (around 10%), 90% might be sufficient as minimum acceptable level for specificity for all dystocia cases, but must remain at 95% for near-miss cases and increase to 99% for ruptured uterus.

a) all dystocia cases (tables 7.5a and b)

The overall performance of questions on symptoms of dystocia is poor, except when information on treatment is analysed. Responses to duration questions showed the expected pattern: the longer the duration, the lower the sensitivity of the question and the higher the specificity. For example, the standard question on duration of **regular contractions greater than 24 hours** detected only 45.9% of true dystocia cases with a specificity of 90.5%-92.9% (tables 7.5a&b); **regular contractions greater than 12 hours**, on the other hand, yields an improved sensitivity (72.3%) at the expense of specificity (73.8%-79.4%). However, for no duration did we obtain a satisfactory combination of sensitivity and specificity.

Other questions on symptoms of dystocia such as **"baby lying in bad position just before birth"** or **"baby was very big"** both achieved reasonable specificity (92.3%-96.0%) but very low sensitivity (20.9%-22.2%). This was to be expected as they reflect conditions present in only a small proportion of dystocia cases.

In contrast, very high sensitivity and specificity were obtained with questions on reasons for Caesarean section. The best responses were provided to question 217 with **"was not told that the Caesarean section was related to bleeding or fit"** reaching a sensitivity 93.8% and a specificity 95.5%-100% depending on the comparison group.

Thought she was going to die achieves poorly both for sensitivity (69.6%) and specificity (54.5%-83.3%), indicating that 30% of all dystocia cases did not report that their life was at risk.

b) near-miss dystocia (table 7.5c and d)

Overall, severity of the condition does not appear to improve the performance of the questionnaire with a widespread decrease in sensitivity and specificity when comparing results for near-miss dystocia with those for all cases of dystocia. Even **thought she was going to die** did not show improved sensitivity. The main reason for the decrease in specificity is of course related to the inclusion of non near-miss cases for dystocia in the comparison group. The best duration question remains **regular contractions greater than 24 hours** with a sensitivity of 40.0% and a specificity of 82.7%-92.9%. The most accurate treatment question was a question on **reasons for Caesarean section** (baby too big, lying in bad position, small pelvis, uterus ruptured or threatening to rupture) with a sensitivity at 72.0% and a specificity at 89.8%-100%.

c) ruptured uterus (tables 7.5e and f)

The specificity is insufficiently high for all questions except for a single question on **"uterus got torn because of contractions"** (specificity of 99.2%). There were only three false negatives, one of these a healthy woman who underwent tubal ligation immediately after birth, the other two were a cervical laceration and a uterine retraction ring. The sensitivity was, however, low at 41.7%: among the 12 ruptured uterus cases included in the sample, seven responded negatively to the question on torn uterus. Highest sensitivities were achieved by **regular contractions longer than 12 hours** and a combination of questions on **stillbirth and ruptured uterus** which identified eight women out of the 12 cases, and by **thought she was going to die** (100% sensitivity). Combining questions on **thought she was going to die and uterus**

torn because of contractions increased specificity (96.6-99.2%) but lowered sensitivity to an inadequate level (36.4%).

A similar phenomenon can be described for transverse lie and brow presentation with most questions performing poorly except for a direct question on the condition (table not shown). The question on **baby was lying in bad position just before birth** yields fairly good sensitivity (71%), with 12 out of the 17 true cases responding positively to this question, and a specificity of 89%-96% depending on the comparison group.

7.5.2 physicians' analysis of questionnaires

Physicians' interpretations of the whole questionnaire provide better results than the computer-based analysis of symptom questions on dystocia. These good results are likely to be explained by the fact that physicians used the question on caesarean section in their interpretation. Specificities appear however slightly lower than those generated by the analysis of a single question on reason for Caesarean section (specificity 87.3%-90.5%) (table 7.6). Physicians' interpretation is less accurate when the open question is read on its own (sensitivity 83.4%-95.6% and specificity 81.4%-89.6%). Once more, inter-physicians agreement is remarkable with Kappa statistics revealing almost perfect agreement (0.94) in the interpretation of the whole questionnaire and substantial agreement (0.70) in the interpretation of the verbatim only.

7.5.3 explanatory variables

We analysed sensitivity and specificity of the main symptom question on labour duration according to survey and women's characteristics (table 7.7). Previous interviewers' survey

experience and recall do not appear to significantly influence the accuracy of information provided on duration of labour by women. Respondents' school attendance is the only variable associated with improved validity with a change in specificity from 84.1% in the group who never went to school to 93.5% in the more educated group.

7.6 SUMMARY

The diagnosis of dystocia encompasses a group of heterogeneous conditions related to prolonged and obstructed labour. Descriptive studies indicate that prolonged and obstructed labour are a common occurrence in developed and developing countries, with estimated prevalences concentrating around 10%. Dystocia was the most common obstetric complication in the hospital sample studied here. Agreement between women's report of labour complications and medical records diagnosis was poor, whether or not the respondent was a near-miss case, with the exception of questions on Caesarean section. Responses to duration questions are significantly influenced by the level of education of women with non-cases less likely to report prolonged labour when educated. Physicians' interpretation of questionnaires reached insufficient specificity levels, although overall results were better than those obtained by a computer-based analysis of questions on Caesarean section.

Table 7.4: Frequencies tabulation of responses to selected questions on symptoms and treatments associated with dystocia (N=380)(1)

Questions	Number of positive answers	%
Had regular contractions which lasted longer than one day and one night (more than 24 hours) (q601)	94	24.7
Had regular contractions which lasted longer than 12 hours and less than 24 hours (q602)	81	21.3
Had regular contractions which lasted less than 12 hours (q602)	170	44.7
Delivered the day after the regular contractions started or later (q603-607)	197	51.8
Delivered the second day after the regular contractions started or later (q603-q607)	55	14.5
Delivered the third day after the regular contractions started or later (q603-q607)	24	6.3
Contractions suddenly stopped after a period of prolonged and painful contractions (q608)	26	6.8
Uterus got torn because of contractions (q609)	8	2.1
Was provided with the following care or treatment to help deliver the baby (q625)		
An injection/perfusion was done to speed up the labour (q625a)	269	71.0
instruments were use to help to get the baby out quickly (q625b)	8	2.1
someone made a cut in the area where the baby comes out (q625c)	28	7.4
a caesarean section was done because the uterus was getting tom (q625d)	6	1.6
a caesarean section was done because the baby could not come out on its own (q625e)	180	47.5
a caesarean section was done because the child was short of air (q625f)	60	15.8
Instruments were used to get out a stillbom baby (q625h)	1	0.3
Was told that she had a Caesarean section because the baby was too big, lying in bad position, small pelvis, uterus ruptured or threatening to rupture, uterine muscles too weak (q217)	122	32.2
Baby was lying in bad position just before birth (q627)	52	13.7
Baby's head did not come out first (q628)	3	0.8
When the baby was born, it was very big (q629)	50	13.7

Note: (1) One woman stopped the interview after question 609 and 32 women who reported a Caesarean section before contractions started did not answer questions 601-624.

Table 7.5a: Sensitivity and specificity of questions on symptoms of dystocia: 160 dystocia cases vs 221 all other women

Symptoms of dystocia	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
regular contractions lasted longer than one day and one night or 24h	73	86	200	21	[380]	45.9	90.5
yes to the above and >12h	115	44	161	60	[380]	72.3	73.8
delivered the day after the contractions started or later	104	47	105	93	[349]	68.9	53.0
delivered the second day after the contractions started or later	42	109	185	13	[349]	27.8	93.4
delivered the third day after the contractions started or later	18	133	192	6	[349]	11.9	97.0
pregnancy ended in stillbirth	12	148	204	17	[381]	7.5	92.3
baby was lying in bad postion just before birth	35	123	204	17	[379]	22.2	92.3
baby was very big when it was born	33	125	204	17	[379]	20.9	92.3
a c-section was performed to deliver the baby	157	3	180	40	[380]	98.1	81.8
was told she had a c-section because baby too big, baby lying in bad position, small pelvis, uterus ruptured or threatening to rupture, or uterine muscles too weak	111	49	209	11	[380]	69.4	95.0
was not told that reason for c-section was related to bleeding or fit	150	10	210	10	[380]	93.8	95.5
c-section because the child could not come out by itself	150	8	191	30	[379]	94.9	86.4
thought she was going to die	110	48	123	97	[379]	69.6	54.5

Table 7.5b: Sensitivity and specificity of questions on symptoms of dystocia: 160 dystocia cases vs 126 healthy women

Symptoms of dystocia	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
regular contractions lasted longer than one day & one night or 24h	73	86	117	9	[285]	45.9	92.9
yes to the above and >12h	115	44	100	26	[285]	72.3	79.4
delivered the day after the contractions started or later	104	47	73	53	[277]	68.9	57.9
delivered the second day after the contractions started or later	42	109	121	5	[277]	27.8	96.0
delivered the third day after the contractions started or later	18	133	124	2	[277]	11.9	98.4
pregnancy ended in stillbirth	12	148	126	0	[286]	7.5	100
baby was lying in bad position just before birth	35	123	121	5	[284]	22.2	96.0
baby was very big when it was born	33	125	117	9	[284]	20.9	92.9
a c-section was performed to deliver the baby	157	3	125	0	[285]	98.1	100.0
was told she had a c-section because baby too big, baby lying in bad position, small pelvis, uterus ruptured or threatening to rupture, or uterine muscles too weak	111	49	125	0	[285]	69.4	100.0
was not told that reason for c-section was related to bleeding or fit	150	10	125	0	[285]	93.8	100
c-section because the child could not come out by itself	150	8	126	0	[284]	94.9	100.0
thought she was going to die	110	48	105	21	[284]	69.6	83.3

Table 7.5c: Sensitivity and specificity of questions on symptoms of near-miss dystocia: 125 near-miss dystocia cases vs 256 all other women

Symptoms of near-miss dystocia	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
regular contractions lasted longer than one day and one night or 24h	50	75	211	44	[380]	40.0	82.7
yes to the above and >12h	88	37	168	87	[380]	70.4	65.9
delivered the day after the contractions started or later	78	42	110	119	[349]	65.0	48.0
delivered the second day after the contractions started or later	30	90	204	25	[349]	25.0	89.1
delivered the third day after the contractions started or later	11	109	216	13	[349]	9.2	94.3
pregnancy ended in stillbirth	10	115	237	19	[381]	8.0	92.6
baby was lying in bad position just before birth	26	98	229	26	[379]	21.0	89.8
baby was very big when it was born	27	97	232	23	[379]	21.8	91.0
a c-section was performed to deliver the baby	123	2	181	74	[380]	98.4	71.0
was told baby too big, baby lying in bad position, small pelvis or uterus ruptured or threatening to rupture as a reason for c-section	90	35	229	26	[380]	72.0	89.8
was not told that reason for c-section was related to bleeding or fit	116	9	211	44	[380]	92.8	82.7
c-section because the child could not come out by itself	118	6	193	62	[379]	95.2	75.7
thought she was going to die	87	37	134	120	[378]	70.2	52.8

Table 7.5d: Sensitivity and specificity of questions on symptoms of near-miss dystocia: 125 near-miss dystocia cases vs 126 healthy women

Symptoms of near-miss dystocia	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
regular contractions lasted longer than one day and one night or 24h	50	75	117	9	[251]	40.0	92.9
yes to the above and >12h	88	37	100	26	[251]	70.4	79.4
delivered the day after the contractions started or later	78	42	73	53	[246]	65.0	57.9
delivered the second day after the contractions started or later	30	90	121	5	[246]	25.0	96.0
delivered the third day after the contractions or later	11	109	124	2	[246]	9.2	98.4
pregnancy ended in stillbirth	10	115	126	0	[251]	8.0	100
baby was lying in bad position just before birth	26	98	121	5	[250]	21.0	96.0
baby was very big when it was born	27	97	117	9	[250]	21.8	92.9
a c-section was performed to deliver the baby	123	2	125	0	[250]	98.4	100.0
was told baby too big, baby lying in bad position, small pelvis or uterus ruptured or threatening to rupture as a reason for c-section	90	35	125	0	[250]	72.0	100.0
was not told that reason for c-section was related to bleeding or fit	116	9	125	0	[250]	92.8	100.0
c-section because the child could not come out by itself	118	6	126	0	[250]	95.2	100.0
thought she was going to die	87	37	105	21	[250]	70.2	83.3

Tables 7.5e: Sensitivity and specificity of questions on symptoms of ruptured uterus: 12 ruptured uterus cases vs 368 all other women

Symptoms of ruptured uterus	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
regular contractions lasted longer than one day and one night or 24h	6	6	280	88	[380]	50.0	76.1
yes to the above and >12h	8	4	201	167	[380]	66.7	54.6
delivered the day after contractions started or later	6	5	147	191	[349]	54.5	43.5
delivered the second day after contractions started or later	3	8	286	52	[349]	27.3	84.6
delivered the third day after contractions started or later	1	10	315	23	[349]	9.1	93.2
contractions suddenly stopped after a period of prolonged & painful contractions	5	7	347	21	[380]	41.7	94.3
uterus got torn because of contractions	5	7	365	3	[380]	41.7	99.2
pregnancy ended in stillbirth	7	5	346	22	[381]	58.3	94.0
pregnancy ended in stillbirth or uterus got torn because of contractions	8	4	344	25	[381]	66.7	93.2
thought she was going to die	11	0	171	196	[379]	100	46.6
uterus got torn because of contractions & thought she was going to die	4	7	365	3	[379]	36.4	96.6

Tables 7.5f: Sensitivity and specificity of questions on symptoms of ruptured uterus: 12 ruptured uterus cases vs 126 healthy women

Symptoms of ruptured uterus	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
regular contractions lasted longer than one day and one night or 24h	6	6	117	9	[138]	50.0	92.9
yes to the above and >12h	8	4	100	26	[138]	66.7	79.4
delivered the day after contractions started or later	6	5	73	53	[137]	54.5	57.9
delivered the second day after contractions started or later	3	8	121	5	[137]	27.3	96.0
delivered the third day after contractions started or later	1	10	124	2	[137]	9.1	98.4
contractions suddenly stopped after a period of prolonged & painful contractions	5	7	123	3	[138]	41.7	97.6
uterus got torn because of contractions	5	7	125	1	[138]	41.7	99.2
pregnancy ended in stillbirth	7	5	126	0	[138]	58.3	100
pregnancy ended in stillbirth or uterus got torn because of contractions	8	4	125	1	[138]	66.7	99.2
thought she was going to die	11	0	105	21	[137]	100	83.3
uterus got torn because of contractions & thought she was going to die	4	7	125	1	[137]	36.4	99.2

Table 7.6 Sensitivity and specificity of physicians' qualitative assessment of dystocia: 160 dystocia cases vs 221 all other women

	Physician 1		Physician 2		Physician 3*		Computer-based analysis (most significant results)	
Dystocia cases vs all other women	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity
using verbatim#	83.6	89.6	95.6	81.4	87.9	84.2	45.6 93.8	90.5 95.5~
using verbatim and closed questions	91.3	90.5	96.3	87.3	94.9	90.0	45.6 93.8	90.5 95.5~

Note:
* based on 380 women only (1 missing value)
\# excluding 2 women without verbatim
** based on reports of regular contractions lasting longer than one day and one night or 24h
~ based on "was not told that reason for c-section was related to bleeding or fit"

Table 7.7: **Sensitivity and specificity of women's reports of regular contractions lasting longer than one day and one night or 24h, according to interview or respondent's characteristics: dystocia cases vs all other women**

	Cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
recall							
<2 years	34	37	115	15	[201]	47.9	88.5
>2 years	39	49	85	6	[179]	44.3 p=0.6534	93.4 p=0.2173
type of interviewer							
experienced	40	36	80	12	[168]	52.6	87.0
not experienced	33	50	120	9	[212]	39.8 p=0.1037	93.0 p=0.1295
school attendance							
yes	44	60	142	10	[256]	42.3	93.5
no	29	26	58	11	[124]	52.7 p=0.2098	84.1 p=0.0278
first pregnancy							
yes	19	22	33	3	[77]	46.3	91.7
no	54	64	167	18	[303]	45.8 p=0.9489	90.3 p=0.9608
age							
<25	18	18	38	3	[77]	50.0	92.7
>=25	55	68	162	18	[303]	44.7 p=0.5757	90.0 p=0.8153
work for cash							
yes	44	60	121	13	[238]	42.3	90.3
no	29	26	79	8	[142]	52.7 p=0.2098	90.8 p=0.9002

Note: p-values were calculated using uncorrected chi-square, or Fisher exact test (2 tailed p-values) when an expected cell value was less than 5

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CHAPTER 8. POSTPARTUM INFECTIONS OF THE GENITAL TRACT

8.1 DEFINITION AND EPIDEMIOLOGY

This chapter focuses on illnesses related to infections of the genital tract during or after delivery. Urinary tract infections and other infectious diseases such as malaria were not included as features of postpartum infections in our validation study.

Puerperal infections present a more complicated picture than the obstetric complications considered so far. Unlike eclampsia, haemorrhage and dystocia, where the diagnosis entirely relies on signs and symptoms, the gold standard diagnosis may require histopathologic findings. Three levels of diagnosis can be identified for postpartum infections: (i) a diagnosis based on the women's reports of symptoms, (ii) a diagnosis based on signs observed during a clinical examination (clinical diagnosis) and (iii) a diagnosis based on laboratory reports (laboratory diagnosis). A laboratory diagnosis is not always available in epidemiological studies of puerperal infections

8.1.1. definition

a) fever

High fever is one of the commonest health problems in the puerperium. Thirty years ago, the US Joint Committee on Maternal Welfare proposed the following standard definition for **puerperal fever**: "an oral temperature of 38.0 degrees centigrade or more on any two days of the first ten days postpartum excluding the first 24 hours" (Corson et al, 1981). Subsequent investigations have prompted other authors to propose that the patient's temperature should

be "38.7 degrees centigrade or higher" in the first 24 hours after delivery (Filker and Monif, 1979; French and Smaill, 1998). This definition is still commonly used in epidemiological studies of febrile puerperal morbidity (Corson et al, 1981; Enkin et al, 1989; French and Smaill, 1998). Not all puerperal fever episodes are related to infection however, and the repeated measurement of temperature is recommended because some elevations are low grade and transient[1].

In normal women a modest elevation of temperature may occur temporarily in the first 24 hours. Ely and colleagues (1996) report this phenomenon as a fairly common occurrence (4%) associated with primiparity, the manual removal of the placenta and the use of a uterine pressure catheter. Furthermore, chills and lower abdominal pains are also frequent in the immediate postpartum period while the uterus undergoes involution work. Differential diagnosis should be made whenever possible. Causes of fever other than endometritis and puerperal sepsis include urinary tract infections, wound infection (abdominal wound, episiotomy or tear), chest infections, mastitis, medical conditions such as malaria, deep vein thrombosis or pulmonary embolism.

b) endometritis and puerperal sepsis

A large proportion of women with puerperal fever have **endometritis**[2], a form of puerperal infection confined to the uterine cavity. Endometritis usually occurs on the second or third day postpartum. It may progress to more serious illness with spreading of the infection to the peritoneal cavity (**peritonitis** and formation of **a pelvic abscess**), to the bloodstream

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1 The arbitrary threshold of 38.0°C and the pertinence of a double recording of fever in times of almost universal antibiotic therapy have been questioned by several authors (for example Gibbs,1980).

2 Urinary tract infections (UTI) are the next most common infections.

(**puerperal sepsis**), and extension of the infection to the pelvic veins (**septic pelvic vein thrombophlebitis**). With endometritis, temperatures typically range between 38-40 degrees, but the lower level of temperature is more common.

The clinical diagnosis of endometritis is usually made on the basis of a combination of signs such as subinvolution of the uterus, uterine tenderness, purulent or foul smelling vaginal discharge and fever. Sometimes it is made on the presence of fever in the absence of any other causes (French and Smaill, 1998). Interestingly, not all patients with endometritis meet the standard Maternal Welfare criterion of puerperal fever. In a hospital study conducted in North America, only 56% of patients with clinical endometritis had an oral temperature greater than 38.0°C on any two of the first 10 days postpartum excluding the first 24 hours (Sweet and Ledger, 1973). The pathological diagnosis of endometritis ("gold standard") requires a positive histology.

Because blood culture is expensive and often unavailable, WHO (1995) proposed the following working definition for **puerperal sepsis** as "infection of the genital tract occurring at any time between the onset of the rupture of membranes or labour and the forty-second day postpartum in which two or more of the following are present: pelvic pain, fever (ie oral temperature 38.5°C or higher on any occasions), abnormal vaginal discharge (e.g. presence of pus), abnormal smell/ foul odour of discharge, delay in the rate of reduction of size if uterus (<2cm per day during first 8 days).". A major drawback with this definition is its lack of specificity as it uses a similar combination of signs to that for the diagnosis of endometritis.

c) wound infection

Wound infection is a common complication following abdominal deliveries. Infections of perineal or vaginal wounds can also occur. A working group on surgical infection proposed that wound infection is defined as "either a purulent discharge in, or exuding from, the wound, or a painful, spreading erythema" [reddening of the skin] "indicative of cellulitis" [inflammation of the cellular tissue] (Peel and Taylor, 1991). A Caesarean section or episiotomy wound is defined as a breaking of the skin or mucous tissue (Peel and Taylor, 1991). A positive bacteriological culture is also required for the pathological diagnosis (Enkin et al, 1989).

8.1.2 mechanisms for infections

Infections occur when there is an imbalance between the activities of pathogens and the host defence. The occurrence of clinical infection in a woman has been described as "proportional to the level of bacterial contamination, the availability of suitable culture medium and inversely proportional to the level of host resistance" (Corson et al, 1981); in other words, it is related to the type of micro-organisms involved, the environment, and the host defence mechanisms (Suonio et al, 1989). Protective barriers against infections disappear for a time at delivery providing pathogens with an opportunity to ascend from the lower genital tract to the sterile environment of the uterus (Whitfield, 1986). Most of these pathogens are endogenous to the genital tract but occasionally the source of infection is extragenous (Symonds, 1987; Monga and Oshiro, 1993). For vaginal deliveries, retained products of conception are often involved while tissue damage created by the uterine incision is a key factor explaining endometritis following abdominal delivery. Williams and Pastoreck (1995) indicate that "the damaged and sutured tissue around the incision site is susceptible to bacterial invasions (...) the collection of serum and blood around the suture site is a good medium for microbial growth".

