

# Tackling Unmet Needs for Major Obstetric Interventions

## Case Studies

### Mali

#### CONTENTS

ABBREVIATIONS.....	2
1. INTRODUCTION.....	3
2. CONTEXT.....	3
<i>General</i> .....	3
<i>Maternal health policy</i> .....	4
3. THE UON EXERCISE.....	6
<i>Equipment and method</i> .....	7
<i>Data base</i> .....	11
<i>Results</i> .....	15
4. UTILISATION OF RESULTS.....	32
<i>Retro-information</i> .....	32
<i>Perception</i> .....	33
5. CONCLUSION.....	34
ANNEX 1: QUESTIONNAIRE FOR WOMEN.....	35
ANNEX 2: QUESTIONNAIRE FOR HEALTH FORMATION.....	37
ANNEX 3. LIST OF MAIN DOCUMENTS PUBLISHED BY THE UON STUDY IN MALI.....	38

## **ABBREVIATIONS**

- AGCD: Agence Générale de Coopération au Développement (Belgian co-operation)
- AMI: Absolute Maternal Indication
- BTC: Belgian Technical Co-operation
- CSAR: Centre de Santé d'Arrondissement revitalisé (revitalised arrondissement health centres)
- CSC: Centre de Santé de Cercle (Cercle health centre)
- CSCom: Centre de Santé Communautaire (community health centre)
- DGCI: Direction Générale de la Coopération Internationale (General division of international co-operation)
- DHS: Demographic and Health Survey
- DPT3: Diphtheria- Per tussis-Tetanus 3, the third injection of vaccine
- DSF-C: Division de la Santé Familiale et Communautaire (Familial and community health division)
- EB: Expected Births
- FAC: Fonds d'Aide à la Coopération (French Co-operation)
- FED: Fonds Européen de Développement (European Development Fund)
- ITM-A: Institut of Tropical Medicine – Antwerpen
- KFW: Kredietanstalt für Wiederaufbau (German bilateral organisation)
- MOI: Major Obstetrical Intervention
- PSPHR: Projet Santé Population et Hydraulique Rurale (Population health and rural hydraulic project)
- SNIS: Système National d'Information Sanitaire (National health information system)
- UON: Unmet Obstetric Need
- UR: Uterine Rupture
- USAID: United States Agency for International Development

## 1. INTRODUCTION

The tackling of Unmet obstetric needs (UON) in Mali has a particular feature as compared with other countries in which this approach has been adopted: it was undertaken at the request of the head of the maternal health programme and executed under her direction. We are thus concerned here with a country in which the value of this approach no longer needs to be demonstrated. The only question to be considered at the beginning of the process was whether the whole or only part of the country should be covered. This question, however, was settled when the Ministry's usual partners in maternal health matters (UNICEF and UNFPA) joined with Belgian Co-operation in financing a study covering the whole country (with the exception of the Kidal region).

In this case study we briefly set out the Malian context, seeking to define what were the strategic orientations of the Ministry of Health at the time when the study of UON was carried out, more particularly in the field of maternal health. We then describe the carrying out of the study in Mali. The description of the methodology and the analysis of results are distinguished to some extent from what has already been produced on this subject by the collaboration of the Malian team and the Co-ordination & Management (CAM) team of the network based in Antwerp. This case study highlights an outsider's view overall research process. Its objective is, besides the analyses of results, to emphasise the favourable and unfavourable factor of this kind of study. Finally, we consider the way in which the results have been used in Mali to support the development of effective maternal health strategies.

## 2. CONTEXT

### **General**

Mali is a large country (1,240,000 sq. km) with a population of around 10 million, between 7.5 and 8 million of whom live in rural areas. Health services are not easily accessible for the majority of this scattered rural population. In 1999, some 60% of the population lived within 15 km of a primary level health formation offering a minimum parcel of activities, and 36% within 5 km<sup>1</sup>. These results, modest though they may seem, have been achieved by an astonishing dynamic, which has enabled Mali to double its health coverage in less than ten years.

Until the end of the 1980s, the restricted health services in operation provided a level of service which was judged to be of poor quality, in part because no medicines were available in public health formations. The health indicators reflected this state of affairs, with an infant mortality rate of 125 per 1000 and maternal mortality of around 1200 per 100,000 live births<sup>2</sup>. During the 1980s, however, a number of projects contributed to laying the bases of a reform of the health sector in Mali. The Health Development Project supported by the World Bank established the first experimental community health centres (CSCoM)<sup>3</sup>. Others experimented with the recovery of costs, with arrangements for ensuring the availability of essential medicines. These experiments showed that the populations were prepared to pay for services of better quality. Then in 1987 the 37th Regional Committee of WHO was held in Bamako and in the course of this WHO, UNICEF and the World Bank undertook to launch what was called the Bamako Initiative. In 1989, an ad hoc group drew up the "Conceptual Framework of the Bamako

<sup>1</sup> Ministère de la Santé, des Personnes Agées et de la Solidarité de la République de Mali, SG, DNSP. 2000. Rapport d'activités de la Direction de la Santé Publique 1999. Programmation 2000. Bamako, Mali.

<sup>2</sup> UNICEF-Mali, 1992. La situation des femmes et enfants au Mali. UNICEF.

<sup>3</sup> Maiga Z, Traoré F & El Abassi A. 1999. La réforme du secteur santé au Mali, 1989-1996. *Studies in Health Services Organisation & Policy*, 12. ITGPress. Antwerp.

Initiative"<sup>4</sup>, which sets out principles for the organisation of the health sector: decentralisation, involvement of the population in the management of health centres, necessity of the availability of essential medicines. This reflection was at the base of the formulation of the new sectorial health policy in 1990. This policy envisaged the extension of health coverage, the improvement of the quality of health services in general and their financial viability<sup>5</sup>. The architecture of this reform rested on a two-tier health system: the Cercle, providing a network of primary-level health services (community health centres and revitalised arrondissement health centres, CSAR) and a second level, the hospital, now called Cercle health centre. The various partners of the Malian government progressively undertook to provide financial support for this policy between 1991 and 1994: first UNICEF (\$15.4 million), then the World Bank (\$26.6 million), USAID (\$15 million), KFW (\$9 million), the European Development Fund (\$13 million) and FAC (\$1.7 million)<sup>3</sup>. The Ministry of Health then decided to launch the Projet Santé Population et Hydraulique Rurale (PSPHR), with the support of co-financing by the partners to pilot the development of the new sectorial policy in 21 out of the 35 Cercles in the five regions involved in the project. The PSPHR end in 1998, and thereafter the reform was directly piloted by the Ministry of Health.

Between 1993 and 1995 the first developments under the new policy showed that the strategy was bearing fruit. There was a manifest improvement in the performance of the CSComs, even though the level achieved was still poor, both in terms of the usage of services for curative consultations (an increase from under 0.1 to 0.2-0.3 new cases per inhabitant per year) and in terms of ante-natal coverage (around 40% of women with at least one consultation) or of vaccination of infants (around 50% of coverage by DTP3). After 1995 the continuous extension of health coverage by infrastructures made it possible to achieve by 1999 (that is, in less than five years) the establishment of 461 CSComs or revitalised CSARs out of 961 health centre areas planned to cover the whole country, or an annual rate of more than 90 new health formations a year.

The Programme of Health and Social Development (PRODESS) for the year 2000 called for an increase in coverage by health infrastructures and "innovative measures to make services more attractive and increase their rate of usage<sup>1</sup>. In addition to the investments in the extension and quality of health services the Ministry of Health continued its efforts to achieve institutional reform in order to promote the carrying out of PRODESS.

### ***Maternal health policy***

Malian policy in the field of maternal health has for many years been in line with the recommendations of international institutions. Until the early 1990s it took concrete form in the priority given to the development of primary maternal care – ante-natal clinics, vaccinations, deliveries assisted by matrones ("midwives" with a limited period of training). In 1991, the declaration of national population policy in Mali drew particular attention to the unduly rapid growth of the population compared with the rate of economic growth<sup>6</sup>. The family planning programme, the coverage of which was very low (11% in urban areas and 2% in rural areas), was then stepped up and given particular support by USAID.

Maternal health then benefited from the development of sectorial policy. After the first encouraging experiences in the development of CSComs the problem of the level of referral fairly soon presented itself. A network of primary-level health services without the support of a hospital of referral is of only limited effectiveness and thereby brings the whole strategy into question. This

<sup>4</sup> Ministère de la Santé et des Affaires Sociales. 1989. Plan de relance des SSP. Initiative de Bamako: cadre conceptuel. Ministère de la Santé et des Affaires Sociales, Bamako.

<sup>5</sup> Ministère de la Santé, de la Solidarité et des Personnes Agées. 1990. Déclaration de politique sectorielle de santé et de population. Ministère de la Santé, de la Solidarité et des Personnes Agées, Bamako.

<sup>6</sup> Direction Nationale de la Planification du Ministère du Plan et de la Coopération Internationale. 1991. Déclaration de la politique nationale de population au Mali. Direction Nationale de la Planification du Ministère du Plan et de la Coopération Internationale, Bamako.

function of the Cercle hospital as hospital of referral was tackled by using the perinatal care programme as the point of entry<sup>7</sup>.

Until the early 1990s the coverage of essential obstetric needs was practically nil outside large towns. The proportion of caesareans (outside Bamako district) was of the order of 0.2% of deliveries. The maternal health programme, however, by developing antenatal clinics and rural maternity homes, had contributed to directing attention on the problems of giving birth as real problems, which were felt by the population. And the strategies followed at primary level made it impossible to avoid obstetric accidents, which called for professional intervention, including surgical intervention. The availability of funds for the perinatal care programme provided an opportunity for strengthening the referral level. The decision-makers realised fairly soon that the problem lay not only at hospital level. It was not only a matter of training specialist teams and providing the necessary equipment in Cercle hospitals: it was necessary to develop the whole system (primary level, referral and evacuation, technical resources in hospitals, viable mechanisms for financing services), including mobilisation of the community. All this was necessary if an improvement in the coverage of obstetric needs was to be achieved. From 1994-95, onwards arrangements for improving the machinery of referral were progressively tested in certain Cercles. This involved not only setting up means of communication between CSComs and hospital (radio communication, ambulance services) and ensuring the availability of the necessary technical resources (trained staff, equipment, medicines) but also ensuring financial viability. This was achieved by establishing a fund collected and managed at Cercle level, coming partly from the Ministry of Health (35%), partly from Community Health Associations (CSComs, around 35%) and partly from payments by patients (30%). Thanks to this system, not only was the physical accessibility of the hospital considerably increased but also its financial accessibility. From 1997, this strategy was promoted throughout the whole country<sup>8</sup>. The development of this system of referral and evacuation, however, was slow: in 1998, a period for which data on obstetric interventions were collected, there were only seven Cercles running a system of referral and evacuation, and in 1999 only 12 out of the country's 55 Cercles had an effective system.

The five-year reproductive health plan for 1999-2003<sup>9</sup> declares a number of ambitious objectives: reducing maternal mortality from 577<sup>10</sup> to 400 per 100,000 live births during the period, reducing infant and juvenile mortality from 238 to 150 per 1000, increasing the usage of reproductive health services by young people and adolescents, and reducing the ambiguities (obstacles) which hinder the participation by both women and men in reproductive health activities.

Following the introduction of the Unmet Obstetric Needs approach in Mali the understanding of the response required has changed. The decision-makers are well aware that the primary level is unable, and will never be able, to solve the problem of maternal and perinatal mortality and morbidity on its own. They know also that the coverage of professional services is still very low: around 10% of assisted deliveries<sup>11</sup> in five of the country's nine regions, between 30 and 40% in Koulikoro, Sikasso and Ségou and around 80% in Bamako. What they do not know is the extent to which essential maternal needs are covered and whether the strategy decided on (an evacuation system co-financed by the State and local communities) is effective.

<sup>7</sup> This use of the perinatal care programme as the point of entry for developing a system for the referral and evacuation of urgent cases is referred to as such in the "Cadre conceptuel de l'organisation du système de référence/évacuation au Mali" published by the National Directorate of Public Health in August 2000.

<sup>8</sup> Division de la Santé Familiale et Communautaire, Ministère de la Santé, des Personnes Agées et de la Solidarité. 1997. Module de formation en périnatalité. Bamako.

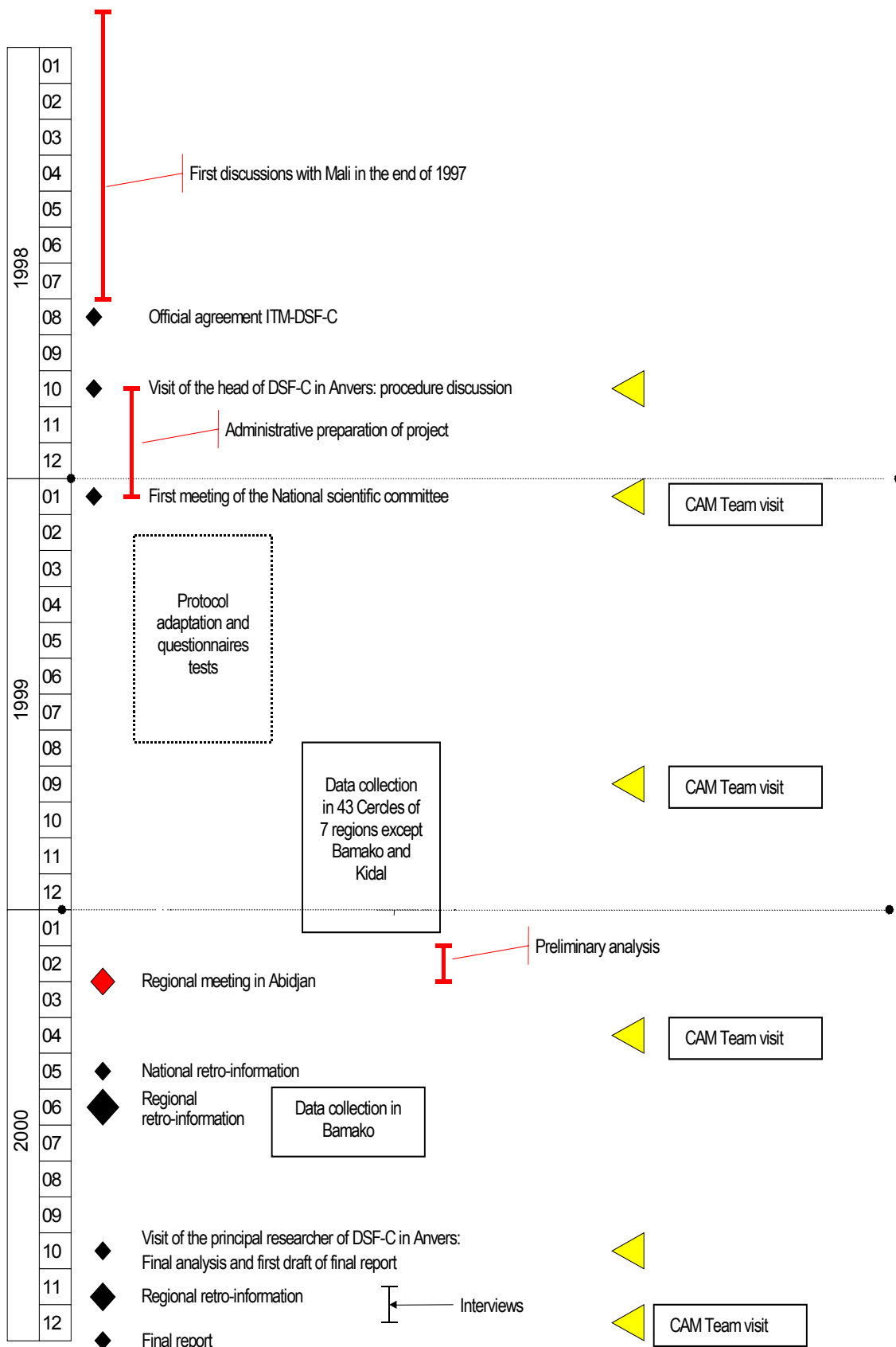
<sup>9</sup> Division de la Santé Familiale et Communautaire, Ministère de la Santé, des Personnes Agées et de la Solidarité. 1998. Programme quinquennal de santé de la reproduction. Division de la Santé Familiale et Communautaire, Ministère de la Santé, des Personnes Agées et de la Solidarité. Bamako