When do the majority of cases first occur? A study showed a significant correlation of early postpartum fever (within 48 hours of delivery) with caesarean section. Altogether, 36% of women who underwent caesarean section had early postpartum fever versus 2% of those who delivered vaginally ($p<0.0001$) (Wager et al, 1980). Late postpartum endometritis (fever first occurring between 48 hours and six weeks after delivery) appeared more common among women who had undergone vaginal delivery but this was not significant (Wager et al, 1980).

8.1.3 epidemiology

a) historical trends

Before the advent of antibiotics in the late 1930s, puerperal sepsis was the most common cause of maternal death (Loudon, 1992). A quarter to half of all maternal deaths were attributed to puerperal sepsis in England and Wales from 1847 to 1935. There were epidemics of puerperal fever, probably all streptococcal in origin. In 1874, for example, 52% of all maternal deaths were assigned to puerperal sepsis. Loudon (1992) argues that changes in streptococcus virulence play an important role in determining trends in maternal mortality. Thus, the streptococcus may have increased in virulence at the beginning of this century and this would explain the elevated case fatality rate (around 15%) between 1910 and 1934 (Loudon, 1992). The fall in the number of postpartum infection deaths with the introduction of sulphonamide[3] (1937) and penicillin (1945) accounts for more than 80% of the total maternal mortality decline between 1934 and 1950 (Loudon, 1992). A population-based study of trends of infectious disease mortality in the Netherlands (1911-1978) showed that puerperal fever mortality decreased 11% per annum after the introduction of antibiotics (Mackenbach and

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[3] Some authors claim that this coincided with a "spontaneous decrease in virulence" of the streptococcus (Gibbs and Weinstein, 1976)

Looman, 1988). In the 1994-1996 UK confidential enquiry report, only 5% of all maternal deaths [4] were attributed to genital tract sepsis (excluding abortion) (DoH, 1998). WHO (1994) attributes at present 15 percent of all maternal deaths worldwide to sepsis. A substantial proportion (sometimes the majority) of maternal sepsis deaths in developing countries are related to abortion complications (see, for example, Ayhan et al, 1994; Juneja et al, 1994).

b) risk factors

Documented risk factors encouraging puerperal sepsis are multiple: presence of certain organisms in the amniotic fluid or genital tract, poor hygiene or poor aseptic technique during delivery, manipulations in the birth canal such as excessive number of digital vaginal examinations and operative vaginal delivery. Other risk factors reported in the literature are premature and prolonged rupture of membranes, prolonged labour, toxaemia, pre-existing vaginitis or cervicitis, retained products of conception, anaemia, obesity, coitus prior to delivery, Caesarean section and in particular emergency Caesarean section (Driessen, 1991; Craigo and Kapernick, 1994; Newton et al, 1990).

Women who have undergone Caesarean section (particularly in emergency and without prophylactic antibiotics) are considerably more at risk of puerperal infection. A study of risk factors for puerperal endometritis found Caesarean section as the dominant predictor with a relative risk of 12.8 ($p<0.0001$) (Newton et al, 1990). Large differences in infection prevalence can be seen in table 8.1 when comparing data for vaginal delivery and Caesarean sections. On the other hand, Boyce et al (1989) did not find a significant effect, nor did Watson and colleagues (1997) when focussing on elective caesarean delivery. There is a large body of evidence that antibiotic prophylaxis with Caesarean section reduced the risk of postoperative

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[4] There were14 such deaths out of 268 maternal deaths and 134 direct obstetric deaths (DoH, 1998).

Table 8.1 **Prevalence of various indicators for postpartum infections in selected studies and according to type of deliveries**

Author, year and place	Type of delivery	Case definition	Incidence (%)	Confidence intervals*
vaginal delivery and/or c-section				
Berger et al (1981) - USA - hospital-based intervention study on elective manual exploration of the uterus	Spontaneous and instrumental vaginal delivery	Endometritis (*postpartum fever associated with uterine tenderness*), episiotomy infection and thrombophlebitis.	2% (4/200)	[0.6-5.0]
Boyce et al (1989) - USA - prospective study among navajo women	Vaginal and c-section delivery	Postpartum fever (>= *38 °C on 2 occasions more than 24 hours after delivery*) and/or endometritis (*postpartum fever plus purulent cervical discharge and/or uterine tenderness*)	12% (NA/668)	Insufficient information
Bo-ying et al (1982) - China - barefoot doctors records in 2 communes	Insufficient information	Postpartum infections	1%	Insufficient information
Ely et al (1996) - USA - retrospective cohort study of deliveries in hospitals	Vaginal delivery	Benign fever (*single fever spike of >=38 °C occurring within the first 24 hours following delivery*)	4.3% (91/2137)	[3.4-5.2]
		Endometritis	3.3% (71/2137)	[2.6-4.2]
Filker and Monif (1979) - USA - prospective cohort of deliveries in hospital	Vaginal and c-section delivery	*Temperature elevation of >= 38 °C in the first 24 hours postpartum*	6.5% (65/1000)	[5.1-8.2]
		As above and required antibiotics and/or exhibit sustained febrile morbidity	3% (30/1000)	[2.0-4.3]
	Vaginal delivery	*Temperature elevation of >= 38 °C in the first 24 hours postpartum*	3.8% (33/858)	[2.7-5.4]
		as above and required antibiotics and/or exhibit sustained febrile morbidity	0.8% (7/858)	[0.3-1.7]
Gibbs et al (1980) - USA - retrospective review of medical records	Vaginal delivery	Endometritis (*fever over 100F with uterine tenderness and/or foul lochia*)	1.2% (158 /13080)	[1.0-1.4]

Author, year and place	Type of delivery	Case definition	Incidence (%)	Confidence intervals*
Gordon et al (1965) - India- prospective study of women delivered by trained vs untrained midwives (with diagnosis confirmed by medical staff)	Vaginal deliveries	Postpartum fever	6.3% (54/862)	[4.7-8.1]
Kampikaho and Irwig (1993) - Uganda - randomised trial of prophylactic antibiotics during labour	Vaginal delivery	Clinical postpartum infection (>=2 *of following symptoms & signs: fever, lower abdominal pain, lower abdominal tenderness, vaginal discharge*) in intervention group	21.8% (72/330)	[17.5-26.7]
		As above in control group	36.4% (120/330)	[31.2-41.8]
		Laboratory-confirmed infection in intervention group	8.5% (28/330)	[5.7-12.0]
		As above in control group	15.5% (51/330)	[11.7-19.8]
		Severe clinical infection plus laboratory confirmed infection in intervention group	6.7% (22/330)	[4.2-9.9]
		As above in control group	4.9% (16/330)	[2.8-7.8]
Saunders et al (1992)- UK- 1988 North West Thames Health Region - obstetric records	Normal vaginal delivery	Postpartum infection (*proven wound, endometrial and urinary tract infection, or the presence of a pyrexia of unknown origin >38 °C on 2 separate occasions*)	2.0% (508/ 25069)	[1.9-2.2]
Stones et al (1991) - UK - Norfolk and Norwich hospital records - maternal morbidity study	Insufficient information	Puerperal infections	3.0% (66/2164)	[2.4-3.9]

Author, year and place	Type of delivery	Case definition	Incidence (%)	Confidence intervals*
Plummer et al (1987) - Kenya - prospective study of a cohort of women with hospital deliveries in a population with high prevalence of STDs	Vaginal delivery	Endometritis and/or salpingitis	20.3% (NA)	insufficient information
Ransjö-Arvidson et al (1998) - Zambia - randomised controlled study of two shedules of midwife home visiting in the postpartum period	Spontaneous vaginal delivery	Fever > 37.6°C at day 42 of the puerperium	4.3% (15/352)	[2.4-6.9]
		Offensive lochia at day 42 of the puerperium	4.0% 14/352	[2.2-6.6]
Sweet and Ledger (1973) - USA - retrospective and prospective study of hospital deliveries	Vaginal delivery and c-section	One-day fever (*single elevation of temperature >100.4 F without documented site of infections*) [excluding first 24 hours]	1.9% (124/ 6436)	[1.6-2.3]
	Vaginal delivery and c-section	Endometritis	3.8% (244/6436)	[3.3-4.3]
Temmerman et al (1995)- Kenya - RCT of mass antimicriobial treatment in pregnancy in a population with high prevalence of STDs	Vaginal delivery and c-section	Postpartum endometritis (*at least 2 of the following symptoms: fever >38 ℃, foul lochia, uterine tenderness*) in intervention group	3.8% (4/106)	[1.0-9.4]
		Postpartum endometritis (same definition as above) in placebo group	10.4% (10/96)	[5.1-18.3]
Wager et al (1980) - USA- prospective study of women with hospital delivery	Vaginal delivery	Intrapartum fever (*temperature >= 38 ℃ during labor, uterine tenderness & no apparent extrauterine source of fever*)	1.5% (5/329)	[0.5-3.5]

Author, year and place	Type of delivery	Case definition	Incidence (%)	Confidence intervals*
		Early posptartum fever (*uterine tenderness with t>= 38.5 ℃ within the 1st 24h postpartum, &/or t>= 38 ℃ on 2 consecutive occasions 6 hrs apart between 24-48 hrs postpartum, & no apparent extrauterine source of fever*)	1.5% (5/329)	[0.5-3.5]
		Late postpartum endometritis(*lower abdominal pain and ueterine tenderness, with or without fever, occurring between 48 hrs & 6 weeks postpartum, with no apparent extrauterine source of infection*)	7.0% (23/329)	[4.5-10.3]
Wiegers et al (1996) - Netherlands - low risk women in a home vs hospital delivery prospective study	Insufficient information	Endometritis	0.2% (3/1836)	[0.0-0.5]
C-section				
Corson et al (1981) - various countries - review of findings of 26 hospital intervention studies ** on antibiotic prophylaxis for c-section	C-section with and without antibiotic prophylaxis	Febrile morbidity (various definitions) in intervention groups (range)	7.5% to 37.5% (3/40 - 18/48)	Not applicable
		As above in control groups	27% to 85.2% (20/74 - 109/128)	Not applicable
Enkin et al (1989) - various countries - review of findings of 91 hospital intervetion studies on antibiotic prophylaxis	C-section with and without antibiotic prophylaxis	Postoperative febrile morbidity (various definitions) in intervention groups (range)	0% to 51.4% (0/30 - 18/35)	Not applicable
		As above in control groups	14.5% to 85.2% (16/110 - 109/128)	Not applicable
Filker and Monif (1979) - USA - Prospective cohort of hospital deliveries	C-section without antibiotic prophylaxis	*At least 1 temperature elevation of >= 38 ℃ in the first 24 hours postpartum*	22.5% (32/142) 16.2% (23/142)	[16.0-30.3]

Author, year and place	Type of delivery	Case definition	Incidence (%)	Confidence intervals*
		As above and required antibiotics and/or exhibiting sustained febrile morbidity		[10.6-23.3]
Moir-Bussy et al (1984) - UK - prospective study 31 hospitals	C-section without antibiotic prophylaxis?	Wound infection (*inflammation or presence of purulent discharge from the wound and bacteriological culture in material taken from the wound*)	5.9% (141/ 2370)	[5.0-7.0]
Pelle et al. (1986) - Denmark - prospective study in 6 obstetric centers	C-section without antibiotic prophylaxis?	Wound infection (*presence of pus irrespective of results of bacteriological examination*)	6.6% (68/1032)	[5.2-8.3]
Suonio et al (1989) - Finland - prospective study of c-section deliveries	C-section without antibiotic prophylaxis	Fever (*axillar temperature > 38 ℃ on 2 occasions without local symptoms & with spontaneous disappearance*)	12.0% (91/761)	[9.7-14.5]
		Endometritis (*axillar temperature > 38 ℃ on 2 occasions with local symptoms such as pain and tenderness over the uterine site & lochia putrita*)	4.7% (36/761)	[3.3-6.5]
		Wound infection (*redness & tenderness around the skin wound or pus formation*)	3.0% (23/761)	[1.9-4.5]
Sweet and Ledger (1973) - USA - retrospective and prospective study of hospital deliveries	C-section without antibiotic prophylaxis?	Wound infections	6.3% (29/464)	[4.2-8.9]
Wager et al (1980) - USA - prospective study of women with hospital delivery	C-section without antibiotic prophylaxis?	Intrapartum fever	4.8% (3/62)	[1.0-13.5]
		Early postpartum fever	35.5% (22/62)	[23.7-48.7]
		Late postpartum endometritis	3.2% (2/62)	[0.4-11.2]

Note:
* exact binomial 95% confidence intervals
** results reported in table exclude one of the 26 studies who had a total sample size of 12
NA data not available

infections (Hopkins and Smaill, 1998). Enkin and colleagues (1989) calculated that this risk was decreased by 70-80% (odds ratio 0.24; CI 0.18-0.32) (Enkin et al, 1989). Duration of labour, membrane rupture prior to Caesarean section and duration of rupture are other important risk factors for infectious morbidity following abdominal deliveries, as is the case for vaginal deliveries (Corson et al, 1981; Enkin et al, 1989; Moir-Bussy et al, 1984; Monga and Oshiro, 1993; Pelle et al, 1986). Obesity is also associated with wound infections (Enkin et al, 1989; Pelle et al, 1986).

c) magnitude

Table 8.1 presents prevalence results for a variety of indicators of puerperal infection. Episodes of puerperal illness following Caesarean section are particularly well documented because of a high number of intervention trials in this area. The variety of definitions[5], study methodology, study population and therapy[6] used, renders the interpretation of results difficult. Nevertheless, overall patterns can be discerned.

The documented prevalence of **fever** after vaginal delivery alone or in combination with caesarean section fluctuates between 1% and 7%, while the documented range appears somewhat larger (0%-36%) for **endometritis** and **other puerperal infections**. The highest figures originate from studies in populations where the prevalence of sexually transmitted diseases is high (Kampikaho and Irwig, 1993; Plummer et al, 1987; Temmerman et al, 1995), and when the three concerned African studies are excluded, results of the remaining studies plummet to 1-4%. Early postpartum fever (first 24 hours) could affect up to 1 in 15 women.

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[5] Most of the studies quoted in table 8.1 used combinations of signs to identify cases. Relatively few seemed to have made use of bacteriological evidence.

[6] Particularly with respect to antibiotic regimens.

Postoperative febrile morbidity all combined is 14%-85% for women who did not receive antibiotic prophylaxis, and 0%-51% for the others. Prevalence figures for **wound infection** amounts to 3% to 7% in settings where antibiotic prophylaxis is not used.

d) sequelae

Infertility, ectopic pregnancy and chronic pelvic pain are all serious consequences of postpartum infections. However, for methodological reasons[7], good epidemiological data quantifying these associations are lacking. A WHO multicentre study on the etiology of infertility, nevertheless revealed that one in every two women with bilateral tubal occlusions in Africa report a history of postpartum or abortion complication (WHO, 1987). A study in Gabon showed that pregnancy wastage and home delivery were risk factors for secondary infertility (Shrijvers et al, 1991). In high income countries, studies have shown that abdominal surgeries including Caesarean section are important risk factors for ectopic pregnancy (Parazzini et al, 1992).

Case fatality for postpartum sepsis can be extremely high, for example a report on maternal deaths in Scotland (Scottish Home and Health Department, 1987) found a risk of death of 1 in 200 for sepsis compared to 1 in 300 for eclampsia, 1 in 3000 for haemorrhage, and 1 in 38,000 for dystocia. In Benin, a case fatality of 21% was established for near-miss puerperal infection (Filippi et al, 1998).

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[7] Because of issues related to case ascertainment, recall bias and exposure assessment bias in the study of risk factors when using a case-control design (most viable option).

8.2 DESCRIPTION OF ALGORITHM

The algorithm (appendix 1) was prepared for women who had delivered vaginally or abdominally. The primary criterion is that mention was made in their medical records of at least one of the following conditions:

- wound infection, infection of a laceration in the lower genital tract, infections of the upper genital tract, infections following exploration of the uterus or perineal suturing, peritonitis, premature rupture of membranes, and infected amniotic fluid.

Whether women with the above conditions are retained as cases of genital tract infection depends on their temperature at the time of the diagnosis or whether they have had a history of fever. Fever magnitude, signs of shock or severe deterioration, are then used to distinguish between near-miss cases and non near-miss cases. Women without fever are automatically excluded from the algorithm.

The algorithm does not include direct evidence of clinical signs of infection such as uterine tenderness, foul lochia, which have been used in other studies, nor does it use histopathologic information. This is because: (i) clinical signs did not appear to be routinely reported in the files, (ii) bacteriology reports were not always available in the files and (iii) they are not always corroboratory even when there are clear clinical signs of puerperal infections (Gibbs and Weinstein, 1976).

Hence, a woman was a near miss case when she met one of the criteria mentioned above (labelled "circumstances of infection" in the algorithm) and:

- she had a temperature >= 38.5°C and signs of shock or severe deterioration of condition
- she had a history of a temperature >= 38.5°C and signs of shock

Conversely, a woman was a non near-miss case when she met one of the criteria of circumstance of infection and:

- she had a temperature >= 38.5°C, but no signs of shock nor of severe deterioration of condition
- she had a history of temperature >= 38.5°C and no signs of shock
- she had a history of temperature greater or equal to 37.5°C but lower than 38.5°C

History of temperature ("anterior temperature" in the algorithm) stands for women's reports of a fever measurement at the time of hospital admission. However, the distinction between temperature measured prior or during hospitalisation was not made during the identification of cases as the former indication was very rarely mentioned in the files.

Although the majority of cases with genital tract infections usually declare themselves within a week after delivery, it is possible that some cases of puerperal sepsis were not recognised because of a short hospital stay. They may have received treatment outside the three hospitals, and be excluded from the study; or, they may be in the sample but as unrecognised cases among healthy women or women with other complications. In CUGO, Lagune and Ouidah, for example, the group of "healthy women" left the hospital within 1 to 2 days after delivery.

8.3 SIGNS AND CHARACTERISTICS OF THOSE SELECTED IN HOSPITALS

A total of 71 women with the diagnosis of infection of the genital tract were identified in the three hospitals. Of these, one woman will be omitted from the ensuing analysis because of missing information on circumstances of infections (she had unexplained pyrexia), bringing the total number of infection cases to 70.

A comparatively small number of women (eight women) presented signs of shock or severe deterioration and were kept as near-miss cases (table 8.2a). The remaining 62 women were selected because they were diagnosed with a condition suggestive of puerperal infections and (theorically - see footnote 8) because they displayed a fever greater than or equal to 38.5 degrees centigrade. Most of the selected women had a diagnosis of wound infections (59%) or upper genital infections (57%) either alone or in combination with other conditions (table 8.2b). The majority of women with upper genital infections (95%) had a diagnosis of endometritis. Almost a quarter (23%) also presented signs of infected amniotic fluid, and a sixth (17%) of premature rupture of membranes. Infected laceration of the lower genital tracts, infections following exploration of the uterus or perineal suturing and puerperal peritonitis were in small numbers. The most frequent combination of conditions was wound infections and upper genital infections (13 women, 19%).

Clinical features were complex for a large proportion of the infection cases. Among the 70 patients with the diagnosis of infection, 52 suffered from one or more other obstetric conditions: three had eclampsia, six haemorrhage and 44 dystocia. For eight women, there was mention of another infectious disease, including malaria (3 women), urinary tract infection (2), pneumopathy (2) and bronchitis (1). Lastly, one woman was sterilised at the time she had a

Table 8.2a: Case definition for infection cases in the hospital sample (N=70)

Case definition	Number of women with criteria
near-miss infection	
circumstances of infection linked to delivery with temperature >=38.5 and shock	6
circumstances of infection linked to delivery with temperature >=38.5, and severe deterioration	2
non near-miss infection	
circumstances of infection linked to delivery with temperature >=38.5, without shock nor severe deterioration	43
circumstances of infection linked to delivery with temperature between 37.5 and 38.5	19

Table 8.2b: Circumstances of infection linked to delivery for infection cases in the hospital sample (N=70)

Circumstances of infection linked to delivery	Number of women
wound infection	41
infected laceration of lower genital tract	4
upper genital tract infections	40
infections following exploration of uterus or perineal suturing	2
premature rupture of membranes	12
infected amniotic fluid	16
puerperal peritonitis	3

Caesarean section and another returned to the hospital after discharge with evidence of fistulae.

Documented fever ranged from 37.5 to 40.5 degrees centigrade with a mean of 38.9°C[8]. More than half (51%) of the women had fetid or purulent lochia. For almost all cases (99%), antibiotics' prescription is reported.

More than half (54%) of infection patients were evacuated from another health facility and one in five arrived in the hospital of selection after delivery (table not shown). The majority of the women (77%) were delivered by caesarean section but among the 14 women who arrived after delivery only one (7%) had an abdominal delivery. Infection cases have similar demographic and reproductive characteristics to other women in the sample. Briefly, they were on average 27.8 years old (versus 27.2, p=0.4215), a third (34%) were nulligravida (versus 32%, p=0.6669), the average parity was 2.3 (versus 1.9, p=0.1727) and 25% had an abortion (versus 26%, p=0.8281).

8.4 SYMPTOMS REPORTED BY WOMEN IN INTERVIEW

8.4.1 brief description of questionnaire

Fever is a very common complaint which most people experience at times in areas of high malaria prevalence such as Benin. In order to obtain responses which were as specific as

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[8] Fever was below 38.5°C for 19 women indicating that the algorithm criteria were not well adhered to when recruiting cases, and that the women's diagnosis in the records was probably the core criteria for selecting infection cases. This diagnosis misclassification will affect the validity analysis as one of the most important "infection" questions on the interview schedule related to fever.

possible, several questions were asked to characterise postpartum fever. Thus, the infection section (section 7 of the questionnaire, appendix 3) commenced with a general question on occurrence of fever at any time during pregnancy or after delivery. More detailed questions were then asked on duration (in days), intensity, whether fever was accompanied by shivers, and whether she had tried to treat the fever herself. The next group of questions elicited a checklist of information on other types of symptoms including pus from Caesarean section wound, badly healed episiotomy or tear, fetid or very smelly vaginal discharge, and whether the woman had any other complications. Finally, after obtaining information on onset of symptoms, questions on severity of illness were asked, focusing on loss of consciousness and whether the respondent felt very thirsty.

8.4.2 frequency of reports of symptoms

Questions on infection were answered by 379 women[9]. Many respondents (193 women, 51% of the entire sample) reported fever and/or another type of complication after the index delivery. Among them, 135 women declared that they were in touch with CUGO, Lagune or Ouidah services.

Altogether 181 women (48%) reported fever at any time during pregnancy and after delivery. A group of 110 women (29%) indicated that fever occurred after delivery (whether or not it occurred during pregnancy), and 69 women (18%) solely after delivery. A quarter of all respondents (24%) recounted a postpartum fever longer than a day, one in twenty respondents (5%) a very high postpartum fever and one in six (16%) postpartum fever with shivers.