<sup>10</sup> This figure comes from the Demography and Health Survey of 1995-96. All staff concerned interviewed at central level are aware of these figures and do not question them.

<sup>11</sup> Assisted deliveries: deliveries in hospital and deliveries in a health centre or at home by trained staff.

### 3. THE UON EXERCISE

**Figure 1.** CHRONOGRAM OF THE UON EXERCISE IN MALI



*Approach to the collection of data in hospitals*

There were two possible scenarios. The first, which had been tried out in Morocco, involves bringing in to central level two persons per district, one of them a responsible officer from the district, the other a person involved in the maternal health programme or in care for parturients. These persons are then trained, either all together or in two or three successive sessions depending on their number. Their role is, on the one hand, to train persons to carry out surveys (selected from nurses and midwives in charge of care at maternity hospitals) and on the other to make sure that there are daily checks on the data collected. The advantage of this scenario is speed. It is theoretically possible in less than a month to train the staff required to carry out surveys and to collect data from all district hospitals in a country. But this approach can be adopted only if there are sufficient human resources in a district to ensure that the employment of some of them in the collection of data does not interfere with the functioning of the care services.

This was not the case in Mali, and it was necessary to devise a scenario which would disturb the functioning of services as little as possible, knowing that on average there are only two doctors per Cercle and that there could be no question of depriving Cercles of such a scarce resource even for the space of two days. The scenario adopted consisted in covering the country Cercle by Cercle. Two members of the national support team<sup>12</sup> visited each region to instruct the regional team<sup>13</sup>. These national officers, accompanied by a regional officer, visited the various Cercles to train the local team<sup>14</sup>. The group then carried out the collection of data (based on hospital records), with the help of reports from the Health Information System (Système National d'Information Sanitaire, SNIS). A synthesis was then made with the Cercle team, involving in particular a calculation of deficits, both total and by health area. The regional and Cercle teams thus participated actively in the collection of data.

***Equipment and method****Introduction*

The UON study has two complementary parts: one based on a questionnaire for women, analysing major obstetric interventions, their indications and their results for women and infants, and another based on a questionnaire for health formations, making it possible to draw up an inventory of the human and material resources of each health formation.

*Population studied*

This study is retrospective, covering data for 1998 collected between August 1999 and July 2000 for all functional health formations in the country (apart from four Cercles in Kidal region, where security considerations made the region inaccessible). The population studied comprised all women who underwent a major obstetric intervention in 1998 and/or died during the birth or from the consequences of the birth.

<sup>12</sup> Consisting of the head of the Division of Family and Community Health (DSF-C), the doctor in charge of the study, the research assistant in the perinatal section of DSF-C, the officer responsible for family planning in DSF-C and a medical student.

<sup>13</sup> Consisting of the head of the public health division or the officer responsible for planning, the gynaecologist or surgeon of the regional hospital and the regional midwife.

<sup>14</sup> Consisting of the head doctor, the chief midwife and the officer responsible for the health information system.

**Table 1.** POPULATION OF REFERENCE BY REGION, MALI, 1998

Regions	Number of inhabitants	Expected births
Kayes	1,507,020	75,350
Koulikoro	1,511,182	75,558
Sikasso	1,728,136	86,407
Ségou	1,666,217	83,312
Mopti	1,497,519	74,876
Tombouctou	543,256	27,164
Gao	343,990	17,200
Bamako	999,570	49,978
<b>Total</b>	<b>9,796,890</b>	<b>489,845</b>

Expected births, broken down by Cercle and by urban or rural area, were used to estimate the number of women potentially exposed to the risk of undergoing a major obstetric intervention or of dying during the period surrounding the birth. These expected births were calculated using the gross birth rate (50 per 1000), the only information available at the time of the study. It is evident that the use of such a global index involves biases, since fertility varies between one region and another and still more between urban and rural areas. But since the objective of the study is to get a good idea of the scale of deficits at Cercle level this method of calculation may be accepted as satisfactory.

Gross birth rates were applied to the population of reference (**Table 1**), obtained by projection from the population recorded in the 1987 census. The total population estimated in the 1998 census (data by Cercle are not yet available) was 9,790,492: a figure consistent with the estimates used here.

#### *Referral rate*

The calculation, for each participating country, of a referral rate is an integral part of the process. This enables workers in the field to involve themselves in the study by discussing in detail, in a group of national experts, each of the indications to be taken into account.

The referral rate for Mali was calculated on the basis of data collected in two studies: one carried out in 1999 at Bougouni and the other, in late 1997, at Kolondiéba and in Commune V in Bamako<sup>15</sup> (**Table 2**). The object was to measure the rate of MOI/AMI in an environment close to a hospital where the health personnel, being familiar with the population, know that there have been no maternal deaths in or around births outside hospital.

**Table 2.** DATABASE FOR CALCULATION OF REFERRAL RATE (FIGURES FOR 1997)

	Urban Population	Expected births	IOM/IMA performed	Referral rate
Bougouni <sup>16</sup>	25,046	1,252	14	1.12%
Commune V <sup>17</sup>	96,480	4,824	58	1.20%
Kolondieba <sup>18</sup>	21,940	1,097	15	1.36%
<b>Total</b>	<b>143,466</b>	<b>7,173</b>	<b>87</b>	<b>1.20%</b>

<sup>15</sup> De Brouwere V. 1997. Appui à la mise en œuvre et à l'évaluation du système de référence avec la périnatalité comme porte d'entrée dans les Cercles. Mission de pré-évaluation, Ministère de la Santé, des Personnes Agées et de la Solidarité, République du Mali, Novembre 1997, 32 p.

<sup>16</sup> Mission effectuée dans le cadre de l'étude BONC par le service socio-sanitaire de Bougouni au centre de santé de référence de ce cercle du 6 au 19 février 1999. L'étude porte sur les activités 1998.

<sup>17</sup> Number of cases of MOI for AMI collected in November 1997, data from first six months of 1997.

<sup>18</sup> Number of cases of MOI for AMI collected in November 1997, data from 1<sup>st</sup> November 1996 to 31<sup>st</sup> October 1997.

**Table 2** shows the results of studies which have made it possible to measure the MOI/AMI rate in three areas, for populations living in urban areas (i.e. near a hospital – in this case within 15 km).

#### *Criteria for inclusion*

The study covered all women of Malian nationality who during 1998 underwent a major obstetric intervention (between the 28th week of pregnancy and the 42nd day post-partum) and/or died in a health formation during that period of their pregnancy, whatever the cause of death.