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[9] Among these 379 respondents, 41 women are cases of infection, but one of these will be excluded from the analysis because of poor case definition (see section 8.3).

A total of 155 women (41%) reported at least one other complication after delivery. Fifty-two women (14%) suffered from symptoms of wound infection, 48 women (13%) declared that they experienced fetid or very smelly vaginal discharge after delivery, and only two (1%) a badly healed episiotomy or tear. Lastly, a group of 92 women (24%) reported another complication not already mentioned in the checklist of questions. For 16 women, these problems were anaemia, stomach or body swelling, and other types gynaecological problems[10].

Finally, 102 women (27%) reported early postpartum symptoms (within a week after birth), 67 women (18%) postpartum symptoms which made them very thirsty, and 36 (9%) declared that they lost consciousness because of these ailments.

8.5 QUESTIONNAIRE PERFORMANCE

8.5.1 analysis using closed questions

The analysis combined results for near-miss and non near-miss infection cases as only four near-miss cases were interviewed at home. Tables 8.4a and 8.4b present the sensitivity and specificity results of symptoms of infections, when the comparison groups are all other women (table 8.4a) and healthy non-cases (table 8.4b). In Benin, the length of hospital stay after normal delivery is short and women may not have returned to the hospital of selection for a postpartum problem developing after discharge. To assess whether this affects the results, a separate analysis was conducted solely for those who had been in touch with the hospital of selection for a postpartum problem. The results of this analysis are presented in Table 8.4c and 8.4d. Specificity improves, but with a small negative impact on sensitivity, as one "true"

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[10] In the analysis, these problems were labelled as "another reproductive problem".

infection case declared that she did not go to CUGO, Lagune or Ouidah for the problem she reported.

a) fever after delivery

The conventional question on occurrence of **fever after delivery** generates both poor sensitivity (55.0%) and borderline specificity (74.3%-87.3%) depending on the comparison group (tables 8.4a and 8.4b). Specificity improves when questions on fever characteristics are asked, but at some cost to sensitivity, which decreases to an unacceptable level. The question on **fever after delivery was very high** presents the best specificity (96.2%-100%) for a very low sensitivity (17.5%).

All fever questions achieve excellent specificity results when the comparison group is healthy women adjusted for contact with the hospitals of selection (table 8.4c). Adjusted results for the group of "all other women" show only marginal improvements (table 8.4c). As a general rule, sensitivity of fever questions is overall poor to very poor as the best level obtained is 55.0%.

b) other symptoms

The question on **pus came out from the Caesarean section scar** identifies only half (50.0%) of the infection cases, with reasonable (89.6%) to excellent specificity (100%) depending on the comparison group. **Fetid or foul smelling vaginal discharge** achieve poorer results overall with a sensitivity of 32.5%[11] and specificity of 89.6%-95.2%. Adjustment for contact with the

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[11] The medical diagnosis found very few of these.

health services marginally improved specificity results for the group of all other women, but results are excellent for healthy women. A separate analysis was not conducted for **badly healed episiotomy and scar** as so few women reported these symptoms.

A combination of symptoms from question 708 (**pus from Caesarean section scar, badly healed episiotomy or tear, fetid or foul vaginal discharge or another reproductive health problem**) generates good sensitivity results (72.5%). Specificity is moderate for all other women (80.5% unadjusted, and 87.9% adjusted) but increases to 91.3% and 97.6% when compared with healthy women (adjusted and unadjusted).

Finally, combining information on fever with other symptoms fails to generate adequate levels of sensitivity and specificity, except when the comparison group is healthy women (specificity mostly above 95%).

c) hospital stay

A single question on length of hospital stay (**stayed in hospital for more than seven nights**) asked in the final section of the questionnaire achieves excellent sensitivity (95.0%) and specificity results when the comparison group is healthy women (95.2%). Specificity is low, however, when compared to all other women (54.7%) as should be expected. **Received antibiotics in CUGO, Lagune and Ouidah** produces very good specificity results (90.2%-96.8%) but only detects 47.5% of cases.

Combining length of hospital stay with symptoms reported in question 708 provides a very good balance of results when the comparison group is healthy women (sensitivity 70.0%, and specificity 100%).

d) thought she was going to die

The question on **thought she was going to die** achieves excellent sensitivity results (92.5%), with low specificity (49.6%) when compared to all other women and insufficient specificity when compared to healthy women (83.3%). Adding this information to symptoms reported in question 708 increase specificity to 97.6%, for a sensitivity of 72.5%, when the comparison group is healthy women.

8.5.2 physicians' analysis of questionnaires

Table 8.5 shows the sensitivity and specificity obtained when three physicians read the questionnaires independently and attributed a diagnosis. Specificity is usually high (between 89.7%-93.5%) and is closer to the required level of 95% when verbatim information is used on its own. Nonetheless, specificity never reaches levels that can be obtained with the computer-based analysis of the questionnaire. Sensitivity is repeatedly low (between 23.1%-55.0%) and lowest when using verbatim data. Once more, levels of sensitivity and specificity appear quite similar between physicians. Sensitivity is, however, where most variation exists, with physician 3 consistently reaching lower levels of sensitivity. Calculation of Kappa statistics confirms that there is substantial agreement between the three physicians with little difference in results when verbatim is used on its own (kappa: 0.73) and when it is complemented by closed questions (kappa: 0.75). Levels of inter-rater agreement are overall not as high as those obtained for dystocia, haemorrhage and eclampsia when using closed questions.

8.5.3 explanatory variables

Table 8.6 shows sensitivity and specificity results for the best combination of symptoms (using information on wound infection, vaginal discharge and spontaneous reports of a reproductive health problem) according to women's individual characteristics and survey conditions. Experienced interviewers appear to detect a greater number of cases (sensitivity 88.2% vs 60.9%) (p-value=0.1192 (not significant)), at some cost for the specificity which drops to 74.1% (85.3% for inexperienced interviewers) (p-value= 0.0101). School attendance and age also influence specificity, with educated and younger than 25 years old patients less likely to declare a problem not recorded in the medical records (specificity 84.0% vs 73.5% for uneducated patient (p-value=0.0210); and, 89.9% vs 78.1% for patients older than 25, p-value=0.0275) . Recall (greater or lower than 2 years), primigravidy and work for cash do not appear to have a statistically significant influence on the results.

8.6 SUMMARY

A wide range of puerperal infections incidence is reported in the literature, some of this variation is explained by important differences in case ascertainment. Nevertheless, incidence is probably very high in countries where reproductive tract infections are common, with up to a third of recently delivered women developing the disease. In other settings, about 1-4% are diagnosed with the condition.

In this study, a total 70 women were identified in the participating hospitals. Most of these women had a diagnosis of wound infections and/or upper genital infection, including endometritis. Many also suffered from other conditions be infectious diseases or an obstetric complication, in particular dystocia. Very few (8) were near miss cases. An over-representation

of milder cases of infections can moreover be expected because the threshold for the fever criteria in the definition was poorly respected. When prompted during interview, more than half of the women (51%) in the overall sample of 379 women reported fever or other complications after delivery. A substantial number had not gone to the health services for these problems. Analysis was therefore conducted adjusted and unadjusted for contact with participating hospitals. Because of the small number of near-miss infection cases, the influence of severity on the reporting of infections could not be considered. Questions on fever perform poorly overall. The best algorithms use information on duration of hospital stay or a combination of symptoms including pus from the Caesarean section scar and fetid or foul vaginal discharge. The balance of sensitivity and specificity for these two types of algorithms is particularly good when the comparison group is healthy women, adjusted or unadjusted. Specificity is otherwise too low for the purpose of this study. Lastly, age of the respondent, school attendance and interviewers' experience all significantly influence the specificity of the results.

Table 8.3: Frequencies tabulation of responses to selected questions on symptoms associated with infection (N=379)(1)

Questions	Number of positive answers	%
Any symptoms after delivery (q702b and q708)	193	50.9
Had fever during pregnancy or after delivery (q701)	181	47.8
Had fever after delivery (whether or not it occured during pregnancy) (q702)	110	29.0
Had fever after delivery only (q702)	69	18.2
Postpartum fever lasted for a day or less (q703) (2)	18	4.7
Postpartum fever lasted for more than a day (q703) (2)	91	24.0
Postpartum fever was high or very high (q704)	63	16.6
Postpartum fever was very high (q704)	20	5.3
Had shivers with postpartum fever (q705)	61	16.1
Suffered from following complications after delivery (q708)		
Pus came out from caesarean section wound	52	13.7
Badly healed episiotomy or tear where the baby comes out	2	0.5
Fetid or very smelly vaginal discharge	48	12.7
Another problem	92	24.3
Problem within broad constellation of infection symptoms (3)	16	4.2
Symptoms started within a week after delivery (q709)	102	26.9
Symptoms started within 8-42 days after delivery (q709)	67	17.7
Lost consciousness because of symptoms (q710)	36	9.5
Felt very thirsty because of symptoms (q711)	67	17.7
Was with or was in touch with Cugo, Lagune or Ouidah (q713,q716, q723, q724)	135	35.6

Note: (1) Two women had stopped the interview before questions on infection were asked
(2) One woman is not included because she did not know the duration of fever
(3) Include reports of anaemia, stomach or body swelling, gynaecological problems (other than fetid or very smelly vaginal discharge)

Table 8.4a: Sensitivity and specificity of questions on symptoms of postpartum infections: 40 postpartum infection cases vs 338 all other women

Symptoms of infections	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
Fever after delivery	22	18	251	87	[378]	55.0	74.3
Fever after delivery was high or very high	16	24	291	47	[378]	40.0	86.1
Fever after delivery was very high	7	33	325	13	[378]	17.5	96.2
Fever after delivery was with shivers	10	30	287	51	[378]	25.0	84.9
Pus came out from c-section scar	20	20	304	32	[376]	50.0	89.6
Fetid or foul smelling vaginal discharge	13	27	303	35	[378]	32.5	89.6
Pus from c-section scar, badly healed episiotomy or tear, fetid or foul smelling vaginal discharge, or another reproductive problem	29	11	272	66	[378]	72.5	80.5
Fever after delivery was very high or pus from c-section scar	22	18	295	43	[378]	55.0	87.3
Fever after delivery was very high or fetid or foul smelling vaginal discharge	17	23	291	47	[378]	42.5	86.1
Fever or complications after delivery & symptoms started 0-7 days after delivery	21	19	257	81	[378]	52.5	76.0
Fever or complications after delivery & lost consciousness	9	31	309	27	[376]	22.5	92.0
Fever or complication after delivery & felt very thirsty	19	21	287	48	[375]	47.5	85.7
Received antibiotics in Cugo, Lagune or Ouidah	19	21	305	33	[378]	47.5	90.2
Stayed in hospital > 7 nights	38	2	185	153	[378]	95.0	54.7
Fever after delivery was very high & stayed in hospital > 7 nights	7	33	327	11	[378]	17.5	96.7
Pus from c-section scar, badly healed episiotomy or tear, fetid or foul smelling vaginal discharge, or another reproductive problem & stayed in hospital > 7 nights	28	12	292	46	[378]	70.0	86.4

Thought she was going to die	37	3	167	170	[377]	92.5	49.6
Pus from c-section scar, badly healed episiotomy or tear, fetid or foul smelling vaginal discharge, or another reproductive problem & thought she was going to die	29	11	291	46	[377]	72.5	86.4

Table 8.4b: Sensitivity and specificity of questions on symptoms of postpartum infections: 40 postpartum infection cases vs 126 healthy women

Symptoms of infections	cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
Fever after delivery	22	18	110	16	[166]	55.0	87.3
Fever after delivery was high or very high	16	24	120	6	[166]	40.0	95.2
Fever after delivery was very high	7	33	126	0	[166]	17.5	100.0
Fever after delivery was with shivers	10	30	117	9	[166]	25.0	92.9
Pus came out from c-section scar	20	20	126	0	[166]	50.0	100.0
Fetid or foul smelling vaginal discharge	13	27	120	6	[166]	32.5	95.2
Pus from c-section scar, badly healed episiotomy or tear, fetid or foul smelling vaginal discharge, or another reproductive problem	29	11	115	11	[166]	72.5	91.3
Fever after delivery was very high or pus from c-section scare	22	18	126	0	[166]	55.0	100.0
Fever after delivery was very high or fetid or foul smelling vaginal discharge	17	23	120	6	[166]	42.5	95.2
Fever or complication after delivery & symptoms started 0-7 days after delivery	21	19	98	28	[166]	52.5	77.7
Fever or complication after delivery & lost consciousness	9	31	121	4	[165]	22.5	96.8
Fever or complication after delivery & felt very thirsty	19	21	119	6	[166]	47.5	95.2
Received antibiotics in CUGO, Lagune or Ouidah	19	21	122	4	[166]	47.5	96.8
Stayed in hospital > 7 nights	38	2	120	6	[166]	95.0	95.2
Fever after delivery was very high & stayed in hospital > 7 nights	7	33	126	0	[166	17.5	100
Pus from c-section scar, badly healed episiotomy or tear, fetid or foul smelling vaginal discharge, or another reproductive problem & stayed inhospital > 7 nights	28	12	126	0	[166]	70.0	100.0

Thought she was going to die	37	4	105	21	[167]	90.2	83.3
Pus from c-section scar, badly healed episiotomy or tear, fetid or foul smelling vaginal discharge, or another reproductive problem & thought she was going to die	29	11	123	3	[167]	72.5	97.6

Table 8.4c: Sensitivity and specificity of questions on elementary symptoms of postpartum infections: 40 postpartum infection cases vs 338 all other women (adjusted for women who were in hospital of selection when symptoms occur or went there because of symptoms)

Elementary symptoms of infections	cases		non-cases				
and was in hospital of selection or went to hospital of selection	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
Fever after delivery	21	19	287	51	[378]	52.5	84.9
Fever after delivery was high or very high	15	25	308	30	[378]	37.5	91.1
Fever after delivery was very high	7	33	327	11	[378]	17.5	96.7
Fever after delivery was with shivers	9	31	312	26	[378]	22.5	92.3
Pus came out from c-section scar	20	20	315	23	[378]	50.0	93.2
Fetid or foul smelling vaginal discharge	12	28	316	22	[378]	30.0	93.5
Pus from c-section scar, badly healed episiotomy or tear, fetid or foul smelling vaginal discharge, or another reproductive problem	28	12	297	41	[378]	70.0	87.9
Fever or complications after delivery	34	6	238	100	[378]	85.0	70.4

Table 8.4d: Sensitivity and specificity of questions on elementary symptoms of postpartum infections: 40 postpartum infection cases vs 126 healthy women (adjusted for women who were in hospital of selection when symptoms occur or went there because of symptoms)

Elementary symptoms of infections	cases		non-cases				
and was in hospital of selection or went to hospital of selection	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
Fever after delivery	21	19	122	4	[166]	52.5	96.8
Fever after delivery was high or very high	15	25	124	2	[166]	37.5	98.4
Fever after delivery was very high	7	33	126	0	[166]	17.5	100.0
Fever after delivery was with shivers	9	31	124	2	[166]	22.5	98.4
Pus came out from c-section scar	20	20	126	0	[166]	50.0	100.0
Fetid or foul smelling vaginal discharge	12	28	124	2	[166]	30.0	98.4
Pus from c-section scar, badly healed episiotomy or tear, fetid or foul smelling vaginal discharge, or another reproductive problem	28	12	123	3	[166]	70.0	97.6
Fever or complications after delivery	34	6	106	20	[166]	85.0	84.1

Table 8.5 **Sensitivity and specificity of physicians' qualitative assessment of infection: 40 infection cases vs 340 all other women**

	Physician 1		Physician 2		Physician 3*		Computer-based analysis (most significant results)	
Infection cases vs all other women	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity	sensitivity	specificity
using verbatim#	35.0	92.0	37.5	90.2	23.1	93.5	72.5 17.5	80.5+ 96.2~
using verbatim and closed questions	55.0	89.7	52.5	90.0	41.0	91.4	72.5 17.5	80.5+ 96.2~

Note:

* based on 379 women only (1 missing value)

\# excluding 2 women without verbatim

\+ based on reports of pus from c-section scar, badly healed episiotomy or tear, fetid or foul smelling vaginal discharge, or another reproductive problem

~ based on "fever was very high"

Table 8.6: **Sensitivity and specificity of women's reports of pus from c-section scar, badly healed episiotomy or tear, fetid or foul-smelling vaginal discharge or another reproductive problem, according to interview or respondent's characteristics: infection cases vs all other women**

	Cases		non-cases				
	true positive	false negative	true negative	false positive	N	Sensitivity	Specificity
recall							
<2 years	15	5	144	36	[200]	75.0	80.0
>2 years	14	6	128	30	[178]	70.0 p=0.7233	81.0 p=0.8147
type of interviewer							
experienced	15	2	109	38	[164]	88.2	74.1
not experienced	14	9	163	28	[214]	60.9 p=0.1192	85.3 p=0.0101
school attendance							
yes	21	9	189	36	[255]	70.0	84.0
no	8	2	83	30	[123]	80.0 p=0.8381	73.5 p=0.0210
first pregnancy							
yes	5	4	56	11	[76]	55.6	83.6
no	24	7	216	55	[302]	77.4 p=0.3847	79.7 p=0.4734
age							
<25	4	3	62	7	[76]	57.1	89.9
>=25	25	8	210	59	[302]	75.7 p=0.5921	78.1 p=0.0275
work for cash							
yes	20	9	170	39	[238]	69.0	81.3
no	9	2	102	27	[140]	81.8 p=0.6771	79.1 p=0.6091

Note: p-values were calculated using uncorrected chi-square, or Fisher exact test (2 tailed p-values) when an expected cell value was less than 5

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CHAPTER 9. DISCUSSION

This thesis examines whether measurement of morbidity prevalence through women's interview provides a suitable alternative to mortality measurement for safe motherhood programme needs assessment. To become a 'suitable alternative', the morbidity measures should be relevant to programmes, valid, reliable, responsive to change, precise, interpretable and easy to obtain (Jenkinson and McGee, 1998). The thesis considers the validity of a survey instrument by comparing results from a questionnaire on obstetric complications to hospital clinical data on severe and less severe episodes of morbidity.

In this chapter, validity results of previous chapters are first drawn together. They are then interpreted in the light of the methodological constraints. This is followed by a commentary on the rigidity and superficiality of structured questionnaires in eliciting women's views on past medical conditions. The way forward in terms of health needs assessment for safe motherhood is finally discussed.

9.1 SUMMARY OF RESULTS

We compared women's recall of complications with a medical diagnosis. Our aim was to find questions with very high specificity for measuring the prevalence of obstetric conditions, even at the expense of sensitivity. Specificity below 90% for dystocia, 95% for near-miss haemorrhage, near-miss dystocia and infections, and 99% for eclampsia would lead to massive over-estimation of the magnitude of the condition[1]. Questions were considered adequate when

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[1] However, the more common the disease the more difficult it becomes to suggest desirable levels of specificity and sensitivity. The weighting of sensitivity becomes more important and the estimated prevalence can be affected either way by an unbalance between sensitivity and specificity, leading to overestimation or underestimation. With very rare diseases, specificity almost

they resulted in a sensitivity of at least 70%. Two comparison groups were used for calculating the specificity: all the women in the sample without the condition of interest and healthy women only. In a general population, a larger proportion of healthy women would be expected than in our sample. Consequently the "true" specificity of the questions probably lies closer to the healthy women results. Likewise, sensitivity is probably biased upwards in our sample (Ronsmans, 1996).

Women could accurately recall eclamptic fits, abnormal bleeding in the third trimester, and all episodes of haemorrhage (independent of timing in pregnancy) if the recall period was less than 2 years (table 9.1). The specificity of questions and combinations of questions for dystocia, near-miss dystocia and infections of the genital tract were weak, except when information on treatment (Caesarean section) or consequences of treatment were used (wound infections). The better results for antepartum bleeding and eclampsia may be related to the fact that such complications are based on acute symptoms which are uncommon during normal pregnancy. Dystocia and bleeding during delivery, on the other hand, are the extreme end of a continuum, and thus may be more difficult for the woman to recognise. The effect of severity could only be analysed for eclampsia and dystocia, and could only make a positive difference in the case of eclampsia with an increase in sensitivity (from 72.7% to 88.2%).

Table 9.1 also presents the prevalence that the questionnaire would generate if the sensitivity and specificity for all other women and healthy women were holding true. The higher the expected 'true' prevalence[2], the more 'exact' the questionnaire findings become. Thus, questionnaire prevalence for antepartum haemorrhage only reaches sufficient accuracy when the expected prevalence attains 5%. Interesting results are moreover obtained for dystocia,

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annihilates sensitivity, and the effect of receding specificity is always overestimation.

[2] Based on findings from the literature review.

Table 9.1: **Sensitivity, specificity and reported prevalence for best symptom questions for the four types of complications**

Best symptom questions	Sensitivity	Specificity (all other women)	Specificity (healthy women)	Expected preva-lence**	Reported preva-lence***
Eclampsia					
convulsion or fit during pregnancy, delivery or after delivery	72.7	99.7	100	1%	1 - 0.7%
Antepartum haemorrhage					
bleeding during the third trimester	90.9	94.3	99.2	2%	7 - 3%
				5%	10 - 5%
Haemorrhage (recall period < 2 years)					
abnormal bleeding during third trimester, delivery, after delivery and bleeding was very abundant	70.3	94.5	97.0	5%	9 - 6%
				10%	12 -10%
Haemorrhage during delivery or after delivery (recall period < 2 years)					
bleeding during third trimester, delivery, after delivery, and bleeding was very abundant	71.9	92.9	97.0	5%	10 - 6%
				10%	14 - 10%
Dystocia					
regular contractions greater than 24 hours	45.9	90.5	92.9	10%	13 - 11%
Infections*					
Pus from c-section scar, badly healed episiotomy or tear, fetid or foul smelling vaginal discharge, or another reproductive problem	70.0	87.9	97.6	5%	15 - 6%
				10%	18 - 9%

Notes:
* Adjusted results were used for infections
** Figures for expected prevalence are from chapters 4-7. In some cases, two ranges of prevalence are presented.
*** Reported prevalences were calculated using the formula presented by Ronsmans (1996): $Pr = P * (SE+SP-1)+ (1-SP)$ where Pr is reported prevalence, P is expected prevalence, SE is sensitivity and SP is specificity. The first reported prevalence was calculated using 'all other women' specificity while the second prevalence used specificity for healthy women.

as the sensitivity and specificity of this question generate a prevalence close to the expected 'true' prevalence but cover up many false positive and false negative.

The study was not designed to investigate differentials according to respondent characteristics and survey methods, yet a few factors emerged. The degree of experience of the interviewers significantly influences the validity of the results for 3 conditions (eclampsia, haemorrhage and infection), but principally affects sensitivity at the expense of specificity for eclampsia and infection. Likewise, a short recall period of less than 2 years improves the sensitivity of the haemorrhage 'best' question, while individual characteristics of the respondent, such as school attendance and young age (below 25 years old), positively influence the specificity of dystocia and infection questions.

Sensitivities and specificities of the computer-based data processing and the physicians' diagnosis by questionnaire review were comparable, except maybe for haemorrhage where physicians obtained a better balance of sensitivity and specificity. There is a remarkable reliability across physicians, with most of the discrepancies being explained by don't know. The study supports the use of 'computer diagnosis' for the analysis of questionnaire results as employing medically trained staff would be costly.

The Benin results appear very good when compared to other studies in both high and low income countries reviewed in chapter 2. The degree to which women correctly recall near-miss complications such as eclampsia and haemorrhage is remarkably high and much higher than what has been reported from other studies. None of the low income country results presented in table 2.2 reached our required balance of sensitivity and specificity for prevalence estimation. The quality of the case definition criteria and the severity of the assessed conditions in Benin could possibly explain these differences. Also probably significant are the research context in which we worked and our efforts in monitoring the quality of the data collection. An important

question is whether the good reporting of near-miss eclampsia was influenced by the severity of the event or the weight of the antepartum criteria (convulsions before labour) in the near-miss definition. The Benin findings of increased accuracy of antepartum events are not replicated by other studies, presumably because of lack of suitable data in three of the settings.

Questions on duration of labour and fever clearly do not measure biomedical entities. The findings on duration of labour have been confirmed by other studies (Stewart and Festin, 1995; Ronsmans et al, 1997)[3].

This study could support the use of retrospective individual interview surveys for community assessment of eclampsia and bleeding in developing countries, providing the sample size is sufficiently large (a typical DHS survey sample of 4000 women is adequate for estimating a prevalence of 1% with a confidence level of 90% that results lay in-between 0.75%-1.25%). Enormous care must also be taken in the development of the questionnaire in the local language and in training the interviewers. The data could be used to assess the relative importance of complications, in order to establish priorities or interventions among them. However, more 'exactitude' in the identification of cases and non-cases would be required for estimating the effect of an intervention. A substantial number of false positives among identified cases is unavoidable in a population-based survey given the expected size of the healthy group.

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[3] See sub-sections 8.2.3 and 9.3.3 for further discussion on this topic.

9.2 METHODOLOGICAL FACTORS AFFECTING THE RESULTS (can we believe these results?)

To what extent can these results be agreed upon? Three methodological facets to the study will be examined in order to answer this question. The first relates to the analysis and the choice of stringent cut-off-points for the sensitivity and the specificity. The second pertains to the study design and the necessary use of a retrospective hospital sample in view of the rarity of the conditions under study. It is about case definition, selection biases, faulty gold-standards and artificial arrays of complications. The third is a critical look at the implementation of the survey methodology and the questionnaire: the questionnaire had imperfections and some interviewers were better than others.

9.2.1 statistical criteria to assess the 'good performance' of the questionnaire

We chose to evaluate the performance of the questionnaire by analysing its sensitivity and specificity in identifying cases and non-cases. Kappa statistic has been used to assess the validity of women's recall in other studies (Danel et al, 1996; Zurayk et al, 1995). The choice of sensitivity and specificity appears appropriate for two main reasons: first the questionnaire diagnosis is evaluated against a gold standard diagnosis of severe complications as opposed to a source of information of similar value; second the interpretation of Kappa statistic is not straightforward as its maximal value is dependent on the sensitivity and specificity of the instrument or observation as well as the actual prevalence of the condition, and can be very low at the extremes of prevalence (very high or very low prevalence) (Thompson and Walter, 1988).

As discussed by Altman (1999), there are no difficult mathematics in the analysis of sensitivity and specificity. The main problem lies in the interpretation of the results and in deciding how good these should be to become useful (Altman, 1999). It is basically a question of threshold and how many misdiagnoses one is prepared to accept. The objectives of the study are important in this decision: a study evaluating the impact of an intervention would clearly require fewer errors of classification in questionnaire diagnoses than a study merely trying to establish priorities among diseases.

The majority of questionnaire validation studies in developing countries do not propose explicit numerical trade-off with which to assess the performance of questionnaires for prevalence estimation (see for example, Egyptian Fertility Care Society, 1995; Filippi et al, 1997; Kalter et al, 1991; Mobley et al, 1996; Seoane et al, 1998; Stewart and Festin, 1995; Zurayk et al, 1995). The process of comparing results across studies (as in table 2.2), or simply assessing findings, is made somewhat difficult, as these were not necessarily designed or analysed with the purpose of obtaining elevated specificity. Encouragingly, the threshold employed in this project, if rigorous, appear in line with recent studies on a variety of themes. Criteria used by Ronsmans et al (1997) include a sensitivity of at least 50% and a specificity of 95% for estimating the prevalence of maternal morbidity. In verbal autopsies of child and adult deaths, specificities of 85% (Anker, 1997) or 90% in cases of cause-specific mortality fractions of less than 10% (Chandramohan et al, 1998) have been suggested.

9.2.2 factors related to the study design

a) case definitions

Advantages of focussing on near-miss morbidity

The focus on near-miss morbidity, rather than overall morbidity, is an important factor in explaining the good congruence between women's reports and medical data compared to other studies. While it was not possible to demonstrate the influence of severity on women's recall for all complications, the overall accuracy of women's reports was in all likelihood 'pushed up' by focussing on the severe end of the condition as well as the quality of the information noted in hospital records probably improved (chapters 1 and 2). Furthermore, as information indicative of severity was not readily available in case-notes and logbooks, strict definition criteria were prepared (chapter 3) avoiding to a large extent misclassification of cases which could have hindered the validity results (in other words decrease the sensitivity and the speficificity of the questionnaire). Other maternal morbidity validation studies appear to have been less rigorous or precise in this respect (Ronsmans et al, 1997; Seoane et al, 1998; Stewart and Festin, 1995) or inclined to make use of the broad clinical diagnosis such as "prolonged labour", "septic infection" (Amoaful et al, 1996).

How gold is the gold standard?

It was necessary to be pragmatic in our case definition and make with what information we could safely obtain. The dystocia algorithm includes definitive cases of near miss (uterine rupture, uterine retraction ring, transverse lie and brow presentation) but also cases of less severity. In many of the women with cephalo-pelvic disproportion, for example the labour may not have been prolonged because a Caesarean section was done relatively early in the

progress of labour. This heterogeneity in severity will certainly affect the apparent validity of the questionnaire findings (section 9.2.3). Information on the general condition of the parturients and whether it was worsening could have helped us deciding whether the case was a near-miss but were not available.

Heterogeneity of cases also affects haemorrhage and infections to some extent. Perhaps no single question could capture such heterogeneous groups?

Information noted in medical records was used to establish a gold standard to assess the validity of women's reports. Errors in diagnosis, recording of procedures or events and during abstractions, affect the value of this criterion. Documentation of such errors abound in the literature for both developed and developing country settings (Bryant et al, 1989; Cartwright et al, 1987; Danel et al, 1996; Hewson and Bennet, 1987; Joffe and Grisso, 1985; Oakley et al, 1990). For example, in Ecuador, Danel and colleagues (1996) discovered that recorded discharge diagnoses were often irreconcilable with problems and treatments noted in obstetric records. Critical information was frequently missing, such as the type and spontaneity of placental delivery unregistered in 36-38% of records. Common problems encountered in the literature include: (1) no mention of a condition in medical records - although this is usually interpreted as the woman not having the condition, other explanations include errors of omission or the problem not deemed worth recording by medical staff (Bryant et al, 1989; Martin, 1987; Olson et al, 1997); (2) errors in recording - for example, several studies found discrepancies between mother and medical records on sex of the infant (Danel et al, 1996; Oakley et al, 1990); (3) evidence of poor medical assessment and local diagnoses preferences - relevant examples include preference for certain values or threshold of blood loss and birthweight, variations in local definitions for the start of labour, some conditions more likely to be mentioned (diagnosed?) in medical records than others (Hewson and Bennet, 1987; Martin, 1987).

A subset of medical records (8%) selected at random was extracted twice by two different research physicians for quality control. This shows very good agreement between extractors for overall diagnosis, but problems on some items of information, particularly recording of fever, which materialized in several places[4] in the medical records. In the case of infection, it is likely that diagnosis label rather than temperature was used by the extractors as a fundamental selection criteria given the large number of women who do not have the required level of temperature in the sample (chapter 7). A comparable phenomenon was documented by Cartwright and colleagues (1987), who observed that extractors tended to rely on summary diagnoses.

Overlap between cases

Health problems often present in clusters. A fifth of all morbidity cases in the sample had more than one complication. The degree to which respondents suffering from concomittant diseases choose to report on all symptoms for all disease categories, or to lay emphasis on one particular symptom, is uncertain.

In this study, infection was very often not found on its own (73%) but generally with dystocia. Most of the infections occurred after a Caesarean section. Post-caesarean section morbidity influenced infections reporting to a very large extent, as one of the most valid questionnaire items included information on wound infection. This means that our results cannot be extrapolated to sepsis in a community where women do not go to hospital.

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[4] In the diary of patient progress and on the monitoring sheet.

Limited spectrum of complications

On the other hand, the study purposely considered a limited and hence artificial spectrum of obstetric complications. An unrealistic lack of overlap between symptoms has been created. For example, the identification of puerperal infection cases would have been embroiled by the presence of women with other severe infectious diseases such as malaria or tuberculosis. The same would have been true for the identification of haemorrhage cases if taking into account diseases such as severe anaemia (considered as a 'blood disease' by the population). In child health, Quigley et al (1996) attribute the poor performance of verbal autopsy questionnaires on acute respiratory diseases and meningitis to an overlap of symptoms with malaria. Our results probably enhance the estimates of the 'true' sensitivity and specificity of the questionnaire.

b) selection bias

Selection biases were considered at length in chapter 3. There are three types of selection factors which could affect the validity of the results: (i) the adequacy of a hospital sample for extrapolating findings to the general population of women who give birth; (ii) the selection within the hospital sample of women for whom an address could be found; (iii) the comparability of women with and those without complications. It is difficult to predict fully how these factors affect the sensitivity and specificity of the questionnaire. However, hypotheses will be put forward in the following discussion.

While attendance to health services is high in South Benin, the women who visited the three participatory hospitals differed from women not attending such hospitals. They were generally young, inhabiting urban areas and showed signs of being comparatively well-off. It is also very likely that they had a good comprehension of medical matters (in a western sense), either because of the increased health awareness which led them to seek specialised care or because

they had been told of their diagnoses in the hospital and were able to observe the management of their illness. This exposure in the sample to the medical paradigm can only improve the sensitivity, and maybe specificity, of the questionnaire

The selection of women with good addresses exacerbated the socio-economic bias in the hospital sample. Women in the 'normal' comparison group were also older and better off than women with morbidity. Overall, socio-economic and demographic variables appear to have relatively little statistical influence on validity statistics except for the positive leverage of school attendance on specificity results for dystocia and infections. We must emphasize however that the sample was very small for this type of analysis. In published morbidity surveys, it is clear that the level of reported morbidity varies with respondents' individual characteristics, and often rises with income (Kroeger, 1983; Murray and Chen 1992). If anything, this would point to increased sensitivity of recall among women with high socio-economic characteristics.

Of all the selection factors, the consequences of the different profiles of healthy women and women with morbidity are probably the most difficult to assess. Recall differentials between the groups are likely to exist. While healthy women, with a higher socio economic profile and health awareness, may report more problems, the reverse is probably true for referred women with complications, thus lessening both sensitivity (which is obtained from women with complications) and specificity (obtained from healthy women or women with less morbidity) of the questionnaire.

Loss to follow up, although more pronounced among women with severe morbidity, did not appear to introduce a significant bias except for demographic variables (age, number of living children). The very small refusal rate encountered once the women were found was gratifying.

9.2.3 factors related to the survey methodology

a) questionnaire

With the benefit of hindsight, we probably stayed too close to the published structured questionnaires, curtailing creativity. In the case of dystocia, the question on duration of contractions longer than a day and a night is ambiguous (a day can be interpreted as 24 hours or time of daylight), and measuring duration using days of the week and time of the day (morning, afternoon, evening and night) imprecise. Even the more precise questions on actual duration (contractions longer than 12 hours or 24 hours) could not be entirely successful, for several reasons. In hospitals, duration is often measured from the time of admission, and progress from the dynamics of cervical dilatation and descent of the presenting part. Women on the other hand also consider the physical symptoms they may have experienced before arrival. When a problem such as a transverse lie is diagnosed in labour, a therapeutic intervention will curtail the progress of labour. Thus some of the women in the sample may not have experienced prolonged labour, particularly among the near-miss cases. Lastly, the notion of time is totally different in societies where the use of watches is not the norm. Altogether, questions on duration could not function well for these women. The heterogeneity of cases meant that a single question could not identify all women. Questions on the nature of labour such as obstructions or difficulties passing the baby through might have performed better than questions on duration *per se* for identifying near-miss cases.

Asking questions on fever was debatable from the start. Fever is the main symptom of puerperal infection but also common to many infectious conditions. A recent cross-sectional study in Cameroon has attributed the very poor specificity (45%) and moderate sensitivity (74%) of a fever question asked to adult users of services, to the low use of thermometers (Einterz

and Bates, 1997). On the other hand, puerperal infection is a condition of public health importance because of its very high case-fatality rates and prevalence.

While we were successful in incorporating a local disease's concept for eclampsia, focus group discussions failed in finding out adequate taxonomy for other complications. The questionnaire is very much a 'western' product searching for 'western' illnesses.

Finally, from an analysis viewpoint, the inclusion of an essential sign at the beginning of three of the complication sections, with an automatic skip to another section if the response to this question was negative, limited us in testing a sufficient set of combinations of questions.

b) interviewers

Female lay interviewers were employed for the study, almost all with a university degree in social sciences. We assumed that they would have the necessary open-mindedness to listen and faithfully transcribe women own formulation of events. Health workers have been enrolled in the context of verbal autopsy surveys. However their use has been debated at length as some investigators are concerned that health workers would be tempted to interpret answers and thus bias the collected information and curtail the repeatability of the interview-based diagnoses (Chandramohan et al, 1994; Gray et al, 1990; Ronsmans and Campbell, 1995). They are also a less practical option for future cross-sectional surveys as costly. This study provides strong evidence that some interviewers were more effective in eliciting positive responses from women, maybe more emphatic. Previous experience of interviewers influenced reporting of eclampsia, haemorrhage and infections symptoms. Interviewers in the experienced category were women who participated in other previous surveys but also older women who had

experienced a pregnancy and/ or a birth. However, recruiting experienced women willing to conduct field work in rural areas is not easy. There will always be variation across interviewers.

9.2.4 summary

The quality of the case definition, the focus on severe complications, the details of information on the complications, the use of well-thought out analytical tools and the high participation rate are the main methodological strengths of our study. It is unlikely that much better results could be obtained with this type of study design, except perhaps for different questions, particularly on dystocia. Retrospective hospital selection engendered biases but was unavoidable for obtaining a sufficiently large sample and accurate reference diagnoses. If anything, selection biases probably enhanced our results towards higher sensitivity and specificity.

9.3 COMMUNICATION FACTORS IN RESULTS INTERPRETATION

Beyond the study design and survey methodology difficulties, mis-reporting could occur for three reasons: (i) the respondent does not know; (ii) the respondent does not wish to report what she knows; (iii) reporting is impaired by the differences between clinical and lay perspective on ill-health, but what the woman says is a reality. These three reasons are all present in this study.

9.3.1 the respondent does not know

Medical staff may have provided the patient and her family with insufficient information on the complication or used a medical terminology which was poorly understood. The husband of a

selected eclampsia case (1033) who had died told us: "*... I was not informed of the cause or the reason for the fit. She again had a similar fit 10 days after our return from hospital and it is on our way back to the hospital that she died.*" What is more, because women with near-miss morbidity often suffered from inpaired consciousness, their reports rely on descriptions done by others. When searching for a young eclampsia case, a mother informed us that her daughter had a limited comprehension of her illness as her family had not told her what happened. Indeed, her daughter responded mostly with 'don't know'. These are noteworthy explanations for the relatively disappointing sensitivity of questions on eclampsia and ruptured uterus, two complications with spectacular symptoms (convulsions) or sometimes consequences (hysterectomy and foetal deaths). Women's limited knowledge and understanding of concepts and procedures is another factor which cannot be fully explored here. The influence of education on dystocia and infection reporting is nevertheless notable.

9.3.2 the respondent does not wish to report

There may be conscious misreporting of morbidity to achieve certain goals (Murray and Chen, 1992), for example over-reporting to get attention or under-reporting to get less attention. There was anecdotal evidence of the latter in our study. Women who had a Caesarean section, or other complex medical or treatment procedures which incurred high costs, often displayed suspicion and reluctance in participating in the interview. An entire village hid their women because of worries that the survey team had come to collect debt money. Intense negotiations were conducted to assure villagers of the contrary.

There is ample epidemiological evidence from western studies that when a child is born alive and healthy, women quickly put aside disagreeable memories surrounding the birth. However, a similar phenomenon could take place when the child is dead. One of the respondents would

not discuss the index pregnancy because her child was stillborn. She chose instead to narrate her subsequent pregnancy which had a happier ending.

Culturally, it can also be unacceptable for individuals to express illness and pain. Sargent (1984) noted that Bariba women in Benin (only a very small proportion of our sample -1%) rarely disclose labour pains as it would bring shame to them and their family. During the pilot study, a group of women reported that although they had regular contractions, these were not painful. As a result, references to 'painful' in questions on contractions were omitted.

9.2.3 differences between clinical and lay perspectives

There may also be unconscious misreporting because of the respondents' different perspective on disease. To define disease, western medicine measures physiological changes according to pre-established 'objective' criteria, for example amount of blood loss in the case of haemorrhage and progress of cervical dilation in the case of dystocia. Individuals define ill-health in terms of abnormal physical symptoms and how it affects them in their normal activities and relation with others (Helman, 1990). A woman, labelled as 'normal' by medical standards, is not necessarily 'wrong' when she reports too much bleeding or too long labour, as she may have suffered unpleasant physical consequences from these. Bleeding and labour are a constant feature of vaginal delivery, and abnormality or disease is a question of threshold for both the woman and the medical profession.

9.4 WAY FORWARD IN TERMS OF MORBIDITY INFORMATION

The Benin results are encouraging, but evidence elsewhere throw doubts on the applicability of this methodology.

Survey programmes using model questionnaires in cross sectional surveys show wide differences in self-reported prevalence across countries, and sub-populations. Although the temptation is there to interpret these differences as reflecting a true variation in disease prevalence and health service use or accessibility, a more likely explanation is linked to the unrobustness of the methodology for measuring biomedically defined morbidity.

Results from studies in Bolivia, Ecuador, Ghana, Indonesia, Philippines, and in Benin were drawn together at a meeting in 1996 in Washington organised by MotherCare and DHS in a consensus statement (appendix 5). This consensus indicates that estimation of population-based prevalence through national cross-sectional surveys was unlikely to be valid because of insufficient specificity for most complications in most settings.

This section will consider the remaining avenues, in terms of morbidity information, for Safe Motherhood programmes.

9.4.1 can validation results be used to adjust the estimated disease prevalence in a subsequent survey?

- **not with this type of design because of hospital case-mix**

A possibility would be to use the sensitivity and the specificity of a questionnaire obtained during a validation study to adjust the prevalence in a survey. This can be done by applying the following formula (Kalter, 1992; Maude and Ross, 1997):

True prevalence = (estimated prevalence + specificity -1) / (sensitivity + specificity -1)

A similar approach was used in Egypt to adjust the estimate of indirect obstetric morbidity (Egyptian Fertility Care Society, 1995). This adjustment assumes that the sensitivity and the specificity of a questionnaire administered in a survey context are identical to the results from the validation study. It is therefore applicable when the morbidity pattern in the population of interest corresponds to the pattern in the validation study sample. As indicated earlier, the disease mix in a population influences the sensitivity and specificity of the instrument and the degree of misclassification of women with the condition of interest.

Unfortunately, such adjustment is usually not an option for direct obstetric morbidity. Validation studies of direct obstetric morbidity use hospital samples, and hospital samples generally have a different disease mix from that in the general population (section 9.2.2). This is either because they focus on certain diseases, or the type of cases presenting in the hospital are generally more severe or acute. Furthermore the samples often suffer from selection bias which influence reporting.

9.4.2 is there still a role for obstetric recall questions in cross sectional surveys?

a) to assess care seeking behaviour

- **no because of misclassification**

Surveys are also an opportunity to assess women's utilisation, demand and perceptions of health services. Information on women's utilisation of maternity services is flourishing (Stewart et al, 1997) but is not necessarily indicative of the burden of morbidity as this utilisation is

'preventative' in essence[5] . Some investigators have proposed the assessment of services use in relation to perceived morbidity (MotherCare/DHS consensus statement (1997), appendix 5). Uzma and colleagues (1999), for example, quantified health care seeking in relation to obstetric and reproductive perceived illnesses during the postpartum period. Qualitative data collected through focus group discussions with women, and unstructured interview with most frequently used providers brought additional information on the actual process of seeking care. The usefulness of this information for informing on 'coverage' of curative services is however open to question as illustrated by Marshall et al (1996) in an analysis of an Indonesian dataset. Although the proportion of women with self-reported symptoms suggestive of complications needing care was estimated at 49% overall and 15% in rural areas, the meaning and pertinence of this data seemed unclear given the uncertainty surrounding the validity of self-reported complications[6]. The statistical concepts of positive predictive value and negative predictive value are useful for explaining this further. Positive predictive value is the proportion of women correctly labelled as having the condition by the interview-based diagnosis. Negative predictive value is the proportion of women correctly labelled as not having the condition by the interview-based diagnosis. Their value is strongly related to the prevalence of the condition. The less common the condition, the higher the proportion or number of women incorrectly diagnosed with the condition by the questionnaire, and the higher the proportion of those accurately identified as normal. It follows that measures of coverage of care among women with

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5 In developed countries, service use can be seen as an approximation (although incomplete) of the size of the problem for pathological conditions where hospitalisation is imperative or a sign of severity(Donaldson and Donaldson, 1993). This could be the case for near-miss conditions as will be discussed later in this section and is basically the strategy used by Bouvier-Colle and colleagues (1998) in their prospective study.