The part of the study concerning health formations covered all health formations, private and public, with an operating suite situated in the regions concerned. Cercle health centres in which no interventions were carried out but which were situated in the chief town of the region (and were thus close to a regional hospital) were also taken into account. As a result of their proximity to these hospitals, they were considered as belonging to the same care service. Data relating to them, however, was used only in calculating the volume of activity of the health formations.

#### *The variables studied*

### **Questionnaire for women**

This questionnaire (presented in Annex 1) made possible the construction of a “women” file, which provided the basis of an analysis designed to reveal deficits in each Cercle. The questionnaires were completed by the national research team in collaboration with the Cercle team and the staff of maternity hospitals. Of the variables covered in the questionnaire the most important for the purposes of the analysis are the following:

Name of health formation

Cercle in which the formation is situated according to the administrative structure of Mali

Type of formation: private or public

Category of formation: national, regional, secondary or Cercle health centre

Cercle of origin of mother: This information is given by the mother on admission to hospital. It should be treated with caution, since the mother may declare as her area of residence not her real home but a temporary area of residence, usually situated near the health formation, where she has been staying for the last stages of her pregnancy.

Area of origin of the mother: urban or rural. All women living within 15 km of a health formation effectively offering major obstetric interventions are regarded as living in an urban area. Those living outside a 15-km radius are regarded as living in a rural area.

Type of intervention: Apart from symphysiotomy, which is not practised in Mali, the list of interventions considered is as suggested in the basic UON protocol<sup>19</sup>.

Indication for intervention: The indications considered are also as suggested in the UON protocol.

Results for mother: nothing to report, died, complication, referred.

Results for child: born living and living when discharged from hospital, stillborn, died within 24 hours of birth.

Time and cause of mother's death: before, during or after intervention – infection, haemorrhage, and hypertensive disease.

<sup>19</sup> Caesarean, laparotomy, hysterectomy, version and extraction, craniotomy.

## Questionnaire for health formations

This questionnaire was used to construct a “health formation” file, required for the analysis of the human and material resources of each health formation and for the linking of information with the “women” file.

Of the variables covered by this questionnaire the most important for the analysis are:

Name of health formation

Cercle in which the formation is situated according to the administrative structure of Mali

Category of formation: national, regional, secondary or Cercle health centre

Number of functional operating theatres

Number of gynaecologists and doctors with surgical competence: This includes not only gynaecologists but also all doctors in the health formation capable of carrying out major obstetric interventions.

Number of midwives and nurses with gynaecological competence: This includes all paramedical personnel capable of carrying out deliveries.

Total number of births

Number of dystocic births

Number of caesareans

Number of uterine ruptures

### *Material used in collection of data*

For information on individual cases of major obstetric interventions for absolute maternal indications the main source of data was the questionnaire for women (see Annex 1). A questionnaire was completed for each case meeting the criteria.

The sources of information for the questionnaire were:

- the register of births
- the records of the maternity home
- the records of hospitalisation in maternity and surgical departments
- operation protocols
- hospitalisation files and partograms

The process of collection is not well documented. It appears that the teams, consisting of at least one member of the national committee and one member of the regional committee, joined up with members of the medical staff of the formations in which the study was being carried out. All women who had undergone a major obstetric intervention or had died during their pregnancy were taken into account in filling up the questionnaire. The information seems to have been systematically cross-checked between the various sources of information, and where necessary was supplemented by asking members of the caring personnel. There was no check on the forms after their completion. It appears that the checking done during the process of collection was regarded as sufficient to ensure the good quality of the data gathered.

For information on health formations (maternity hospitals, i.e. all hospitals in which major obstetric interventions were carried out in 1998) the main source was the questionnaire for health formations (see Annex 2). A questionnaire was completed for each health formation selected.

The completion of the forms on health formations was apparently done at the same time as the questionnaires on women and by the same people. The main source of information seems to have been the routine annual report of the National Health Information System (Système National d'Information Sanitaire, SNIS), which is prepared by the management of the Cercle health centre or the hospital, though the source is not stated. As we shall see, this method was not well managed by the collecting team, since frequently the data common to both files (numbers of caesareans and uterine ruptures, for example) differs in the two documents.

## **Data base**

### *Description of data used*

#### **The questionnaire for women**

Before treatment the “women” file comprised 3875 recorded cases. No duplicate entry was found; but one case was withdrawn from the file, since none of the variables essential for the study had been completed and the case had been recorded as non-MOI and non-AMI. The file analysed thus comprised 3874 recorded cases.

There were in the file some missing data (no value having been coded) and data not noted or unknown (the source register not containing the information).

Where the missing data related to maternal deaths it was possible, by cross-checking the variables “cause of death” and “time of death”, to recover cases in which the mother had died but the variable “result for mother” was noted “unknown”.

Problems relating to the variable “result for child” could not be resolved, no other variable in the file giving any complementary information on such cases.

There were also a number of inconsistencies between types of intervention and the indications for them. Because of such variables as the precision of the indication, the intervention or the cause of death, these inconsistencies could not be corrected.

As a result –

- 3 caesareans for uterine rupture became laparotomies;
- 4 caesareans for post-partum haemorrhage became laparotomies;
- 2 laparotomies noted as “other types of intervention” became laparotomies;
- 36 severe ante- or post-partum haemorrhages involving the death of the mother became absolute maternal indications;
- 12 uterine ruptures for which no intervention had been carried out because of the mother’s death (8 before intervention, 4 at time not specified) became absolute maternal indications;
- in 88 cases the type of intervention was not noted; 27 died before intervention, 61 others died, but the time was not specified; there were 35 absolute maternal indications and 25 cases of non-absolute indications (including 25 indications not specified) (see **Table 4**).

As regards the mother’s area of origin, missing data or unknown origins could not be corrected; but, taking account of the definition of area of origin, it was possible to make certain modifications. The populations of Tominian, Douentza, Goundam, Ansongo, Bourem and Ménaka were regarded as entirely rural because of the absence of a functional operating suite in these Cercles. Consequently, the area of origin of women living in these Cercles is always rural. Similarly, women living in Bamako were all considered as coming from an urban area.

The most serious problem with this database relates to the codes assigned to the Cercles (the mother’s Cercle of origin being identified by a two- or three-figure code). Two or more districts in different regions were sometimes given identical codes; and in the absence of complementary documentation, for example a list of Cercles and the corresponding codes, the mother’s Cercle of origin could not be established with certainty. Only the person or persons who had taken an active part in the enquiry were able to understand these codes, which is likely to give rise to difficulty in the future use of the data base or the analysis of the data by a person not involved in the coding process.

After these corrections have been made certain variables still present problems. Some data is still missing or not recorded. **Table 3** gives a summary of unresolved problems for the most important variables in the file.

**Table 3.** MISSING AND UNRECORDED DATA IN THE "WOMEN FILE", MALI, 1998*Total number of cases*

Variable	Data					
	Missing		Not noted		Total	
	Number	%	Number	%	Number	%
Whole file (3,874 records)						
Type of area			74	1.9%	74	1.9%
Indication	37	1.0%			37	1.0%
Type of intervention	57	1.5%			57	1.5%
Results for child	8	0.2%	56	1.5%	64	1.7%
Results for mother			131	3.4%	131	3.4%
Mother's deaths (234 cases)						
When mother died			79	33.8%	79	33.8%
Cause of mother's death			65	27.8%	65	27.8%

*Major obstetric interventions for absolute maternal indications*

Variable	Data					
	Missing		Not noted		Total	
	Number	%	Number	%	Number	%
Whole file (2,656 records)						
Type of area			55	2.1%	79	2.1%
Results for child	4	0.2%	25	0.9%	29	1.2%
Results for mother			96	3.6%	96	3.6%
Mother's deaths (115 cases)						
When mother died			17	14.8%	17	14.8%
Cause of mother's death			34	29.6%	34	29.6%

The data on the result for the mother is rather poorly recorded. In almost 4% of cases the result of the intervention is not known. Where the mother died the time of death is unknown in 33% of cases. Most of these (80%) are not MOI for AMI. The cause of death is also poorly recorded; it is absent in 28% of cases, more than half of which are MOI for AMI.