6 In this particular instance, validation results of the study reported by Ronsmans et al (1997) were used to deduce that these findings probably underestimate the true coverage of complications. This is related to the lack of specificity. The underestimation was put as 10 percent for the rural calculation of 15% coverage.

self-reported complications (as commonly done in the DHS context) become meaningless as many of these women are false positives.

b) for other purposes

- **yes, for indirect obstetric complications, chronic ailments, and serious antepartum events**

Individual questionnaires combined with health examination or laboratory components, have obtained useful population-based prevalence or incidence data when concentrating on chronic or indirect obstetric morbidity, such as anaemia (Marshall et al, 1996; Levene et al, 1999) sexually transmitted diseases in pregnant women (Wawer et al, 1999); urinary tract infections (Bulut et al, 1997), high blood pressure (WHO, 1988), minor postpartum ailments (Ransjo-Arvidson et al , 1998) or other chronic or long term morbidity such as malnutrition, prolapse or fistula (Bulut et al, 1997; Egyptian Fertility Care Society, 1995). As this type of investigation is costly, they are often conducted within the context of randomised control trials evaluating single interventions rather than prevalence surveys. This combination of methods is particularly useful when they clearly complement each other. For example, a study in Kenya supplemented quantitative data on haemoglobin levels in a sample of women attending antenatal care with subsequent self-reports of physical, psychological and social consequences. The main objective was to assess the impact of anaemia on pregnant women (Levene et al, 1999).

9.4.3 would it be more useful to ask questions on general health status?

- **maybe but pertinence remains unclear in safe motherhood context**

Acknowledging that surveys assess perceived ill-health rather than biomedical indicators, a logical step would be to abandon the development of the symptoms-oriented questionnaire in favour of a focus on general health status and quality of life. The anthropological field has long established that individuals rate their health as a function of their ability to fulfil their role in society as much as their perception of physical changes in bodily functions and pain[7] (Helman, 1990). In high income countries, there is increased dissatisfaction with clinical data, whether in the context of health need assessment or clinical trials, and a concomitant interest in complementing these with subjective health status measurement (Jenkinson, 1994). A very large number of disease or condition-specific health-related quality of life questionnaires have been validated[8] and published in thick volumes. Bowling (1994) for example reviewed more than 200 such questionnaires[9]. Typically, this type of instrument is used to assess acceptability or satisfaction with competitive treatment or for screening mental distress. Several 'general health status' questionnaires have also been validated and applied in population surveys in Europe and the United States (Jenkinson and McGee, 1998). These questionnaires can be used in healthy populations as well as for a very wide range of conditions. They focus on dimensions such as general health, cognitive functions, mental health, emotional state, physical functions, pains and discomfort, life satisfaction, social supports and functional ability

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[7] This roughly corresponds to the concept of functional ability that medical sociologists seek to evaluate.

[8] Because they do not try to measure disease, these questionnaires are not validated against a biomedical gold standard but for face (relevance of questionnaire), content (comprehensiveness of questionnaire) and construct validity (how much results reflect key hypotheses underlying measurement, in other words whether these show an expected pattern) (Bowling, 1997).

[9] None of these are on pregnancy-related morbidity.

(Jenkinson and MCGee, 1998). As for disease-specific quality of life questionnaires, they use rating scales and often combine responses to questions into one or several summary indicators.

Although without doubt helpful for priority setting (among interventions or types of services from the patient perspective), the robustness of these instruments with respect to reliability and sensitiveness to change is not yet well established (Ziebland, 1994). In high income countries, health status measurement is advocated on the premise that medical interventions aim at improving of patients' quality of life, in place of the simple alleviation of disease. Low income countries do not have these objectives yet, because of the minimal performance of curative services, resources constraints, the scale and the severity of the conditions of interest, and the relative importance of acute conditions. All these factors apply to safe motherhood with its sometimes overwhelming focus on maternal deaths and complications.

Health status measurement is certainly an area of growth for future health interview surveys, but instruments are not yet available for developing countries[10][11], and until the necessary developmental work is done, the relevance of these indicators will remain unclear for safe motherhood needs assessment - although many would argue that a shift in focus on women's perspectives can only be beneficial to 'shaping' activities.

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[10] Developing a valid 'health status' instrument for maternal health would first demand systematic research on the various dimensions of pregnancy, its positive aspects and negative consequences (on health and life), and the factors that cause it to be 'good' or 'bad'. It is remarkable how little information exists on these issues in developing countries.

[11] A group at WHO has embarked on the design and testing of instruments for measuring health status as a basis for policy making in low income countries (Ritu Sadana, personal communication)

9.4.4 are there other means by which to assess the incidence of obstetric complications?

a) longitudinal studies in special populations

- **yes, where health service coverage is high**

Longitudinal studies of direct obstetric complications can be done in population surveillance areas, or where health services coverage is very good, but suffer the same difficulties in obtaining biomedical data as cross-sectional surveys in other areas. Bouvier-Colle and colleagues (1998), for example, conducted a longitudinal study in seven towns in four African countries with several contacts during pregnancy, at delivery and during the postpartum. A very large proportion of the sampled women (80%) delivered in a health structure and information on hospital admissions for direct obstetric conditions was supplemented by self reports of complications during pregnancy and at delivery or by interviews with traditional birth attendants. This study established that the magnitude of severe morbidity ranged from 3% (Bamako in Mali) to 9% (Saint Louis in Senegal)[12]. It should be emphasized however, that this methodology is only applicable in a context where there is high service use as it quantifies the amount of hospital complications. Typically, the frequencies of self-reported 'pathology' during pregnancy presented strong national characteristics varying from 46% in Abidjan to 18% in Niamey (Niger)[13], which can only be explained by a variety of biomedical and cultural considerations.

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12 Interestingly, severe morbidity was not really defined and in general, hospital admission was taken to represent severity. It is uncertain to what extent varying case definition used by health providers affected the results.

13 The authors interpret this by differences in morbidity patterns in relation to malaria, lower back pains and vomiting. However Niamey self-reports are systematically among the lowest for the majority of symptoms.

b) use of hospital data

- **yes, when using indicators of unmet needs**

In high income countries, hospital inpatient data are repeatedly used as an indicator of morbidity (Donaldson and Donaldson, 1993). While in developing countries hospital case-load data might not be very informative on their own for drawing conclusions at population level, risk of death within diagnostic group (case fatality[14]) can be calculated, and indicators of unmet needs derived by comparing existing case load with those expected from the population covered. Suggestions for unmet need indicators include Caesarean sections for absolute maternal indications as a percentage of all births (with a minimal target level of 1%) (Belghiti et al, 1998); complications managed at health facilities as a percentage of total complications expected (with total complications expected arbitrarily being set at 15%) (Maine et al 1992; Nirupam and Yuster, 1995; WHO, 1994); and the 'over versus expected ratio' (OVER) which is calculated for easily identified conditions and with a well know incidence (breech deliveries, twin pregnancies, placenta praevia and placental abruption (Pittrof, 1997). Use of these indicators, which are all health outcome indicators in nature, has been reported for Bangladesh, India, Morocco, Nepal and Zimbabwe (Belghiti et al, 1998; Nirupam and Yuster, 1995; Pathak et al, 1998; Pittrof, 1997) The 'unmet need' approach has been particularly successful in Morocco, where it has been used for measurement as well as awareness and with the direct involvement of the district health teams in data collection and analysis (Belghiti et al, 1998). Proponents of the approach indicate that the indicators are useful for identifying geographical areas of needs and monitoring progress across time. Practical difficulties

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[14] Case fatality has been proposed as an indicator of health impact of hospital quality of care (Maine et al, 1992; WHO, 1994). However, it is best calculated by cause of obstetric complications (rather than for all obstetric complications as suggested by Maine et al, 1992) and often suffers from rarity of deaths, even in large hospitals (Campbell et al, 1997).

encountered are with the definitions of complications (different studies used different definitions for the numerator which may not fit with the denominator and impair international comparison), the hospital identification of these complications and absolute maternal indications for Caesarean section, and how to interpret results once the absolute minimum level has been reached or is being approached. For these reasons, they are not universal indicators (with the possible exception of the OVER indicator), nor do they provide robust estimates for monitoring progress over time. However, they can be extremely valuable for target setting at sub-national level, where coverage of care is minimal, and for identifying vulnerable population groups.

9.4.5 what future for the near-miss concept?

Near-miss complications can still play a major role as an endpoint for safe motherhood needs assessment. If we accept that urgent interventions are (nearly) mandatory to prevent the death of a near-miss case, near-miss hospital data can be used as approximation of the size of the severe complications at population level. A successful programme could either lead to an increase of morbidity seen at hospital level and/or a decrease in severe conditions or hospital deaths depending on the interventions. It is now well established that near-miss cases occur in larger numbers than deaths: as much as 10 times more in Benin and 5 times more in South Africa (Filippi et al, 1998; Mantel et al, 1998). Risk factors and determinants for near-miss occurrence can thus be quantified. Because some of these factors will be related to quality of care, suggestions have been made to use near-miss cases as a starting point for obstetric care audit in developing countries (Filippi et al, 1998; Mantel et al, 1998). Auditing cases of life-threatening complications which have been saved, rather than deaths, are probably less threatening to health providers, allow a more constructive approach and enable both quantitative and qualitative analysis the determinants of quality of care. Lastly, interviewing near-miss cases enables the incorporation of the women's views in quality of care, thus ensuring a comprehensive assessment of quality of care.

9.5 CONCLUSION

The evidence for caution is overwhelming against the measurement of population-based prevalence through cross-sectional survey methods. Fortunately, there are other avenues for safe motherhood assessment, such as the use of hospital data, however imperfect and patchy. Surveys will also continue to have a role to play in developing country health information systems, but with a different objective (women's priorities and perspective) and in a different format (impact of complications and pregnancy rather than symptom-based). They are, after all, the only mean of communicating with women outside health services. Our study was of a very intensive nature, with elaborate quality control and our cases were generally at the more severe end of the morbidity spectrum. One of its most useful contributions is the refinement of the near-miss concept. Our definitions have now been used in an effort to enumerate near-miss cases in Cotonou teaching hospital (CUGO) (Filippi et al, 1998). This enumeration proved very valuable in demonstrating the unthinkable amount of severe complications and raising awareness on quality of care issues. Research is now needed on the development and testing of health status measurement scales specific to pregnancy and near-miss assessment in relation to quality of care at facility level.

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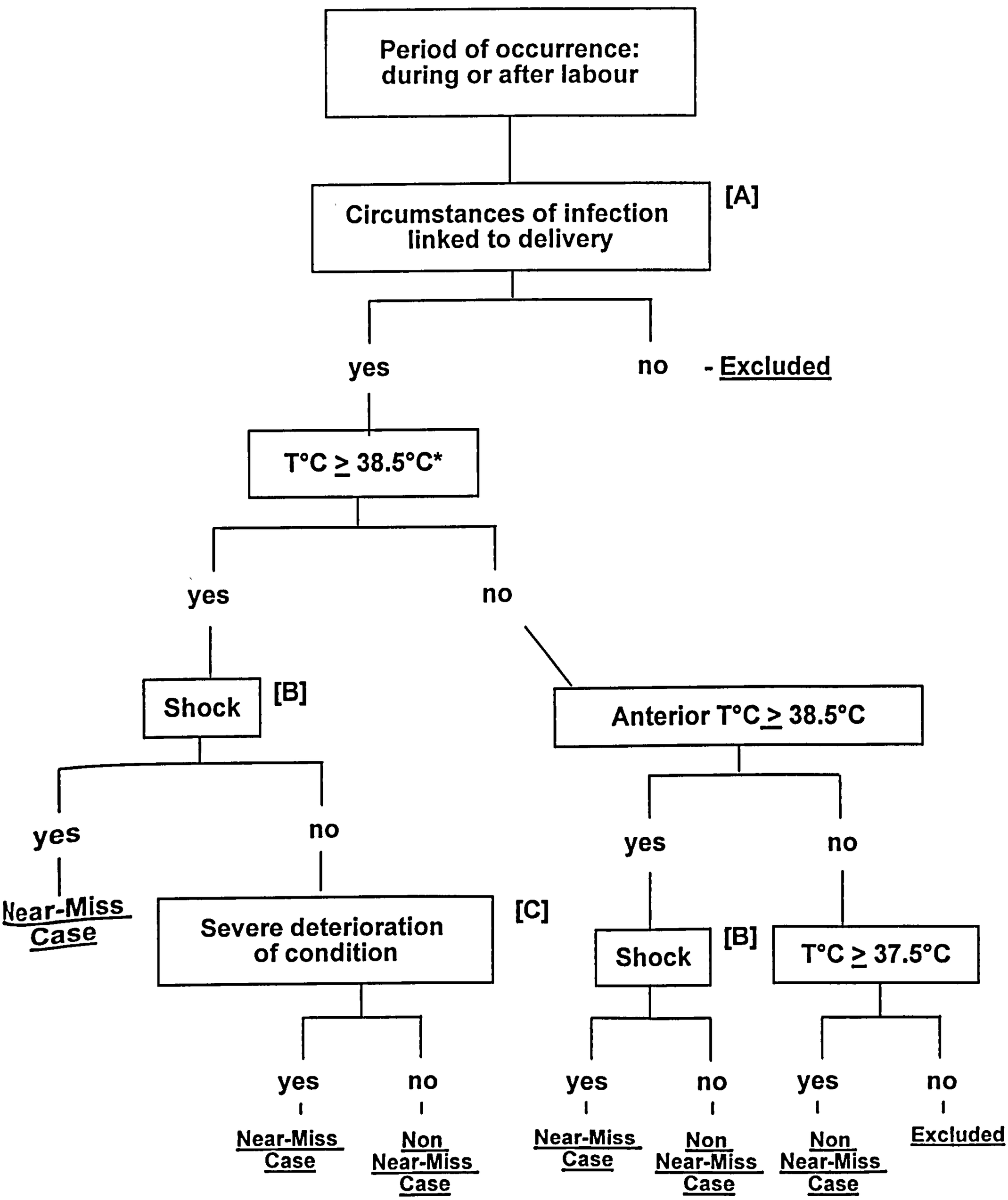
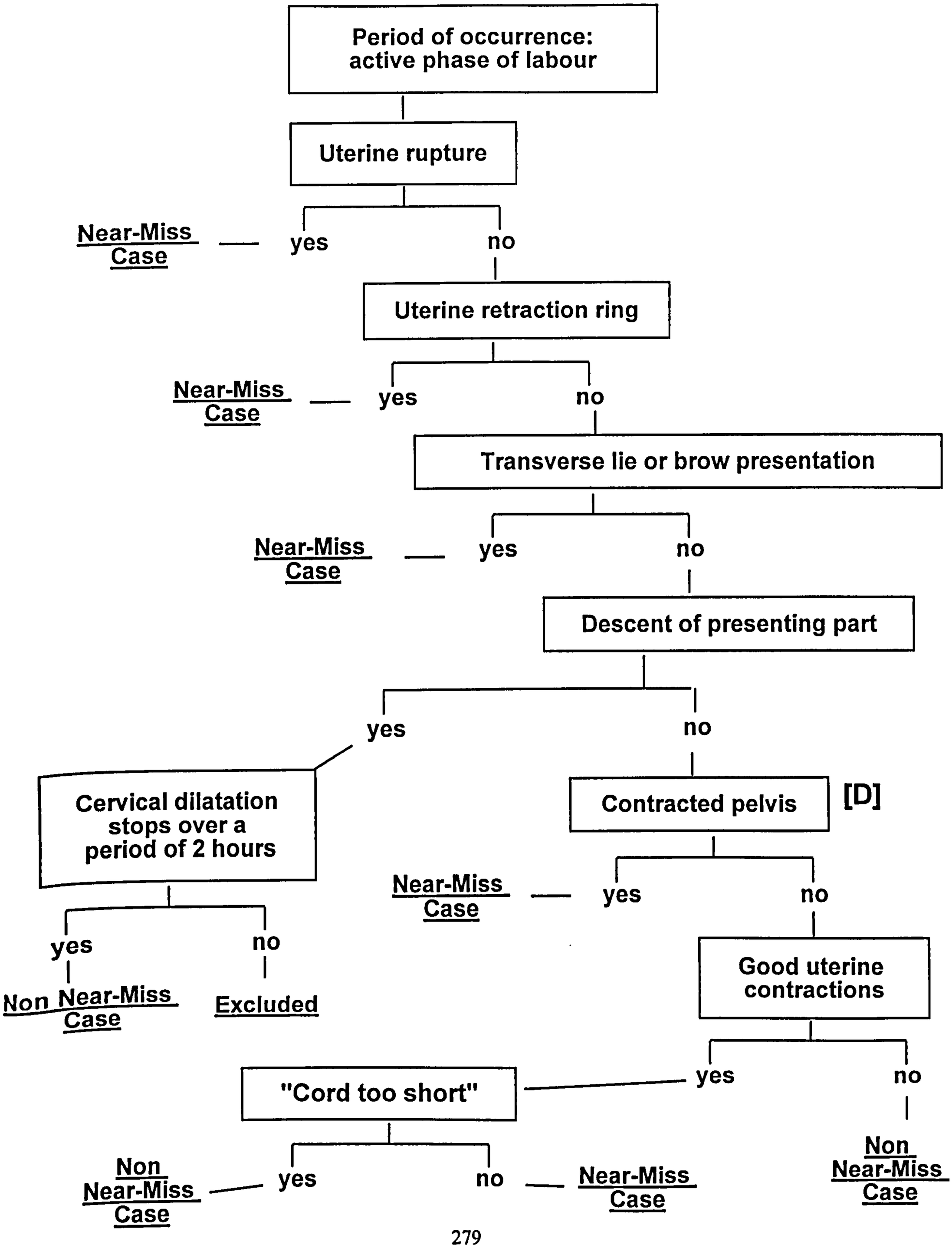
APPENDIX 1: ALGORITHMS (ENGLISH)

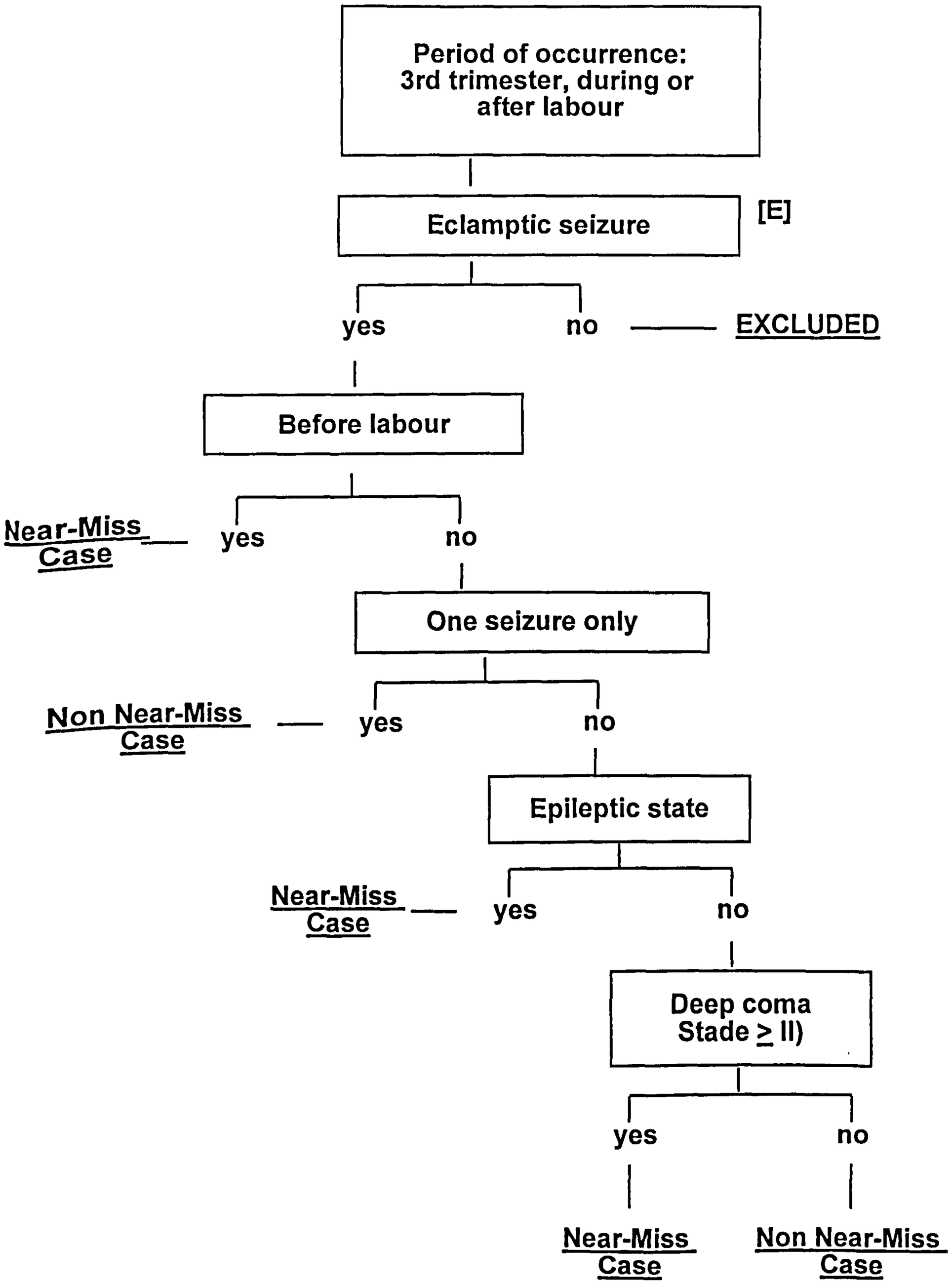
Puerperal infection of woman delivered or operated on