After corrections have been made **Table 4**, giving types of intervention according to types of indication, can be drawn up.

**Table 4.** DISTRIBUTION OF CASES ACCORDING TO CATEGORY OF INTERVENTION AND CATEGORY OF INDICATION, MALI, 1998

MOI	AMI			Total
		Yes	No	
	Yes	2,657	1,127	
No	51	39	<b>90</b>	
<b>Total</b>	<b>2,708</b>	<b>1,166</b>	<b>3,874</b>	

As noted above, some cases recorded as non-AMI were transferred to the AMI category; they comprised 12 cases of women who died from uterine rupture and 36 who died from severe haemorrhage.

There are still, however, 90 cases which are not major obstetric interventions but are included in the data base because they are cases in which the mother died. Among these cases, a distinction can be made between those classed in the AMI category (51 cases) and those classed as non-AMI (39 cases).

The 51 cases of women who died without a major obstetric intervention with an absolute maternal indication comprised:

- 16 women who died before an intervention (8 uterine ruptures, 1 transverse presentation and 7 severe haemorrhages);
- 1 mother who died after a non-MOI intervention (forceps) although the indication had been foeto-pelvic disproportion;
- 34 women whose time of death is not known, for whom the type of intervention is not recorded but the cause of whose death is known (4 uterine ruptures, 1 retro-placental haematoma and 29 severe haemorrhages).

The 39 cases of women who died in hospital without a major obstetric intervention and with a non-absolute maternal indication were distributed as follows:

- 37 died, 11 of them before any intervention (7 causes unknown, 1 hypertension, 2 severe infections and 1 respiratory insufficiency), 3 after an intervention (1 cause unknown, 1 cardiopathy and 1 hypertension), for 23 of them the time of death is not stated (5 causes not stated, 6 causes unknown, 1 respiratory infection, 1 severe anaemia, 5 hypertension and 5 severe infections).
- In 2 cases there was no information. They were not removed from the file but were not included in the analysis of MOI for AMI.

### **The “health formations” file**

The data relate to 60 health formations: 2 national hospitals, 6 regional hospitals, 2 secondary hospitals, 44 health centres and 6 private hospitals. One secondary hospital is missing from the database – Markala hospital in Ségou Cercle, for which the questionnaire was not completed.

Of the 54 public health formations, 44 have a functional operating suite, 5 have a non-functional operating suite (they are included because they are the health centres of Cercles situated in regions in which the study is being carried out and there is a surgeon in each of them), 5 are presumed not to carry out any operations since they are situated beside a regional hospital (these formations did not participate in the part of the enquiry concerning women).

Some formations, mainly regional hospitals, did not reply completely to the questionnaire. The most important types of missing data are the following:

Number of births: 3 hospitals (Sikasso, Tombouctou and Gabriel Touré) and 1 Cercle health centre not performing any operations

Number of caesareans: 3 hospitals (Sikasso, Mopti and Tombouctou)

Number of uterine ruptures: 5 hospitals (Sikasso, San, Mopti, Tombouctou and Gao)

Number of stillbirths: 4 hospitals (Sikasso, San, Ségou and Tombouctou)

Number of maternal deaths: 2 hospitals (Sikasso and Tombouctou)

### **Reconciliation of data from the “women” and “health formation” questionnaires**

Of the 44 public health formations, which completed the "health formation" questionnaire and practise surgery, only 9 have matching data on caesareans. For 24 formations, the number of caesareans declared in the “health formation” questionnaire is higher than the number in the “women” questionnaire. In total, a comparison between the “women” and “health formation” files reveals a “shortage” of 200 caesareans in the “women” file.

In the recording of uterine ruptures, there is no difference in the figures for 21 health formations. In the case of 11 formations, the number of ruptures is higher in the “health formation” questionnaire, revealing a “shortage” of 32 ruptures in the “women” file.

These inconsistencies reflect a clear failure to crosscheck between the two questionnaires during the collection of data – perhaps indeed a lack of conscientiousness in the completion of the “health formation” questionnaire. Over all, cases of caesarean and rupture are more

numerous in the “health formation” file. But the total of MOI is broadly the same, so that one is led to wonder whether in the SNIS report prepared by the administration, which probably served as the source of the information, caesareans, laparotomies and hysterectomies are not all recorded as caesareans.

### *Discussion of biases*

One of the objectives of the UON approach is to make a reliable estimate of the minimum number of women who have not had access to a complete range of essential obstetric care. The biases which we now consider do not in any way affect the validity of the approach. Its object is not to provide an exact measurement of deficits but to offer as precise a view as possible of the scale of deficits as a planning tool and a stimulus to consideration of the aspects of obstetric care, which need improvement.

The biases in the analysis can be classed in two categories: those resulting from the imprecision of the demographic data in developing countries and those connected with the validity of the data and the method of collecting it.

### **“Demographic” biases**

The results of the national population census of 1998 are not yet available for the various Cercles in the country. The population figures used here – on which the estimates of expected births were based – are those of the last census (1987) projected for each Cercle and for the year under study based on the annual rate of growth. The country’s total population obtained in this way (9,854,682 inhabitants)<sup>20</sup> seems consistent with the total population in the 1998 census (9,790,492).

The gross birth rate was used in estimating the number of expected births (itself proxy for the number of women expected to give birth). More specific data, by age group and by Cercle, are not available, which makes any more exact estimate of expected births impossible. It seems likely that expected births in urban areas are over-estimated and in rural areas under-estimated, for the data in the last Demography and Health Survey (DHS) for 1996 show general fertility rates which differ very considerably according to type of area (190.4 per 1000 in urban areas and 254 per 1000 in rural areas). Estimates of expected births based on this DHS shows an over-estimation around 12% of births in urban areas. This is not sufficient, however, to justify a decision to adjust the figures proposed by Mali, for although the figures can be adjusted at national level we have no information on differences (in the distribution of population by age and sex) between the seven regions covered by the study. We have decided, therefore, to stick to the gross birth rate as a tool for estimating expected births.

### **Biases due to inexact diagnosis**

The absence in certain health formations of precise means of diagnosis and the lack of obstetric competence of some doctors, non-gynaecologists, performing interventions may lead to errors in the interpretation of the indication for intervention. This type of bias is difficult to evaluate. In order to minimise such imprecision as far as possible the collection of data was carried out in presence of experts in obstetrics and doctors performing interventions in hospital, making it possible to discuss disputed cases.

### **Biases in collection of data**

The most important of these relates to the contamination of the numerator for the mother’s area of origin. It is probable that some women admitted to hospital declare a temporary place of

<sup>20</sup> The population of Kidal (57,792) has been added to the total obtained in **Table 1** (9,796,890).

residence, usually situated close to the health formation, i.e. urban. This is due to the fact that in late pregnancy these women, and perhaps more particularly those who are liable to have problems at the stage of delivery, decide to stay near a hospital with a member of their family. Although it is impossible in the present study to correct this bias it is perfectly possible to envisage dealing with it in future by paying more attention to the recording of this data in hospital registers and comparing the address given in the hospital register with that given in the ante-natal consultation form.

## Results

We begin by describing the overall results on the distribution of interventions, indications and deficits between Cercles. We then carry out a more specific analysis, seeking to identify possible differences between different types of area, to establish levels and causes of maternal and infantile mortality and to link this data with information collected in the “health formation” questionnaires.

The tables, graphs and maps presented below are constructed by reference to the categories in **Table 4**. Our concern will be more specifically with major obstetric interventions (3784 cases), whatever their indication, and with absolute maternal indications (2708 cases) and non-absolute indications (1,166 cases). In the analyses according to type of area, women whose area of origin is unknown are not included. They represent around 2% of cases (for the three categories MOI, AMI and MOI for AMI).

### Major obstetric interventions

A total of 3,784 major obstetric interventions was recorded in 1998 (**Table 5**). This represents an average national rate of 0.8 MOI per 100 expected births. The disparity between different types of area is evident: average rates were 1.8 in urban areas and 0.4 in rural areas. The bias concerning the mother's area of origin is no doubt one of the explanations for this difference, but it is certainly not the principal reason for the inequality. In order to bring these rates into balance – that is, to make them identical in both types of area – it would be necessary that more than half the women considered as coming from urban areas should in reality have been of rural origin.

**Table 5.** MAJOR OBSTETRIC INTERVENTIONS ACCORDING TO TYPE OF INTERVENTION AND AREA, MALI, 1998

	Urban area	Rural area	Unknown area	Total
	Number (%)	Number (%)	Number (%)	Number (%)
C-section	2,314 (92.5%)	934 (76.8%)	51 (76.1%)	3,299 (87.2%)
Hysterectomy	7 (0.3%)	29 (2.4%)		36 (1.0%)
Laparotomy	122 (4.9%)	179 (14.7%)	9 (13.4%)	310 (8.2%)
Version and extraction	38 (1.5%)	45 (3.7%)	4 (6.0%)	87 (2.3%)
Craniotomy	20 (0.8%)	29 (2.4%)	3 (4.5%)	52 (1.4%)
<b>Total</b>	<b>2,501 (100%)</b>	<b>1,216 (100%)</b>	<b>67 (100%)</b>	<b>3,784 (100%)</b>

Caesareans represent 93% of interventions in urban areas and 77% in rural areas, while laparotomies (usually for suture of a uterine breach) account for only 5% of interventions in urban areas, compared with 15% in rural areas. This probably points to some delay in taking on the care of women in rural areas. As we shall see, this hypothesis is confirmed by the identification of higher intra-hospital maternal mortality and early perinatal mortality<sup>21</sup> rates in rural areas.

The caesarean rate per 100 expected births is 1.7 in urban areas and 0.3 in rural areas.

<sup>21</sup> Early perinatal mortality includes still-births and infants born alive who die within 24 hours of birth.

*Women who have not had an obstetric intervention*

Of the 90 women (**Table 4**) who had no MOI and who all died in a maternity hospital (the reason for which they were recorded), 27 died before any intervention. For the other women only 5 cases of the use of forceps and one case of repair of a perineal tear are noted; other interventions performed are not known.

*Absolute maternal indications*

There was a total of 2,708 (70%) absolute maternal indications among all cases recorded (MOI and deaths without MOI or any mention of MOI). Foeto-pelvic disproportion was the principal indication (52%) for a major obstetric intervention in both urban and rural areas (**Table 6**). If uterine ruptures and abnormal presentations are added to these cases problems connected with obstructed labour account for 82% of major interventions; this proportion differs very little according to type of area. This is partly due to the method of recording, which does not include the non-surgical treatment of haemorrhages or eclampsia. But in Mali there are few resuscitation or blood transfusion facilities (except in regional hospitals), and it is unfortunately very probable that the majority of these cases die before reaching hospital.

**Table 6.** ABSOLUTE MATERNAL INDICATIONS ACCORDING TO TYPE OF AREA, MALI, 1998

	Urban area	Rural area	Unknown area	Total
	Number (%)	Number (%)	Number (%)	Number (%)
Uterine rupture	99 (6.1%)	194 (19.2%)	8 (13.3%)	301 (11.1%)
Transverse, facial and front presentation	290 (17.7%)	216 (21.3%)	12 (20.0%)	518 (19.1%)
Foeto-pelvic disproportion and pre-rupture	927 (56.7%)	457 (45.2%)	27 (45.0%)	1,411 (52.1%)
Ante-partum haemorrhages	300 (18.3%)	126 (12.5%)	9 (15.0%)	435 (16.1%)
Post-partum haemorrhages	6 (0.4%)	1 (0.1%)		7 (0.3%)
Severe haemorrhages	14 (0.9%)	18 (1.8%)	4 (6.7%)	36 (1.3%)
<b>Total</b>	<b>1,636 (100%)</b>	<b>1,012 (100%)</b>	<b>60 (100%)</b>	<b>2,708 (100%)</b>

While the proportion of obstructed labour among indications is practically the same in urban and rural areas, the distribution according to the gravity of the indications is very different. In rural areas 22% of these indications have a uterine rupture as consequence, while in urban areas this is the case in only 7.5% of cases. This indicates a problem of accessibility to hospital structures in rural areas, leading to a delay in providing care for urgent cases. Similarly, ante-partum haemorrhages and severe haemorrhages are much less frequent in rural areas. The probable explanation, corroborating this problem of accessibility, is that these women suffered a fatal haemorrhage before they could be taken into care. This inaccessibility of rural hospitals – whether due to geographical, financial, cultural or other reasons – is no doubt one of the preponderant causes of maternal mortality in rural areas in Mali.

*Non-absolute maternal indications*

In either type of area, it is dynamic dystocias, which head the list of non-absolute maternal indications when they are classed according to their numbers in absolute figures (**Table 7**). In terms of absolute difference between relative proportions the greatest disparity between types of area (11%) is in foetal distress as an indication for a caesarean: this represents 18% of indications in urban areas compared with only 7% in rural areas.

The antecedents for a caesarean are twice as frequent in urban areas, which is logical, since the caesarean rate is higher (1.7 per 100 expected births in urban areas against 0.3 in rural areas). It is to be noted that caesareans represent 98% of interventions performed for non-absolute maternal indications in urban areas and only 92% in rural areas<sup>22</sup>.

**Table 7.** NON-ABSOLUTE MATERNAL INDICATIONS ACCORDING TO TYPE OF AREA, MALI, 1998

	Urban area	Rural area	Total
	Number (%)	Number (%)	Number (%)
Dynamic dystocia	246 (29.5%)	49 (26.6%)	300 (29.2%)
Foetal distress	150 (18.0%)	13 (7.1%)	164 (15.9%)
Antecedent of C-section	84 (10.1%)	9 (4.9%)	93 (9.0%)
Eclampsia	63 (7.6%)	15 (8.2%)	78 (7.6%)
Complications connected with cord	45 (5.4%)	17 (9.2%)	63 (6.1%)
Breach presentation	39 (4.7%)	7 (3.8%)	47 (4.6%)
Other cause	36 (4.3%)	10 (5.4%)	46 (4.5%)
Prophylactic C-section	31 (3.7%)	16 (8.7%)	49 (4.8%)
Prolonged labor	30 (3.6%)	27 (14.7%)	57 (5.5%)
Toxaemia, pre-eclampsia	24 (2.9%)	1 (0.5%)	25 (2.4%)
Premature rupture of the membranes	21 (2.5%)	2 (1.1%)	23 (2.2%)
Other obstetric antecedent	18 (2.2%)	10 (5.4%)	29 (2.8%)
Obstructed labor for non-AMI cause	18 (2.2%)	1 (0.5%)	19 (1.8%)
Genital malformation	17 (2.0%)	4 (2.2%)	21 (2.0%)
Mother's medical problem	9 (1.1%)	1 (0.5%)	10 (1.0%)
Obstructed labor for non-AMI presentation	2 (0.2%)	2 (1.1%)	5 (0.5%)
<b>Sub total</b>	<b>833</b>	<b>184</b>	<b>1,029</b>
Not mentioned or unknown	72 (8.0%)	63 (25.5%)	137 (11.9%)
<b>Total</b>	<b>905 (100%)</b>	<b>247 (100%)</b>	<b>2,195* (100%)</b>