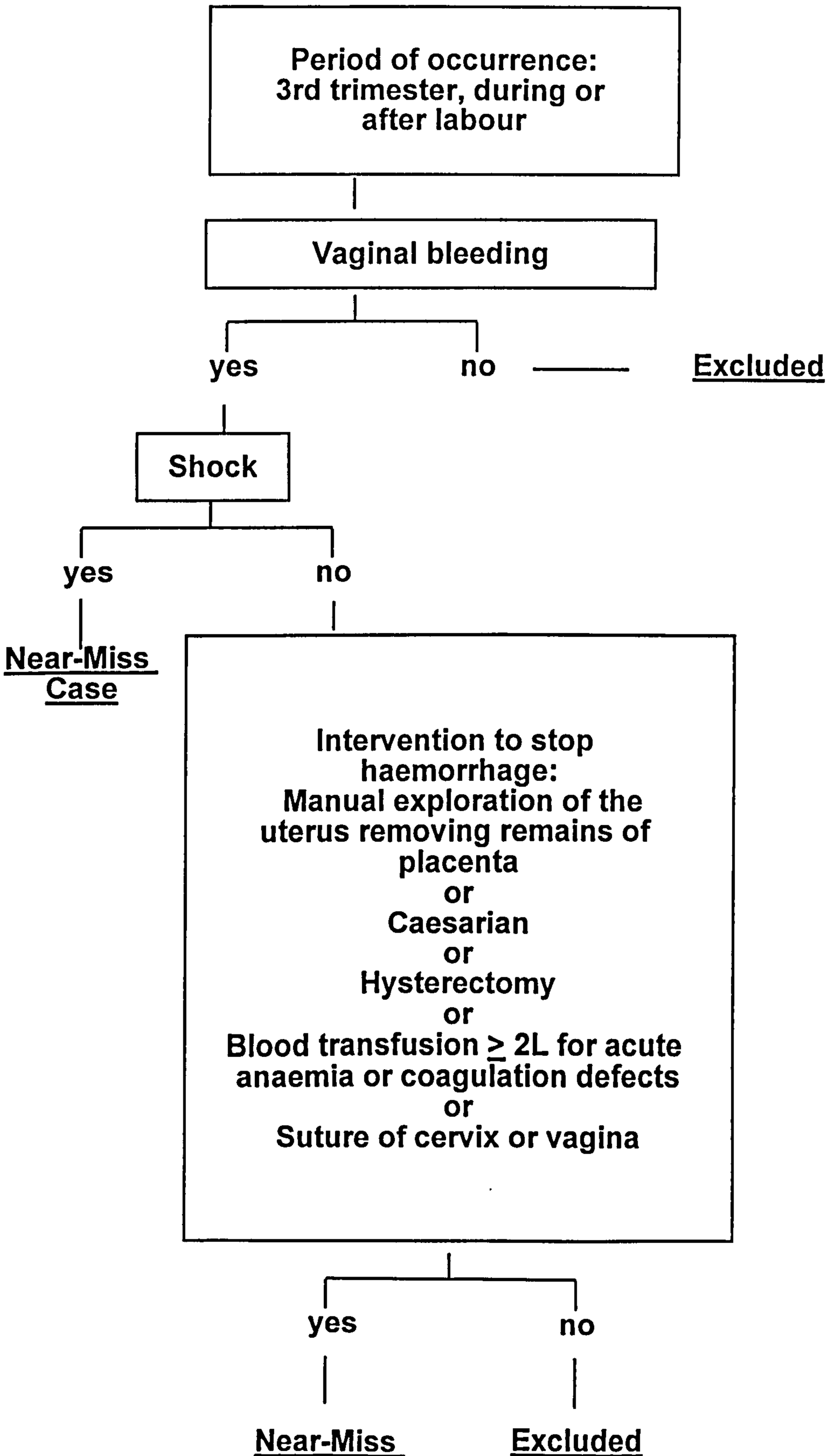
Dystocia


Period of occurrence: active phase of labour
Uterine rupture
yes
Near-Miss Case
no
Uterine retraction ring
yes
Near-Miss Case
no
Transverse lie or brow presentation
yes
Near-Miss Case
no
Descent of presenting part
yes
no
Cervical dilatation stops over a period of 2 hours
Contracted pelvis
[D]
yes
no
Near-Miss Case
yes
no
Non Near-Miss Case
Excluded
Good uterine contractions
yes
no
"Cord too short"
Non Near-Miss Case
yes
no
Near-Miss Case
Non Near-Miss Case

Eclampsia


Period of occurrence: 3rd trimester, during or after labour
Eclamptic seizure
[E]
yes
no
EXCLUDED
Before labour
yes
no
Near-Miss Case
One seizure only
Non Near-Miss Case
yes
no
Epileptic state
Near-Miss Case
yes
no
Deep coma Stade ≥ II)
yes
no
Near-Miss Case
Non Near-Miss Case

External haemorrhage



[A] **Circumstances of infection linked to delivery**

Wound infection

or

Infected laceration of lower genital tract

or

Upper genital tract infections

or

Infections following exploration of uterus or perineal suturing

or

Premature rupture of membranes (6 hours before the start of labour)

or

Infected amniotic fluid (amniotic fluid clouded or fetid)

or

Puerperal peritonitis

[B]

Shock

BP not recordable

or

BP syst < 70 mm Hg

or

2 of the following:
Very rapid pulse
or
Cold sweat
or
Acute thirst
or
Altered sensorum
(restlessness)

[C]
Severe alteration of condition

Severe dehydration

or

Altered sensorum

or

"Infected facies"

or

Severe alteration of condition

[D]

Contracted pelvis

2 of the 3 following elements:

Prominent sacral promontory

or

Inominal lines followed > 2/3

or

Prominent ischial spines

or

Borderline pelvis

or

General pelvic contraction

[E]

Eclamptic Seizure

Tonic-clonic seizure

and

BP ≥ 140/90 mm Hg

and

Proteinuria > +
or
Proteinuria not mentioned
or
Oedema > +

APPENDIX 2: MEDICAL RECORD EXTRACTION FORM (FRENCH)

ETUDE SUR LES MORBIDITES MATERNELLES GRAVES

FICHE D'EXPLOITATION DES DOSSIERS

Part 1. Definition des Cas

Numéro d'identification : __/__/__/__/ Noid __/__/__/__/

A. Définition du Cas

conditions	cas (=1)	témoin (=2)	
DYSTOCIE			__/ Dys
HEMORRHAGIE EXTERNE			__/ Hem
ECLAMPSIE			__/ Clam
INFECTION DE L'ACCOUCHEE ET DE L'OPEREE			__/ Inf
GROSSESSE/ ACCOUCHEMENT NORMAL			__/ Nor

(ni l'un ni l'autre=3)

B. Résumé

C. Diagnostiques

(a)dys _____ ___/___ Diaga

(b)hem _____ ___/___ Diagb

(c)clam _____ ___/___ Diagc

(d)inf _____ ___/___ Diagd

(e)autre _____ ___/___ Diage

ETUDE SUR LES MORBIDITES MATERNELLES GRAVES

FICHE D'EXPLOITATION DES DOSSIERS

Part 2. Identification

Numéro d'identification: __/__/__/__/ | __/__/__/__/ Noid

A. Identification de la Femme

Centre de Sélection: CUGO __/ (=1) | Lagune __/ (=2) | Ouidah __/ (=3) | __/ Sel

Numéro du dossier: __/__/__/__/__/ | _/__/__/__/__ Nodo

(Lagune) Année du dossier: __/__/ | __/__Laga

Nom: _____ | Nomf

Prénom: _____ | Pref

Adresse

Carré: _____ | Carf

Quartier: _____ | Quaf

Maison: _____ | Maif

Localité: _____ | Locf

Lieu de résidence: Cotonou __/ (=1) | Pahou __/ (=2) | reste de Ouidah __/ (=3) | zones limitrophes __/ (=4) | ___/ Resf

Profession: _____ | ___/___ Prof

B. Identification du Mari

Nom: _____ | Nomh

Prénom: _____ | Preh

Adresse (si différente de la femme)

Carré: _____ | Carh

Quartier: _____ | Quah

Maison/employeur: _____ | Maih

Localité: _____ | Loch

Profession: _____ | ___/___ Proh

C. Antécédents Obstétricaux		
Age:	___/___	___/___Age
Gestité:	___/___	___/___Ges
Parité:	___/___	___/___Par
Nombre d'avortements:	___/___	___/___Avo
Nombre d'enfants vivants:	___/___	___/___Viv
Nombre de césariennes:	___/	___/Cesar

D. Durée de Séjour		
Date d'entrée:	___//___//___	___//___//___ Dent
Heure d'entrée:	___:___	__/__Hent __/__Ment
Date au 1er traitement:	___//___//___	___//___//___ D1er
Heure au 1er traitement:	___:___	__/__H1er __/__M1er
Date de l'accouchement:	___//___//___	___//___//___ Dacc
Heure de l'accouchement:	___:___	__/__Hacc __/__Macc
Date de sortie:	___//___//___	___//___//___ Dsort

E. Evacuation

S'agit-il d'une évacuation? __/ oui (=1) __/ non (=2) __/ Evac

Centre Evacuateur: _____ __/__ Cvac

Cause Evacuation: _____ __/__Causeval

Date de départ ___//___//___ ___//___//___ devac1

Heure de départ ___:___ ___/___hevac1
___/___mevac1

Y-a-t-il eu ré-évacuation? __/ oui (=1) ___/ non (=2) __/ Evac2

Si oui, Date de départ ___//___//___ ___//___//___ devac2

Heure de départ ___:___ ___/___hevac2
___/___mevac2

Centre Récepteur: _____ __/__Rvac

Cause Evacuation: _____ __/__Causevac

ETUDE SUR LES MORBIDITES MATERNELLES GRAVES

FICHE D'EXPLOITATION DES DOSSIERS

Part 3. Critères de définition de cas ou de témoin pathologique

3.1 Infection de l'accouchée et de l'opérée

Numéro d'identification:___/___/___/___		__/___/___/__ Noid
A.Période de survenue		
Avant travail d'accht, 3ieme trimestre	__/oui __/non	___/I-peri1
Travail d'accouchement	__/oui __/non	___/I-peri2
Après accouchement, < 6 semaines	__/oui __/non	___/I-peri3
B. Circonstances d'infection liées à l'accouchement		
Suppuration plaie opératoire (césarienne)	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-suppur
Lésions infectées des voies génitales basses	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9) Si oui, type d'infections: _____	___/I-basse ___/I-bastyp
Infections génitales hautes	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9) Si oui, type d'infections: _____	___/I-haute ___/I-hautyp
Interventions par voie basse	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9) Si oui, type d'interventions: _____	___/I-inter __/I-intyp
Rupture prématurée des membranes	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-RPM
Infection ovulaire	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9) Si oui, signes d'infections: _____	___/I-ovu ___/I-ovusig
Péritonite Puerpérale	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-perito
Lochies	___/ normales (=1) (dont sanguinolente & séro-sanguinolentes) ___/ fétides (=2) ___/ purulentes (=3) ___/ non mentionné (=9)	___/I-loch

C. Température ___/___/.___ c	__/__/.__ I-temp
D. Choc	
Choc: ___/oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-choc
Signes de choc:	
Tension artérielle 999.999 si non-mentionné 777.777 si imprenable	__/___/___ : __/___/___ Systolique Diastolique	__/__/__I-Sys __/__/__I-dia
Pouls filants	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-poul
Sueurs froides	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-sueu
Soif vive	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-soif
Troubles de la conscience	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-trou
E. Altération sévère de l'état général	
Altération sévère: ___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-alt
Signes d'altération de l'état général:	
Deshydratation aigue	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-deshy
Troubles de la conscience (Fonte du panicule adipeux)	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-trou2
Faciés d'infecté	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/I-faci
Autres symptômes:		___/I-autre

ETUDE SUR LES MORBIDITES MATERNELLES GRAVES

FICHE D'EXPLOITATION DES DOSSIERS

Part 3. Critères de définition de cas ou de témoin pathologique

3.2 Dystocie (période de survenue: travail d'accouchement, phase active)

Numéro d'identification: ___/___/___/___		__/___/___/__ Noid
Rupture utérine	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/ D-rup
Pré-rupture utérine	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/D-prerup
Présentation transversale	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/D-trans
Présentation de front	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/D-front
Présentation engagée	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/D-engage
Bassin rétréci	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/D-retrec
Signes de bassin rétréci		
promontoire atteint	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9) Distance en cm: __/__.__ (99.9 si non-mentionné)	___/D-promon ___/___.___ D-procm
Lignes innominées suivies sur > 2/3	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/D-inno
épines sciatiques saillantes	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/D-epin
Mention de bassin rétréci (sans autre spécification)	___/ bassin limité (=1) (=2)/ bass.général.rétréci ___/ autre (=3) ___/ non mentionné (=9)	___/D-retaut
Contractions utérines bonnes: ___/oui (=1) ___/non (=2) ___/non-mentionne (=9)		___/d-cont
Accident funiculaire: ___/oui (=1) ___/non (=2) ___/non-mentionné (=9)		___/d-funicu
Arrêt dilatation pendant 2 heures ___/oui (=1) ___/ non (=2) ___/non-mentionné (=9)		___/d-arret

ETUDE SUR LES MORBIDITES MATERNELLES GRAVES

FICHE D'EXPLOITATION DES DOSSIERS

Part 3. Critères de définition de cas ou de témoin pathologique

3.3 Eclampsie

Numéro d'identification: ___/___/___/___		__/___/___/__ Noid
A. Période de survenue		
Avant travail d'accouchement, 3ième trimestre	___/	___/E-peri
Travail d'accouchement	___/	
Après accouchement, < 6 semaines	___/	
B. Définition de la crise éclamptique		
Crise Tonicoclonique	___/ oui (=1) ___/ non (=2)	___/E-tonico
Tension artérielle (999.999 si non-mentionné)	__/___/___ : ___/___/___ Systolique Diastolique	__/__/__E-sys __/__/__E-dia
Albuminurie	___/ 0 (=1) ___/ + (=2) ___/ ++ (=3) ___/ +++ (=4) ___/ non mentionné (=9)	___/E-albu
Oedèmes maximum des membres inférieurs	___/ 0 (=1) ___/ + (=2) ___/ ++ (=3) ___/ +++ (=4) ___/ non mentionné (=9)	___/E-oede
Oedèmes généralisés	___/oui (=1) ___/non (=2) ___/non-mentionné (=9)	___/E-oed2
Crise avant le travail d'accouchement: ___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)		___/E-avant
Nombre de crises: ___/___ (77 si multiples mais nombre inconnu) (88 si état de mal; 99 si inconnu)		__/__/E-nomb
Etat de Mal: ___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)		___/Emal
Si Etat de Mal, estimation de la durée moyenne entre les crise (min): ___/___/ (99 si non mentionné)		__/__/ E-maldur
Coma prolongé: ___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)		___/E-coma
Si Coma prolongé, stade du coma: ___/1 ___/2 ___/3 (8 si pas applicable)		___/E-stade

ETUDE SUR LES MORBIDITES MATERNELLES GRAVES

FICHE D'EXPLOITATION DES DOSSIERS

Part 3. Critères de définition de cas ou de témoin pathologique

3.4 hemorragie externe

Numéro d'identification: ___/___/___/___/		__/___/___/__ Noid
A. Période de Survenue		
Avant travail d'accht, 3ième trimestre	__/oui __/non	___/ H-peri1
Durant travail d'accouchement	__/oui __/non	___/ H-peri2
Après travail d'accouchement	__/oui __/non	___/ H-peri3
B. Choc		
Tension artérielle 999.999 si no-mentionné 777.777 si imprenable	___/___/___ : ___/___/___ Systolique Diastolique	__/__/__H-sys __/__/__H-dia
Pouls filants	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/H-poul
Sueurs froides	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/H-sueu
Soif vive	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/H-soif
Troubles de la conscience	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	__/H-trou
C. Interventions pour arrêter l'hémorragie		
Y-a-t'il eu une intervention? ___/oui (=1) ___/ non (=2)		___/H-inter
Si oui, type d'intervention:		
Révision utérine	___/ oui (=1) ___/ non (=2)	___/h-revut
Révision utérine ramenant des débris placentaires	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/h-debris
Césarienne	___/ oui (=1) ___/ non (=2)	___/h-cesar
Hysterectomie	___/ oui (=1) ___/ non (=2)	___/h-hyster

Transfusion sanguine	___/ oui (=1) ___/ non (=2)	___/h-trans
Transfusion sanguine en urgence pour corriger une anémie aigue	___/ oui (=1) ___/ non (=2) nombre de litres : ___/___/.___/ ou, nombre de sachets: ___/___/	___/H-anemi __/__.__ H-anelit __/__H-anesac
Transfusion sanguine en urgence pour corriger des troubles de la coagulation	___/ oui (=1) ___/ non (=2) nombre de litres : ___/___/.___/ ou, nombre de sachets: ___/___/	___/H-coagu __/__.__ H-coalit __/__H-coasac
Autre type d'intervention	___/ oui (=1) ___/ non (=2)	___/H-inter2

D. Cause de l'hémorragie

Placenta praevia	___/ oui (=1)	___/ non (=2)	___/H-cause1
Abruptio placenta	___/ oui (=1)	___/ non (=2)	___/H-cause2
Retention placentaire	___/ oui (=1)	___/ non (=2)	___/H-cause3
Atonie utérine	___/ oui (=1)	___/ non (=2)	___/H-cause4
Lésions du col	___/ oui (=1)	___/ non (=2)	___/H-cause5
Autre cause	___/ oui (=1)	___/ non (=2)	___/H-cause6
Cause inconnue	___/ oui (=1)	___/ non (=2)	___/H-cause7

ETUDE SUR LES MORBIDITES MATERNELLES GRAVES

FICHE D'EXPLOITATION DES DOSSIERS

Part 4. Examens

4.1 Examen général à l'entrée

Numéro d'identification: ___/___/___/___		__/___/___/__ Noid
Entrée par rapport à l'accouchement	__/ pendant grossesse (1) __/ phase latente (2) __/ phase active (3) __/ apres accouchement (4)	___/gen-entre
Etat général	__/ bon (=1) __/ altéré (=2) __/ altéré sévère (=3) __/ autre (=4) _____ __/ non mentionné (=9)	___/gen-etat
Etat neurologique		
Coma	__/ oui (=1) __/ non (=2) __/ non mentionné (=9)	___/gen-coma
Si oui, stade du coma:	/1 /2 /3	___/gen-stad
Perte de conscience	__/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/gen-cons
Convulsion	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/gen-conv
Agitation	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/gen-agit
Autre		___/gen-aut
Etat de Choc	___/ oui (=1) ___/ non (=2) ___/ non mentionné	___/gen-choc
Muqueuses	___/ colorées (=1) ___/ peu colorées (=2) ___/ trés pales (=3) ___/ non mentionné (=9)	___/gen-muq
Température	__/__.__ (99.9 si inconnu)	__/__.___ gen-temp
Tension Artérielle (999.999 si non mentionné) (777.777 si imprenable)	___/___/___ : ___/___/___ Systolique Diastolique	__/__/___ gen-sys __/__/__g-dia
Pouls fréquence	___/___/___ per minute (999 si inconnu)	__/__/__ gen-poul

ETUDE SUR LES MORBIDITES MATERNELLES GRAVES

FICHE D'EXPLOITATION DES DOSSIERS

Part 4. Examens

4.2 Examen obstétrical

Numéro d'identification: ___/___/___/___		__/___/___/__ Noid
Terme de la grossesse à l'entrée	___/___ mois (99 si non mentionné) (88 si entrée après accht)	__/__Ex-term
Hauteur utérine	___/___ cm (99 non mentionne) (88 entrée après accht)	__/__Ex-haut
Durée du travail avant l'entrée	__/__ heures (99 si non mentionné) (88 entrée avant accht)	__/__Ex-dur
Bassin rétréci	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/Ex-br
Si en phase de travail à l'entrée:		
Cerclage	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/Ex-cercl
Col effacé	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/Ex-col
Dilatation cervicale	___/___ cm (99=non mentionné)	___/___Ex-dil
Présentation	___/ céphalique (=1) ___/ siège (=2) ___/ transversale (=3) ___/ autre (=4) _____ ___/ non mentionné (=9)	___/Ex-pres
Engagement	___/ mobile (=1) ___/ fixe (=2) ___/ engagé (=3) ___/ non-mentionné (=9)	___/Ex-eng
Intensité des contractions utérines	___/ faible (=1) ___/ normales (=2) ___/anormalement intense(3) ___/ non-mentionné (=9)	___/Ex-convu
Partogram présent	___/ oui (=1) ___/ non (=2)	___/Ex-parto

Si accouchement, type d'accouchement:		
non-assisté	___/ oui (=1) ___/ non (=2)	___/Ex-typ1
naturel	___/ oui (=1) ___/ non (=2)	___/Ex-typ2
antispamodique	___/ oui (=1) ___/ non (=2)	___/Ex-typ3
utéro-tonique	___/ oui (=1) ___/ non (=2)	___/Ex-typ4
RAM	___/ oui (=1) ___/ non (=2)	___/Ex-typ5
forceps	___/ oui (=1) ___/ non (=2)	___/Ex-typ6
ventouse	___/ oui (=1) ___/ non (=2)	___/Ex-typ7
épisiotomie	___/ oui (=1) ___/ non (=2)	___/Ex-typ8
césarienne	___/ oui (=1) ___/ non (=2)	___/Ex-typ9
embryotomie	___/ oui (=1) ___/ non (=2)	___/Ex-typ10
non-mentionné	___/ oui (=1) ___/ non (=2)	___/Ex-typ99
Délivrance (ne s'applique pas aux césariennes)		
Délivrance spontanée	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/Ex-spon
Si délivrance spontanée, Délivre complet?	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/Ex-del
Sinon, rétention placentaire?	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/Ex-ret
Si rétention placentaire, durée entre accht bébé & délivrance totale placenta	___/___/___ minutes	___/___/___ Ex-min
Pertes sanguines physiologiques Si non, notion de quantité de pertes:	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9) _____	___/Ex-perte ___/ Ex-quant
Rétraction utérine	___/ normale (=1) ___/ utér.mal-rétracté (=2) ___/ non-mentionné (=9)	___/Ex-retra
Nouveau-né 1	**Nouveau-né 2**	
___/ Vivant (=1) ___/ mort-né macéré (=2) ___/ mort-né frais (=3) ___/ non mentionné (=9)	___/ Vivant (=1) ___/ mort-né macéré (=2) ___/ mort-né frais (=3) ___/ non mentionné (=9)	___/Ex-NV1 ___/Ex-NV2
Malformation foetale: ___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9) Si oui, type:	Malformation foetale: ___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9) Si oui, type:	___/Ex-NV1ml ___/Ex-NV1tp ___/Ex-NV2ml ___/Ex-NV2tp
Poids de naissance ___/___/___/___ grammes (9999 si non mentionné)	Poids de naissance ___/___/___/___ grammes (9999 si non mentionné)	__/__/__/__ Ex-NV1gr __/__/__/__ Ex-NV2gr