\* This total includes the 14 cases for which the mother's area of origin is unknown

When rates of incidence are calculated for each of these indications in relation to expected births for each type of area the ratio of these rates in urban areas to rates in rural areas gives a very different picture of the disparities between the two types of area (**Table 8**). The leading place is taken by toxaemia/hypertension, which is 61 times less represented in rural areas than in urban areas. Because C-section is not the first treatment of toxaemia, it is here difficult to analyse these disparities

<sup>22</sup> Significant: Chi-square = 24.195 p < 0.000

**Table 8.** NON-ABSOLUTE MATERNAL INDICATIONS RATIO OF URBAN RATES TO RURAL RATES, MALI, 1998

Indication	Urban rate (‰ EB)	Rural rate (‰ EB)	Ratio U/R
Toxaemia Hypertension	0.177	0.003	61
Foetal distress	1.107	0.038	29
Premature rupture of the membranes	0.155	0.006	27
Antecedent of C-section	0.620	0.026	24
Mother's medical problem	0.066	0.003	23
Obstructed labour for other non-AMI presentation	0.148	0.009	17
Breach presentation	0.288	0.020	14
Dynamic dystocia	1.815	0.143	13
Genital malformation	0.125	0.012	11
Eclampsia	0.465	0.044	11

In second place comes foetal distress, with a ratio of 29. Even though the probability of undergoing an intervention for foetal distress is 29 times lower in rural than in urban areas, it must be remarked that this indication features as principal indication in only around 0.1% of births in urban areas (or 6% of caesareans). In wealthy countries, by way of comparison, Francome<sup>23</sup> considers that a minimum of 0.7 to 2% of deliveries should be by caesarean for this indication.

#### *Major obstetric interventions for absolute maternal indications*

The rate of MOI/AMI is 1.21 per 100 expected births in urban areas and 0.30 per 100 expected births in rural areas: i.e. four times higher in urban than in rural areas (**Table 9**). The difference is still more marked for caesareans for AMI: 1.06% in urban areas against 0.21% in rural areas or five times more frequent in rural areas.

**Table 9.** TYPE OF INTERVENTION ACCORDING TO TYPE OF INDICATION AND OF AREA, MALI, 1998

#### *Urban areas*

	C-section	Hysterec tomy	Laparo tomy	Version extraction	Cranio tomy	Unknown type of intervention	Total	Mother died before intervention
Uterine rupture		3	93			1	97	2
Transverse, facial and front presentation	248			37	4		289	1
Foeto-pelvic disproportion an pre-rupture	891		24		12		927	
Ante-partum haemorrhages	298	1				1	300	
Post-partum haemorrhages		2	4				6	
Severe haemorrhages						10	10	4
<b>Total</b>	<b>1,437</b>	<b>6</b>	<b>121</b>	<b>37</b>	<b>16</b>	<b>12</b>	<b>1,629</b>	<b>7</b>

<sup>23</sup> Francome C. and Savage W. (1993) Caesarean section in Britain and the United States 12% or 24%: is either the right rate? *Soc. Sci. & Med.* **37**: 1199-1218.

*Rural areas*

	C-section	Hysterectomy	Laparotomy	Version extraction	Craniotomy	Unknown type of intervention	Total	Mother died before intervention
Uterine rupture		25	161			2	188	6
Transverse, facial and front presentation	167			43	6		216	
Foeto-pelvic disproportion an pre-rupture	427	2	15		12	1	457	
Ante-partum haemorrhages	125	1					126	
Post-partum haemorrhages			1				1	
Severe haemorrhages						15	15	3
<b>Total</b>	<b>719</b>	<b>28</b>	<b>177</b>	<b>43</b>	<b>18</b>	<b>18</b>	<b>1,003</b>	<b>9</b>

To these two tables must be added 60 cases for which the mother's area of origin is unknown.

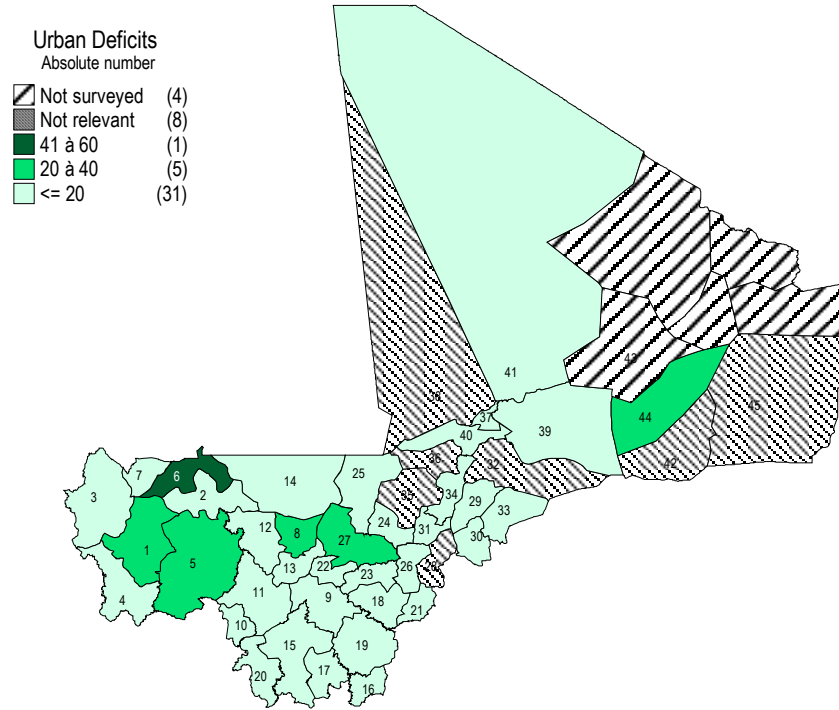
*Deficits in urban areas*

Only one Cercle has an absolute "urban" deficit higher than 41 – Nioro Cercle in the Kayes region (**Figure 2** and **Table 10**). There are five Cercles with absolute deficits ranging between 20 and 40, including Ségou and Gao, the chief towns of regions, with regional hospitals. This type of map (**Figure 2**) shows very clearly, which are priority towns for action aimed at improving care for obstetric emergencies. If these results in terms of the numbers of women who have not had an MOI are compared with the results in terms of relative values, that is in proportion to the number of cases expected, it can be seen that in four of these Cercles the relative deficit is above 60%, but for the town of Ségou it is only 28%. This indicates that if in terms of [quantity of] lives lost Ségou is a priority, the hospital is already largely performing its role in the reception of obstetric emergencies. The other Cercles, and in particular Gao, which also has a regional hospital, are not responding satisfactorily to the needs. As here there is no problem of distance (since by definition living in an urban area means living within 15 km of a hospital), we must look for other causes limiting accessibility to hospital: lack of a professional with surgical competence, quality of care unacceptable to the population, financial barrier, etc.

Many Cercles have negative deficits. As explained above, this is no doubt due to urban/rural contamination. This contamination is particularly high in Mopti, where three of the eight Cercles in the region have no functional operating suite. In support of this hypothesis, it may be noted that 28% of women operated on in Mopti came from other Cercles in the region. For Tombouctou this proportion is 37% and for Bamako 16%.