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Part 4. Examens

4.3 Etat de la femme dans le service (à l'entrée ou au cours de l'hospitalisation)

Numéro d'identification: ___/___/___/___		__/___/___/__ Noid
Fiévre (>37.5c)	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/Ev-fiev
Si fiévre:		
Durée	___/___ jours	___/__Ev-fdur
Température maximum	___/___/. ___ C	__/__.__ Ev-temp
Infection pelvienne	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/Ev-inf1
Si infection pelvienne:		
Diagnostique: (ex: pelvi-peritonite, endometrite, etc)	_____ _____	___/Ev-infd1
Lochies	___/ normales (=1) (dont sero-sanguinol. & sanguinolentes) ___/ fétides (=2) ___/ purulentes (=3) ___/ non-mentionné (=9)	___/Ev-loch
Infection non-pelvienne	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/Ev-inf2
Si infection non-pelvienne:		
Diagnostiques: (ex: paludisme, pneumonie, etc)	_____ _____	___/Ev-infd2
Tension artérielle élevée (systolique > 130 ou diastolique > 80)	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/Ev-tael
Si oui, durée	___/___/ jours	___/__ Ev-eldur
Si oui, TA maximum	___/___/___ Systolique ___/___/___ Diastolique	__/__/__ Ev-elsys __/__/__ Ev-eldia

4.3 *Etat de la femme dans le service (à l'entrée ou au cours de l'hospitalisation) (suite)*

Tension artérielle basse (systolique <90)	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/Ev-tabas
Si oui, durée	___/___ jours	__/__ Ev-badur
Si oui, TA minimum	___/___/___ Systolique	__/__/__ Ev-basys
Etat de choc	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/Ev-choc
Hémorragie (perte de sang abondante)	___/ oui (=1) ___/ non (=2) ___/ non mentionné (=9)	___/Ev-hem
Si oui, cause:	_____	___/___ Ev-hemcs
Si oui, période de survenue:		
avant le travail pendant le travail aprés le travail	___/ oui (=1) ___/ (=2) ___/ oui (=1) ___/ (=2) ___/ oui (=1) ___/ (=2)	___/Ev-hemav ___/Ev-hempt ___/Ev-hemap
Altération de l'état général (déshydratation aigue, troubles de la conscience)	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/Ev-etat
Si oui, spécifications:	_____	___/ Ev-spec
Diurèse	___/ normale (=1) ___/ oligurie (=2) ___/ anurie (=3) ___/ non-mentionné (=9)	___/ev-diur
Troubles neurologiques:		
Coma Si oui, stade du coma:	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9) ___/1 ___/2 ___/3	___/Ev-coma ___/Ev-stad
.perte de conscience	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/Ev-cons
convulsions	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/Ev-convu
autre	_____	___/Ev-trou

4.3 Etat de la femme dans le service (à l'entrée ou au cours de l'hospitalisation) (suite)

Hémoglobine minimum	___/___/. ___/ (99.9 si non-mentionné)	___/___.___ Ev-hemo
Albuminurie maximum	___/ 0 (=1) ___/ + (=2) ___/ ++ (=3) ___/ +++ (=4) ___/ non mentionné (=9)	___/Ev-albu
Oedèmes maximum des membres inférieurs	___/ 0 (=1) ___/ + (=2) ___/ ++ (=3) ___/ +++ (=4) ___/ non mentionné (=9)	___/Ev-oede
Oedèmes généralisés	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/ev-oed2
Traitement reçu		
Thérapie antibiotique	___/ oui (=1) ___/ non (=2)	___/antibio
Antipaludiques	___/ oui (=1) ___/ non (=2)	___/antipalu
Uterotoniques	___/ oui (=1) ___/ non (=2)	___/ev-tonic
Si oui, lesquels?	___/ syntocinon (=1) ___/ méthergine (=2) (combinaison des deux =3)	___/ev-tonqu
Le <u>syntocinon</u> a-t-il été donné au cours du travail d'accouchement?	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/ ev-tonacc
Transfusion sanguine	___/ oui (=1) ___/ non (=2)	___/ev-trans
Si oui, nombre de litres ou nombre de sachets	___/___/. ___/ litres ___/___ sachets	__/__.__ ev-litre __/__ev-sac

ETUDE SUR LES MORBIDITES MATERNELLES GRAVES

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Part 5. Consultations Prénatales

Numéro d'identification: ___/___/___/___	__/___/___/__ Noid
Information disponible dans le dossier: ___/ oui (=1) ___/ non (=2)	___/anc-info

Si oui:

Nombre de visites anc-no ___/___ (88=pas applicable)	1	2	3	4	5	6	7	>=8
Oedemes (anc-oede) (0=1; +=2; ++=3; +++=4; pas appl.=8; nm=9)								
Albuminerie (anc-albu) (0=1; +=2; ++=3; pas appl.=8; +++=4; nm=9)								
Tension artérielle (anc-sys; anc-dia) (888/888 = pas applicable)								
Etat des muqueuses (anc-muq) (colorées=1; peu colorées=2; très pâles=3; nm=9)								

(nm = non-mentionné)

Date de la 1ère visite	___/___/___/	__/__/__ anc-date
Terme à la 1ère visite	___/___/ mois	__/__ anc-term
Evolution de la grossesse normale?	___/ oui (=1) ___/ non (=2) ___/ non-mentionné (=9)	___/anc-nor
Si évolution anormale, quels étaient les problèmes?	_____ _____ _____	___/anc-diag

APPENDIX 3: INDIVIDUAL QUESTIONNAIRE (WITH QUESTIONS TRANSLATED INTO ENGLISH)

Nota Bene: Response categories have been maintained into the original French

Centre de Recherche en Reproduction Humaine et en Démographie
London School of Hygiene and Tropical Medicine
Etude sur les morbidités maternelles graves

Individual Questionnaire

Partie 1. Woman's Identification

Numéro de la question	Question	Catégories de réponse	Skip
Noqei	Questionnaire Number	i/____/____/____	
Noid	Identification number	____/____/____/____	
i2.	Place of residence (PRECISER_____)	Cotonou.....1 Pahou.....2 reste de Ouidah...3 zones limitrophes.4	
i3.	Interviewer code	___/___	
i4.	Date of interview	____//____//_____	
i5.	Time at the beginning of the interview	_____:_____	
	ENQUETRICE: "I would like to ask you questions on you and your health".		
q101	In what month and year were you born? (ENQUETRICE: DEMANDER UN ACTE D'ETAT CIVIL)	___/___ mois NSP=97 ___/___ année NSP=97 acte état civil..1 déclaration.....2	
q102	How old were you on your last birthday?	___/___ ans	
q103	To which ethnic group do you belong? ("Autre" PRECISER_____)	Adja.....01 Sahoué.....02 Fon.....03 Aizo.....04 Tori.....05 Goun.....06 Yoruba.....07 Nagot.....08 Autre.....09 Etrangère.....10	
q104	What is your religion? ("Autre" PRECISER_____)	Catholique.....1 Protestante.....2 Autre.chretienne..3 Musulmane.....4 Traditionelle.....5 Autre.....6 Aucune.....7	
q105	Have you ever been to school?	oui.....1 non.....2→	q108
q106	For how many years did you attend?	___/___ années	

q107	What was the highest level of school attended? ("Autre" PRECISER_____)	primaire.....1 collège.....2 professionel.....3 université.....4 autre.....5 (_____)	
q108	What is your profession? (PRECISER _____)	___/___	
q109	Have you done any work for cash during the last 4 weeks?	oui.....1 non.....2→	q111
q110	What work did you do?	commerce.....1 agriculture.....2 artisanat.....3 autre.....4	
q111	Do you participate in one or several tontines?	oui.....1 non.....2→	q113
q112	What amount do you give to tontines per month? NOMBRE DE CONTRIBUTION/MOIS _____ x MONTANT _____ = TOTAL _____	___/___/___/___/___ FCFA	
q113	Are you currently married or living with a man?	oui.....1 non.....2→	q118
Q114	Are you currently living under the same roof as your husband or partner?	oui.....1 non.....2	
q115	Does your husband or partner have other spouses?	oui.....1 non.....2→	q117
q116	Altogether, how many wives has he got?	___/___ épouses	
q117	What is his profession? (PRECISER_____)	___/___	q119
q118	Are you single and living on your own, separated, divorced or widowed?	célibataire.....1 séparée.....2 divorcée.....3 veuve.....4	
q119	Who is the owner of the house where you live? ("Autre" PRECISER:_____)	couple.....1 parents.....2 beaux-parents....3 famille (autre)..4 location.....5 autre.....6 non déclaré.....7	
q120	Do you have access to transport which you could used in case of emergency at any time of day or night?	oui.....1 non.....2→	q122
q121	Which type of transport? ("Autre" PRECISER:_____)	pirogue.....1 motocyclette.....2 bicyclette.....3 voiture.....4 autre.....5	

q122	Do you have to ask permission to visit the health centre when you have a health problem?	oui.....1 non.....2→	q124
q123	From whom do you have to ask permission? ("Autre" PRECISER:_____)	mari.....1 père.....2 mère.....3 beaux parents....4 autre.....5	
q124	Who pays for health care for pregnancy and delivery in your household? ("Autre" PRECISER:_____)	elle-même.....1 mari.....2 le couple.....3 père.....4 mère.....5 autre.....6	
	ENQUETRICE: "Now I would like to ask you a few questions about your pregnancies".		
q125	How many livebirths have you ever had?	___/___ enfants nés vivants	
q126	How many stillbirths have you had, that is pregnancies which lasted more than 6 months but where the baby did not cry at birth?	___/___ enfants mort-nés	
q127	How many pregnancies have you had which lasted less than 6 months, and which ended in a miscarriage, an abortion or an ectopic pregnancy?	___/___ fausses-couches ___/___ avortements provoqués ___/___ Extra-Utérines ___/___ sans précision	
q128	ENQUETRICE: "I would like to go over the number of your pregnancies. You have been pregnant ___/___ time. Is this correct?" SI OUI, CONTINUEZ L'ENTRETIEN; SI NON, CORRIGEZ.		
q129	How many of your children born alive are still alive today?	___/___ enfants vivants	
q130	Did you have your monthly period this last month?	oui.....1→ non.....2	Par-tie 2
q131	Are you currently expecting a child?	oui.....1 non.....2 NSP.....7	

Partie 2. Maternity care

Numéro de la question	Question	Catégories de réponse	skip
	ENQUETRICE: "I would like to speak about your pregnancy of .... (date), when you were in contact with .... (service de santé)."		
q201	How long did this pregnancy last for?	____/____ mois	
q202	During the pregnancy, did you see anyone for an antenatal check?	oui.....1 non.....2→	q210
q203	Who did you see?		
	traditional birth attendant	oui....1 non....2	
	midwife	oui....1 non....2	
	doctor	oui....1 non....2	
	other (PRECISER_____)	oui....1 non....2	
q204	How many months was the pregancy when you went for the first time for antenatal care?	___/ mois	
q205	What was the reason for your first consultation? ("Autre" PRECISER_____)	confimer gross..1→ vérifier tout va bien.....2→ recevoir injections.....3→ problème de santé.....4 autre.....5→	q207 q207
q206	(Si problème de santé) What was your problem? (PRECISER_____)	___/___	
q207	Altogether, how many times did you go for antenatal care?	___/___ visites	
q208	During any of your visits:		
	did someone check your blood pressure?	oui....1 non....2 NSP....7	
	did someone check your albuminuria (sels dans les urines)?	oui....1 non....2 NSP....7	
	did someone tell you that you had anaemia and sent you for blood test?	oui....1 non....2 NSP....7	
q209	During any of your visits, did someone advise you to go to the hospital or a better equipped health centre for the delivery?	oui.....1 non.....2	

q210	Where was the baby delivered? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée .08 chez matronne....09 à la maison.....10 ailleurs.....11	
q211	Where did you plan to deliver? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée .08 chez matronne....09 à la maison.....10 ailleurs.....11	
q212	What was the exact date of the delivery? (ENQUETRICE: VERIFIEZ LA DATE SUR LE CARNET DE SANTE DE L'ENFANT)	__/__jour NSP=97 __/__mois NSP=97 __/__année NSP=97	
q213	Was the baby delivered vaginally or was a caesarean section performed?	vaginal.....1 césarienne.....2→	q215
q214	(If vaginal delivery), Were instruments used to help the baby out, or did the baby arrive by itself?	avec instrument..1→ sans instrument..2→ NSP.....7→	q218
q215	(If caesarean), Was it your first caesarean section?	oui.....1 non.....2	
q216	(If caesarean), Was the decision to perform a caesarean section taken during pregnancy or after the labour commenced?	durant grossesse..1 durant accht.....2	
q217	Were you told one of the following reasons for your caesarean section?		
	Baby too big	oui....1 non....2	
	Baby lying in bad position	oui....1 non....2	
	Small pelvis	oui....1 non....2	
	rupture of the uterus or uterus threatening to rupture	oui....1 non....2	
	Baby needed to breathe (foetal distress)	oui....1 non....2	
	Uterine (womb) muscles too weak	oui....1 non....2	
	Previous caesarean section	oui....1 non....2	
	Fits	oui....1 non....2	
	Bleeding	oui....1 non....2	
	Other (PRECISER_____)	oui....1 non....2 ___/autq217	
	no reason given/ don't know	oui....1 non....2	

q218	What was the outcome of the pregnancy?	naiss.vivante....1 mort-né.....2→ jumeaux vivants..3 jumeaux mort nés.4 jumeaux mort+viv.5	q220
q219	Is the child still alive?	oui.....1 non.....2 1 jumeau vivant..3	
q220	Have you seen anyone for postnatal care during the six weeks following your departure from hospital after delivery?	oui.....1 non.....2→	q223
q221	Whom did you see? traditional birth attendant midwife doctor other (PRECISER_____)	 oui....1 non....2 oui....1 non....2 oui....1 non....2 oui....1 non....2	
q222	Where did you go? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée..08 chez matronne....09 ailleurs.....11	
q223	Have you been pregnant again after this pregnancy?	oui.....1 non.....2→	q301
q224	How many times have you been pregnant?	___/ fois enceinte	
q225	Where did you deliver for your last pregnancy which lasted more than 6 months?	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée .08 chez matronne....09 à la maison.....10 ailleurs.....11	
q226	What was the date of the delivery?	___/___ jour NSP=97 ___/___ mois NSP=97 ___/__ année NSP=97	
Q227	Have you been hospitalised for a health problem linked to this last pregnancy or delivery?	oui.....1 non.....2	
q228	If yes, what was the problem? (PRECISER_____)	___/___	

Partie 3. Open question

ENQUETRICE: "Tell me how it went during your pregnancy, your delivery and after the delivery"

LAISSEZ L'ENQUETEE DECRIRE SA GROSSESSE AVEC SES PROPRES MOTS. N'INTERROMPEZ PAS, SAUF POUR DEMANDER SI IL Y A AUTRE CHOSE. PRENEZ NOTES DES EVENEMENTS MAJEURS LIES A LA MORBIDITE PAR ORDRE CHRONOLOGIQUE.

Summary of symptoms reported spontaneously	
q301. Bleeding of the 3rd trimester, delivery or after the delivery	oui.....1 non.....2
q302. Convulsions	oui.....1 non.....2
q303. Prolonged or obstructed labour	oui.....1 non.....2
q304. Fever after delivery	oui.....1 non.....2

q305. Other problem (SPECIFIER_____ _____ _____)	oui.....1 non.....2 ___/aut1 ___/aut2 ___/aut3

Partie 4. Eclampsia

Numéro de la question	Question	Catégories de réponse	skip
	ENQUETRICE: "Now I would like to ask you more specific questions on problems you may have encountered during your pregnancy"		
q401	At any time during your pregnancy, did someone tell you that had salts in the urine (albuminuria)?	oui.....1 non.....2	
q402	At anytime during your pregnancy did someone tell you that your blood pressure was high?	oui.....1 non.....2	
q403	Did you have oedema (maladie d'enflement) during your pregnancy?	oui.....1 non.....2-	q407
q404	Which part of your body was affected by the swellings?		
	face	oui....1 non....2	
	legs/ feet	oui....1 non....2	
	hands	oui....1 non....2	
	other (PRECISER_____)	oui....1 non....2	
	everywhere	oui....1 non....2	
q405	Did you get in touch with health services because of these swellings?	oui.....1 non.....2-	q407
q406	Where did you go? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée..08 matronne.....09 à la maison.....10 ailleurs.....11	
q407	During your pregnancy, the delivery or after the delivery, did you ever have a convulsion or fit (kaun kaun) ?	oui.....1 non.....2-	Part 5
q408	Have you ever had similar convulsions or fits when you were not pregnant?	oui.....1 non.....2 NSP.....7	
q409	When did you have your first fit during this pregnancy?	avant accht.....1 durant accht.....2 après accht.....3	
q410	Altogether, how many fits did you have during this pregnancy?	___/___ crises NSP=97	
q411	Did you lose consciousness because of these fits?	oui.....1 non.....2 NSP.....7	

q412	Where were you at the time of the first fit?	chez moi.....1- hors de chez moi.2- service/agent de santé.....3	q414
q413	(If already with health service or health staff), Which health services/ staff was this? ("Ailleurs" PRECISER_____)	CUGO.....01- Lagune.....02- Ouidah.....03- CCS Pahou.....04- autre hôpital...05- autre CCS.....06- autre maternité.07- clinique privée.08- matronne.....09- ailleurs.....11-	q423
q414	Did you get in touch with the health services because of these fits?	oui.....1 non.....2-	Part 5
q415	At what point in time was taken the decision to get in touch with the health services?	après 1ère crise..1 après 2ième crise.2 après crise >=3...3 NSP.....7	
q416	How long was it between the time the decision to consult was taken and your actual arrival at the health services?	___/___ minutes NSP=97 ___/___ heures NSP=97 ___/___ jours NSP=97	
q417	What was your first point of contact? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée..08 matronne.....09 ailleurs.....11	
q418	How did you get there?		
	pirogue	oui....1 non....2	
	motorbike	oui....1 non....2	
	bicycle	oui....1 non....2	
	car	oui....1 non....2	
	on foot	oui....1 non....2	
	ambulance	oui....1 non....2	
	other (PRECISER_____)	oui....1 non....2	
q419	Did you get immediate attention?	oui.....1 non.....2 NSP.....7	
q420	Who looked after you first? ("Autre" PRECISER_____)	matronne.....1 s-femme.....2 docteur.....3 autre.....4 NSP.....7	

q421	What care or treatment did you get?		q423edica
	medication	oui....1 non....2	
	injection	oui....1 non....2	
	perfusion	oui....1 non....2	
	caesarean section	oui....1 non....2	
	other (PRECISER_____)	oui....1 non....2-	
	none	oui....1 non....2	
	don't know	oui....1 non....2	
q422	How long was it between your arrival and your first treatment?	___/___ minutes NSP=97 ___/___ heures NSP=97 ___/___ jours NSP=97	
q423	Were you sent to a better equipped health centre?	oui.....1 non.....2-	Par-tie 5
q424	Where were you sent? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée..08 chez matronne....09 ailleurs.....11	
q425	What was your last point of contact with the health services? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée .08 chez matronne....09 ailleurs.....11	
q426	How long was it between your departure from .....(first point of contact) and your arrival at ....(last point of contact)?	___/___ heures NSP=97 ___/___ minutes NSP=97	
q427	How did you get to your last point of contact?		
	pirogue	oui....1 non....2	
	motorbike	oui....1 non....2	
	bicycle	oui....1 non....2	
	car	oui....1 non....2	
	on foot	oui....1 non....2	
	ambulance	oui....1 non....2	
	other (PRECISER)	oui....1 non....2	

q428	Did you get immediate attention?	oui.....1 non.....2 NSP.....7	
q429	Who look after you first? ("Autre" PRECISER_____)	matronne.....1 s-femme.....2 docteur.....3 autre.....4 NSP.....7	
q430	What care or treatment did you get?		
	medication	oui....1 non....2	
	injection	oui....1 non....2	
	perfusion	oui....1 non....2	
	caesarean section	oui....1 non....2	
	other (PRECISER_____)	oui....1 non....2	
	none	oui....1 non....2→	
	don't know	oui....1 non....2	Par-tie 5
q431	How long was it between your arrival and your first treatment at ... (last point of contact)?	___/___ heures NSP=97 ___/___ minutes NSP=97	

Partie 5. Bleeding during pregnancy, delivery or after delivery

Numéro de la question	Question	Catégories de réponses	skip
q501	Did you have abnormal bleeding during pregnancy, delivery or after delivery?	oui.....1 non.....2→	q524
q502	When did you get this abnormal bleeding?		
	1st and 2nd trimesters of pregnancy	oui....1 non....2 NSP....7	
	3rd trimester of pregnancy	oui....1 non....2 NSP....7	
	during delivery	oui....1 non....2 NSP....7	
	after delivery	oui....1 non....2 NSP....7	
	ENQUETRICE: SI SAIGNEMENT AU COURS DU 1er ET 2nd TRIMESTRES UNIQUEMENT PASSEZ A Q524		
q503	For how many days did it last?	moins d'1 jour...1 plus d'1 jour....2 NSP.....7	
q504	Was the bleeding not abundant, abundant or very abundant?	peu abondante....1 assez abondante..2 très abondante...3 NSP.....7	
q505	Did you lose consciousness because of this bleeding?	oui.....1 non.....2	
q506	Where were you when the bleeding started?	chez moi.....1→ hors chez moi...2→ avec service/agent de santé.....3	q508
q507	(If already in a health service or with health staff), which health service/ staff was it? ("Ailleurs" PRECISER_____)	CUGO.....01→ Lagune.....02→ Ouidah.....03→ CCS Pahou.....04→ autre hôpital...05→ autre CCS.....06→ autre maternité.07→ clinique privée.08→ matronne.....09→ ailleurs..... 11→	q514
q508	Did you get in touch with the health services because of this bleeding?	oui.....1 non.....2→	q524
q509	How long was it between your first bleeding and your decision to get in touch with the health services?	___/___ minutes NSP=97 ___/___ heures NSP=97 ___/___ jours NSP=97	

q510	What was your first point of contact with the health services? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée .08 matronne.....09 ailleurs.....11	
q511	How did you get there?		
	pirogue	oui....1 non....2	
	motorbike	oui....1 non....2	
	bicycle	oui....1 non....2	
	car	oui....1 non....2	
	on foot	oui....1 non....2	
	ambulance	oui....1 non....2	
	other (PRECISER_____)	oui....1 non...2	
q512	Did you get immediate attention?	oui.....1 non.....2 NSP.....7	
q513	Who looked after you first? ("Autre" PRECISER_____)	matronne.....1 s-femme.....2 docteur.....3 autre.....4	
q514	Were you sent to a better equipped centre because of this bleeding?	oui.....1 non.....2→	q521
q515	Where were you sent? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée .08 chez matronne....09 ailleurs.....11	
q516	What was your last point of contact with the health services? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée .08 chez matronne....09 ailleurs.....11	

q517	How long was it between your departure from .....(your first point of contact) and your arrival at ....(your last point of contact)?	___/___ minutes NSP=97 ___/___ heures NSP=97 ___/___ jours NSP=97	
q518	How did you get there?		
	pirogue	oui....1 non....2	
	motorbike	oui....1 non....2	
	bicycle	oui....1 non....2	
	car	oui....1 non....2	
	on foot	oui....1 non....2	
	ambulance	oui....1 non....2	
	other (PRECISER_____)	oui....1 non....2	
q519	Did you get immediate attention?	oui.....1 non.....2 NSP.....7	
q520	Who was the first to look after you? ("Autre" PRECISER_____)	matronne.....1 s-femme.....2 docteur.....3 autre.....4 NSP.....7	
q521	Were you provided with any of following care or treatment to stop the haemorrhage		
	a caesarean section was done to get the child out quickly	oui....1 non....2 NSP....7	
	someone gave you a blood transfusion	oui....1 non....2 NSP....7	
	someone repaired a tearing after the baby came out	oui....1 non....2 NSP....7	
	someone put his/her hands in your womb to get the afterbirth	oui....1 non....2 NSP....7	
	someone gave you an injection to stop the bleeding after the placenta came out	oui....1 non....2 NSP....7	
	other (PRECISER_____)	oui....1 non....2 ___/autq521	
	no treatment	oui....1 non....2	
	Don't know	oui....1 non....2	
q522	(if transfusion), how many bags of blood did you get in transfusion?	___/___ sachets NSP=97	

q523	How long was it between your arrival at ... (last point of contact) and your first treatment?	___/___ heures NSP=97 aucun traitemt=98 ___/___ minutes NSP=97 aucun traitemt=98	
q524	(for vaginal delivery only) how long was it between the delivery of your baby and the time when the placenta came out?	moins d'1 heure..1 plus d'1 heure...2 NSP.....7	

Partie 6. Prolonged or obstructed labour

Numéro de la question	Question	Catégorie de réponses	skip
q601	During labour, did you have regular labour pains which lasted longer than one day and one night (more than 24 hours)?	oui.....1→ non.....2	q603
q602	(If not), Did the regular labour pains last longer than 12 hours?	oui.....1 non.....2	
q603	Which day of the week did they start?	lundi.....1 mardi.....2 mercredi.....3 jeudi.....4 vendredi.....5 samedi.....6 dimanche.....7 NSP.....8	
q605	That day, did they start during the morning, the afternoon, the evening or in the middle of the night?	matin.....1 après-midi.....2 soir.....3 durant la nuit...4 NSP.....7	
q606	Which day of the week did you deliver?	lundi.....1 mardi.....2 mercredi.....3 jeudi.....4 vendredi.....5 samedi.....6 dimanche.....7 NSP.....8	
q607	Did you deliver in the morning, the afternoon, the evening or in the middle of the night?	matin.....1 après-midi.....2 soir2.....3 durant la nuit...4 NSP.....7	
q608	Did the labour pains suddenly stop after a period of prolonged and painful contractions?	oui.....1 non.....2	
q609	Did your uterus (womb) get torn because of these contractions?	oui.....1 non.....2	
q610	Where were you when the regular labour pains started?	chez moi.....1→ hors chez moi...2→ avec service/agent de santé.....3	q612
q611	(If already in a health service or with health staff), which health service/ staff was this? ("Ailleurs" PRECISER_____)	CUGO.....01→ Lagune.....02→ Ouidah.....03→ CCS Pahou.....04→ autre hôpital...05→ autre CCS.....06→ autre maternité.07→ clinique privée.08→ matronne.....09→ ailleurs.....11→	q618
q612	Did you get in touch with the health services during labour?	oui.....1 non.....2→	q627

q613	How long was it between the beginning of the regular labour pains and your decision to get in touch with the health service or health staff?	___/___ minutes NSP=97 ___/___ heures NSP=97 ___/___ jours NSP=97	
q614	What was your first point of contact with the health services? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 cliniq.privée....08 matronne.....09 ailleurs.....11	
q615	How did you get there?		
	pirogue	oui....1 non....2	
	motorbike	oui....1 non....2	
	bicycle	oui....1 non....2	
	car	oui....1 non....2	
	on foot	oui....1 non....2	
	ambulance	oui....1 non....2	
	other (PRECISER_____)	oui....1 non....2	
q616	Did you receive immediate attention?	oui.....1 non.....2 NSP.....7	
q617	Who looked after you first? ("Autre" PRECISER_____)	matronne.....1 s-femme.....2 docteur.....3 autre.....4	
q618	Were you sent to a better equipped centre to help you to get the baby out?	oui.....1 non.....2→	q625
q619	Where were you sent?	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privé ..08 matronne.....09 ailleurs.....11	
q620	What was your last point of contact with the health services? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 cliniq. privée...08 matronne.....09 ailleurs.....11	

q621	How long was it between your departure from ....(your first point of contact) and your arrival at... (your last point of contact)?	___/___ minutes NSP=97 ___/___ heures NSP=97 ___/___ jours NSP=97	
q622	How did you get there?		
	pirogue	oui....1 non....2	
	motorbike	oui....1 non....2	
	bicycle	oui....1 non....2	
	car	oui....1 non....2	
	on foot	oui....1 non....2	
	ambulance	oui....1 non....2	
	other (PRECISER_____)	oui....1 non....2	
q623	Did you receive immediate attention?	oui.....1 non.....2 NSP.....7	
q624	Who looked after you first? ("Autre" PRECISER_____)	matronne.....1 s-femme.....2 docteur.....3 autre.....4 NSP.....7	
q625	Were you provided with any of the following care or treatment to help you to deliver the baby?		
	an injection/perfusion was done to speed-up the labour	oui....1 non....2 NSP....7	
	instruments were used to help to get the baby out quickly	oui....1 non....2 NSP....7	
	someone made a cut in the area where the baby comes out	oui....1 non....2 NSP....7	
	a caesarean section was done because the uterus was getting torn	oui....1 non....2 NSP....7	
	a caesarean section was done because the baby could not come out on its own	oui....1 non....2 NSP....7	
	a caesarean section was done because the child was short of air	oui....1 non....2 NSP....7	
	instruments were used to get out a stillborn baby	oui....1 non....2 NSP....7	
	other (PRECISER_____)	oui....1 non....2 ___/autq625	
	don't know	oui....1 non....2	
q626	How long was it between your arrival at ... (last point of contact) and the delivery?	___/___ minutes NSP=97 ___/___ heures NSP=97 ___/___ jours NSP=97	

q627	Just before the baby was born, in which position was it lying?	à l'endroit.....1 à l'envers.....2 sur les cotes....3 autre.....4 NSP.....7	
q628	(For vaginal delivery only), what part of the baby came out first? ("AUTRE" PRECISER_____) (ENQUETRICE: METTRE CODE "PAS APPLICABLE" POUR CESARIENNE)	tête.....1 pied.....2 visage.....3 bras.....4 fesses.....5 autre.....6 NSP.....7 Pas applicable...8	
q629	When the baby was born, was he/she very big, big, average, small or very small?	très gros.....1 gros.....2 moyen.....3 petit.....4 très petit.....5	
q630	Was the baby weighed at birth?	oui.....1 non.....2→	par- tie 7
	q631 What was its weight? (ENQUETRICE: VERIFIEZ LE CARNET DE SANTE)	___/___/___/___ grammes (NSP=7777) carnet de santé...1 déclaration.....2 ___/___/___/___ grammes (NSP=7777) carnet de santé...1 déclaration.....2	

Partie 7. Infections of women delivered and operated on

Numéro de la question	question	categories de reponses	skip
q701	Did you have fever during pregnancy or after delivery?	oui.....1 non.....2→	q708
q702	(If yes), when did you have fever?		
	during pregnancy	oui....1 non....2→	oui= q708
	after delivery	oui....1 non....2	
q703	(If after delivery), how long did your fever last for?	___/___ jours	
q704	Was your fever moderate, high or very high?	modérée.....1 forte.....2 très forte.....3	
q705	Did you get chilling with the fever?	oui.....1 non.....2	
q706	Did you try to treat yourself on your own for this fever?	oui.....1 non.....2→	q708
q707	What did you do? ("Autre" PRECISER_____)	médicaments.....1 tisanes.....2 autre.....3	
q708	After delivery did you experience one of the following complications?		
	caesarean wound infected	oui....1 non....2 pas applicable...8	
	a badly healed episiotomy or tear where the child came out	oui....1 non....2	
	foul smelling vaginal discharge	oui....1 non....2	
	another problem (PRECISER_____)	oui....1 non....2 ___/autq708	
	ENQUETRICE: SI NI FIEVRE NI COMPLICATION APRES L"ACCOUCHEMENT, SE RENDRE A LA PARTIE 8 DU QUESTIONNAIRE		
q709	How long after the delivery did these symptoms start?	___/___ jours NSP=97	
q710	Did you lose consciousness or control of yourself because of these symptoms?	oui.....1 non.....2	
q711	Did you feel a strong thirst because of these symptoms?	oui.....1 non.....2	
q712	Where were you at the time these symptoms started?	chez moi.....1→ hors chez moi....2→ avec service/agent de santé.....3	q714

q713	(if already in a healh service or with health staff), which health service/ staff was this? ("Ailleurs" PRECISER_____)	CUGO.....01→ Lagune.....02→ Ouidah.....03→ CCS Pahou.....04→ autre hôpital...05→ autre CCS.....06→ autre maternité.07→ clinique privée.08→ matronne.....09→ ailleurs.....11→	q720
q714	Did you get in touch with the health services because of these symptoms?	oui.....1 non.....2→	Par-tie 8
q715	How long was it between the onset of your symptoms and your decision to get in touch with the health service/ staff?	___/___ minutes NSP=97 ___/___ heures NSP=97 ___/___ jours NSP=97	
q716	What was your first point of contact with the health services? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée .08 matronne.....09 ailleurs.....11	
q717	How did you get there?		
	pirogue	oui....1 non....2	
	motorbike	oui....1 non....2	
	bicycle	oui....1 non....2	
	car	oui....1 non....2	
	on foot	oui....1 non....2	
	ambulance	oui....1 non....2	
	other (PRECISER_____)	oui....1 non....2	
q718	Did you receive immediate attention?	oui.....1 non.....2 NSP.....7	
q719	Who looked after you first? ("Autre" PRECISER_____)	matronne.....1 s-femme.....2 docteur.....3 autre.....4 NSP.....7	
q720	What treatment did you get?	antibiotiques....1 antipaludiques...2 autres.....3 NSP.....7	
q721	How long was it between your arrival at ... (first point of contact) and your first treatment?	___/___ heures NSP=97 ___/___ minutes NSP=97	

q722	Were you sent to a better equipped centre? ("Ailleurs" PRECISER_____)	oui.....1 non.....2-	Par- tie 8
q723	Where were you sent? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hôpital....05 autre CCS.....06 autre maternité..07 clinique privée .08 matronne.....09 ailleurs.....11	
q724	What was your last point of contact with the health services? ("Ailleurs" PRECISER_____)	CUGO.....01 Lagune.....02 Ouidah.....03 CCS Pahou.....04 autre hopital....05 autre CCS.....06 autre maternité..07 clinique privée..08 matronne.....09 ailleurs.....11	
q725	How did you get there?		
	pirogue	oui....1 non....2	
	motorbike	oui....1 non....2	
	bicycle	oui....1 non....2	
	car	oui....1 non....2	
	on foot	oui....1 non....2	
	ambulance	oui....1 non....2	
	other (PRECISER_____)	oui....1 non....2	
q726	Did you receive immediate attention?	oui.....1 non.....2 NSP.....7	
q727	Who looked after you first? ("Autre" PRECISER_____)	matronne.....1 s-femme.....2 docteur.....3 autre.....4 NSP.....7	
q728	What treatment did you get? ("Autre" PRECISER_____)	antibiotiques....1 antipaludiques...2 autre.....3 NSP.....7	
q729	How long was it between your arrival at ... (last point of contact) and your first treatment?	___/___ minutes NSP=97 ___/___ heures NSP=97 ___/___ jours NSP=97	

Partie 8 - Information on hospitalisation and conclusion to the interview

Numéro de la question	Question	Catégories de réponses	Skip
	ENQUETRICE: "I would like to ask you more general questions on your stay in the hospital"		
q801	When you went to..... (centre de sélection), did someone accompany you?	oui.....1 non.....2→	q803
q802	Who went with you?		
	husband	oui....1 non....2	
	mother	oui....1 non....2	
	mother-in-law	oui....1 non....2	
	sister (same mother)	oui....1 non....2	
	brother (same mother)	oui....1 non....2	
	traditional birth attendant	oui....1 non....2	
	female neighbour	oui....1 non....2	
	other	oui....1 non....2 ___/autq802	
q803	Do you remember your arrival at ..... (centre de sélection) or were you not conscious?	consciente.....1 inconsciente.....2	
q804	During your stay at .... (centre de sélection), did you think you nearly died?	oui.....1 non.....2	
q805	How many nights did you spend at ..... (centre de sélection)?	___/___ nuits	
q806	Altogether, how many nights did you spend outside your home, (centre de sélection et ailleurs)?	___/___ nuits	
q807	When you left the hospital, were you able to resume your normal housework immediately or did you have to wait to get better?	tout de suite....1 a du attendre....2	
q808	Are you completely restored to normal health today?	oui.....1→ non.....2	q810
q809	If not, what are your health problems? (PRECISER _____)	___/___	
	ENQUETRICE: "We are looking for people to answer a few general questions on health in the community and we would like to speak to your sisters and brothers"		
q810	How many children did your mother give birth to?	___/___ enfants	
	ENQUETRICE: SI "0" ARRETEZ L"ENTRETIEN. SI 1+ CONTINUEZ.		
q811	How many of these sisters and brothers are more than 15 years old today?	___/___ soeurs et frères > 15 ans	

	ENQUETRICE: SI "0" ARRETEZ L"ENTRETIEN SINON DEMANDEZ "What are the names and addresses of your sisters and brothers)?" ET COMPLETEZ LA FICHE D"IDENTIFICATION DES SOEURS ET FRERES		
	ENQUETRICE "Thank you very much for your help".		
q812	Time at the end of the interview	___/___ heures ___/___ minutes	
q813	ENQUETRICE: OBSERVE THE ROOF OF THE HOUSE AND INDICATE THE MATERIAL FOR ITS CONSTRUCTION	tole.....1 paille.....2 tuile.....3 autre.....4 pas chez elle...8	
q814	ENQUETRICE: OBSERVE THE FLOOR OF THE HOUSE AND INDICATE THE MATERIAL FOR ITS CONSTRUCTION	terre de barre..1 ciment/carreau..2 sable de plage..3 autre.....4 pas chez elle...8	
q815	In which language did the interview take place?	Fon.....1 Français.....2 Autre.....3	
	Remarks/observations:		

APPENDIX 4: ESTIMATED PREVALENCE OF DISEASE OVER A RANGE OF SENSITIVITIES AND SPECIFICITIES

Source:

Ronsmans, C. (1996). Studies validating women's reports of reproductive ill health: how useful are they? Paper presented at the IUSSP seminar on 'Innovative approaches to the assessment of reproductive health', Manilla, Philippines, September 24-27, 1996.

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Table 1: Estimated prevalence of disease over a range of sensitivities and specificities when the actual disease prevalence is 1%, 5%, 10% and 20% respectively.

Actual disease prevalence 1%

Specificity	Sensitivity 0.50	0.6	0.7	0.8	0.9	0.95	0.98	0.99	1.00
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.51
0.60	0.40	0.40	0.40	0.40	0.41	0.41	0.41	0.41	0.41
0.70	0.30	0.30	0.30	0.31	0.31	0.31	0.31	0.31	0.31
0.80	0.20	0.20	0.20	0.21	0.21	0.21	0.21	0.21	0.21
0.90	0.10	0.10	0.11	0.11	0.11	0.11	0.11	0.11	0.11
0.95	0.05	0.06	0.06	0.06	0.06	0.06	0.06	0.06	0.06
0.98	0.02	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.03
0.99	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
1.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

Actual disease prevalence 5%

0.50	0.50	0.51	0.51	0.52	0.52	0.52	0.52	0.52	0.53
0.60	0.41	0.41	0.42	0.42	0.43	0.43	0.43	0.43	0.43
0.70	0.31	0.32	0.32	0.33	0.33	0.33	0.33	0.33	0.34
0.80	0.21	0.22	0.22	0.23	0.23	0.24	0.24	0.24	0.24
0.90	0.12	0.12	0.13	0.14	0.14	0.14	0.14	0.14	0.15
0.95	0.07	0.08	0.08	0.09	0.09	0.10	0.10	0.10	0.10
0.98	*0.04*	0.05	0.05	0.06	0.06	0.07	0.07	0.07	0.07
0.99	*0.03*	*0.04*	*0.04*	0.05	0.05	0.06	0.06	0.06	0.06
1.00	*0.03*	*0.03*	*0.04*	*0.04*	0.05	0.05	0.05	0.05	0.05

Actual disease prevalence 10%

0.50	0.50	0.51	0.52	0.53	0.54	0.55	0.55	0.55	0.55
0.60	0.41	0.42	0.43	0.44	0.45	0.46	0.46	0.46	0.46
0.70	0.32	0.33	0.34	0.35	0.36	0.37	0.37	0.37	0.37
0.80	0.23	0.24	0.25	0.26	0.27	0.28	0.28	0.28	0.28
0.90	0.14	0.15	0.16	0.17	0.18	0.18	0.19	0.19	0.19
0.95	0.10	0.11	0.12	0.13	0.14	0.14	0.14	0.14	0.14
0.98	*0.07*	*0.08*	*0.09*	0.10	0.11	0.11	0.12	0.12	0.12
0.99	*0.06*	*0.07*	*0.08*	*0.09*	0.10	0.10	0.11	0.11	0.11
1.00	*0.05*	*0.06*	*0.07*	*0.08*	*0.09*	0.10	0.10	0.10	0.10

Actual disease prevalence 20%

0.50	0.50	0.52	0.54	0.56	0.58	0.59	0.60	0.60	0.60
0.60	0.42	0.44	0.46	0.48	0.50	0.51	0.52	0.52	0.52
0.70	0.34	0.36	0.38	0.40	0.42	0.43	0.44	0.44	0.44
0.80	0.26	0.28	0.30	0.32	0.34	0.35	0.36	0.36	0.36
0.90	*0.18*	0.20	0.22	0.24	0.26	0.27	0.28	0.28	0.28
0.95	*0.14*	*0.16*	*0.18*	0.20	0.22	0.23	0.24	0.24	0.24
0.98	*0.12*	*0.14*	*0.16*	*0.18*	0.20	0.21	0.21	0.21	0.22
0.99	*0.11*	*0.13*	*0.15*	*0.17*	*0.19*	0.20	0.20	0.21	0.21
1.00	*0.10*	*0.12*	*0.14*	*0.16*	*0.18*	*0.19*	0.20	0.20	0.20

The bold figures indicate perfect agreement between the estimated and the actual prevalence of disease, the italic figures indicate a downward bias in the estimated prevalence of disease.

APPENDIX 5: MOTHERCARE/DHS CONCENSUS STATEMENT

Source:
Statement from a Task Force Meeting on Validation of Women's Reporting of Obstetric Complications in National Surveys, MotherCare Matters, Volume 6, Number 2, March/April 1997

Statement From a Task Force Meeting on Validation of Women's Reporting of Obstetric Complications in National Surveys

On September 16 and 17, 1996, a task force meeting, organized by the MotherCare Project and the Demographic and Health Surveys (DHS) Program, was held to review results of six studies seeking to validate women's self-reporting of major obstetric complications. A major goal of the meeting was to determine, as a group, the usefulness of asking women questions on signs and symptoms of obstetric complications using survey methods. As a group we agreed that four postulated uses of such data would include: 1) estimating the population prevalence of these complications; 2) identifying women who needed medical evaluation; 3) identifying women who perceived they had a problem; and 4) studying women's reported behavior in the context of a perceived problem. Knowledge of the validity of women's reporting of complications is most relevant for the first two of these objectives.

Conclusions

1. The focus of these studies was on broad categories of maternal complications including dysfunctional labor, hemorrhage, sepsis, and eclampsia. Estimations of the population prevalence of these problems, based on interview data collected in national surveys, are not likely to be valid (e.g., accurate when comparing self-report with medical records) or reliable. Estimations based on data from in-depth, more focused community studies may be more accurate. (See no. 4 under general findings below.)

2. In large scale surveys, women's retrospective self-report of complications is not an accurate means of estimating the proportion of women who needed medical treatment for obstetric complications.

3. It is possible and useful to ask about women's perceived problems if questions on health care seeking are also asked. The main objective of this line of questioning is to learn about health care seeking behavior in the context of a perceived problem. Because such results would be interpreted in the context of the woman's perception that she had a problem rather than as a medically defined problem, validation of reporting would not be necessary. The resulting indicator proposed would be:

$$\frac{\textbf{Women who sought care}}{\textbf{Women with a perceived problem}}$$

Such an indicator would not be sufficient for the purpose of monitoring safe motherhood programs. There is a strong need to explore other indicators, such as coverage of obstetric care, which may better capture changes in access to and quality of essential obstetric care.

4. The context of data collection should be considered in assessing the usefulness of data obtained. In this light, community surveys differ from nationally representative surveys in ways that might affect both the validity and reliability of responses. For example, in large-scale surveys conducted in countries with multiple languages and ethnic groups, time and financial resources often pose significant constraints. These constraints make it less feasible to conduct the in-depth qualitative research that is needed in each language and culture group to assure appropriate conceptualization, wording, and translation of questions for a standardized questionnaire. In addition, large sample sizes often necessitate the employment of many interviewers which complicates training and supervision of data collection in ways that prevent the required degree of attention to detail. And

continued

in multi-purpose, DHS type surveys, many widely varying subjects are covered in the questionnaire, thus limiting the time allowed for special training on any one topic.

Implications

1. Data from national surveys should not be used to indicate whether women who had a medically defined complication are seeking medical care. Such surveys are thus more worthwhile if focused on knowledge, behavior, and perceptions.
2. The standards applied here to the study of obstetric complications in surveys are somewhat higher than has been used in the past for some other types of morbidity. Justification for this more rigorous approach is based on our desire to avoid the use of indicators that are likely to give an inaccurate picture of program impact. Based on the preliminary results of these studies we believe, in general, that women's reporting of obstetric complications in large scale surveys should not be the basis of indicators of program failure or success.

Finally, we would note that this statement is based on the preliminary findings from these studies and that more in-depth insights will be forthcoming when the final results are published.

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