For Cercles such as Koulikoro, Kolokani and Bla in which the deficits are also negative, this type of finding is not at all evident. Almost all women operated on in these health formations were stated to come from the Cercle in which the health centre is situated. Nevertheless these three Cercles have an evacuation system, and this is very probably one of the reasons for the negative urban deficits observed, women evacuated from other Cercles having given a wrong place of residence on admission. And indeed it can be seen from the file that 51%, 25% and 55% respectively of women coming in majority from a rural area (95% of cases) were referred to the Kolokani, Koulikoro and Bla health centres but were nevertheless recorded as being residents of the Cercle in which they were operated on. Unfortunately, we do not know the name of the health formation, which evacuated these women, and it is thus impossible to say whether they came from the same Cercle out from a rural area or from some other Cercle.

**Figure 2.** DEFICITS IN ABSOLUTE NUMBERS OF MAJOR OBSTETRIC INTERVENTIONS FOR ABSOLUTE MATERNAL INDICATIONS, URBAN AREAS, MALI, 1998



The numbering of the Cercles refers to **Table 10**

**Table 10.** DEFICITS IN MAJOR OBSTETRIC INTERVENTIONS FOR ABSOLUTE MATERNAL INDICATIONS BY CERCLE, URBAN AREAS, MALI, 1998

Region	N°	Cercle	Expected births	MOI for AMI		Deficits (%)
				Expected	Performed	
KAYES	1	BAFOULABE	2,109	25	3	22 (88%)
	2	DIEMA	845	10	2	8 (80%)
	3	KAYES	4,768	57	55	2 (4%)
	4	KENIEBA	1,007	12	7	5 (42%)
	5	KITA	2,885	35	14	21 (60%)
	6	NIORO	4,035	48	0	48 (100%)
	7	YELIMANE	1,233	15	2	13 (87%)
KOULIKORO	8	BANAMBA	2,651	32	11	21 (65%)
	9	DIOILA	2,529	30	20	10 (34%)
	10	KANGABA	543	7	3	4 (54%)
	11	KATI	3,480	42	60	-18 (-44%)
	12	KOLOKANI	1,072	13	23	-10 (-79%)
	13	KOULIKORO	1,246	15	40	-25 (-168%)
	14	NARA	1,857	22	4	18 (82%)
SIKASSO	15	BOUGOUNI	1,418	17	19	-2 (-12%)
	16	KADIOLO	2,139	26	21	5 (18%)
	17	KOLONDIÉBA	1,097	13	8	5 (39%)
	18	KOUTIALA	5,025	60	53	7 (12%)
	19	SIKASSO	9,691	116	132	-16 (-14%)
	20	YANFOLILA	3,157	38	20	18 (47%)
	21	YOROSSO	586	7	4	3 (43%)
SEGOU	22	BARAOUELI	1,074	13	9	4 (30%)
	23	BLA	930	11	22	-11 (-97%)
	24	MACINA	812	10	0	10 (100%)
	25	NIONO	2,698	32	17	15 (48%)
	26	SAN	3,200	38	28	10 (27%)
	27	SEGOU	9,217	111	80	31 (28%)
	28	TOMINIAN	Non relevant*			Non relevant
	29	BANDIAGARA	2,037	24	8	16 (67%)
MOPTI	30	BANKASS	1,220	15	4	11 (73%)
	31	DJENNE	1,642	20	10	10 (49%)
	32	DOUENTZA	Non relevant			Non relevant
	33	KORO	1,603	19	7	12 (64%)
	34	MOPTI	1,527	18	70	-52 (-282%)
	35	TENENKOU	Non available		1	/
	36	YOUAWAROU	Non available		0	/
	37	DIRE	863	10	7	3 (32%)
TOMBOU CTOU	38	GOUNDAM	Non relevant			Non relevant
	39	GOURMA- RHAROUS	644	8	0	8 (100%)
	40	NIAFUNKE	707	8	1	7 (88%)
	41	TOMBOUCTOU	587	7	10	-3 (-42%)
GAO	42	ANSONGO	Non relevant			Non relevant
	43	BOUREM	Non relevant			Non relevant
	44	GAO	3,443	41	12	29 (71%)
	45	MENAKA	Non relevant			Non relevant
		BAMAKO	49,978	600	828	-228 (-38%)
		<b>Total</b>	<b>135,555</b>	<b>1,627</b>	<b>1,616</b>	<b>12 (1%)</b>

The total number of MOI/AMI observed includes cases for which the mother's Cercle of origin is not known.

\*Non relevant = according to our definition of urban population, there is no urban population in this Cercles.

Nara, the largest Cercle and the farthest from the Koulikoro regional hospital, has no evacuation system, and its population is 80% rural. Its proximity to the Mauritanian frontier would appear to be one explanation for this deficit. But further research has shown that at that period there was no functional Mauritanian health formation within 300 km of the frontier.

The situation in Macina, in the Ségou region, is particularly worrying because all the cases of MOI for AMI coming from this district were operated on in health structures in other Cercles, most frequently in Ségou regional hospital. Only one major obstetric intervention was performed in Macina during 1998.

Gourma-Rharous and Niafunké, in Tombouctou region, have an essentially rural population and have no system of referral and evacuation. Their operating suites are functional, and there is a generalist doctor working in the centre who has the equipment required for interventions.

For all these Cercles, which have high deficits in both urban and rural areas, there is the problem of accessibility; nevertheless, if women living near the health centre do not go there, even for urgent obstetric problems, there must also be a problem at the level of the health formation itself. And since all of them have a functional operating suite and a doctor capable of performing interventions, we must envisage causes other than those usually put forward to explain these deficits. Although there may be many possible factors, the effective presence (or availability) of the doctor and the quality of reception and care are perhaps the matters to be looked at as a priority in these formations. The problem of urban/rural contamination does not arise here, since the deficits are as large in urban as in rural areas.

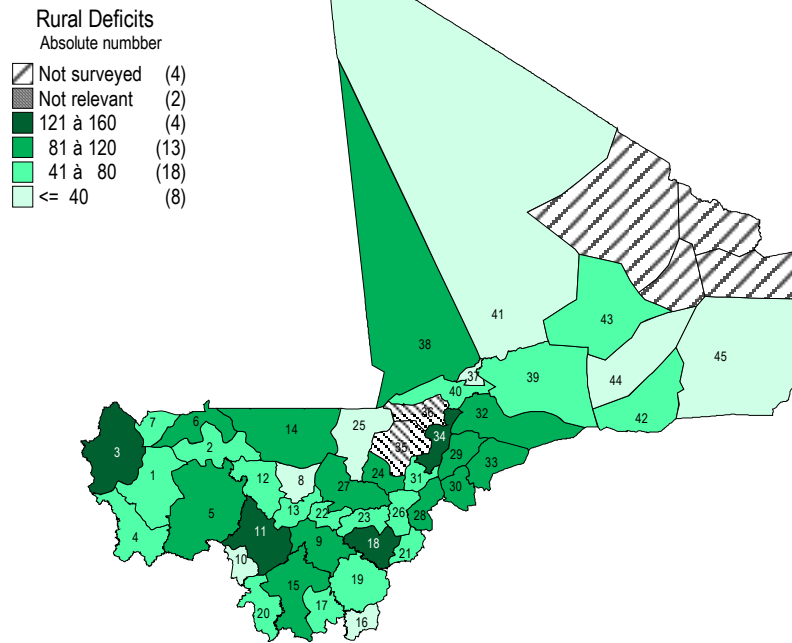
Among the Cercles in which the relative deficit is lowest, in addition to the two mentioned above (Niono and Kadiolo), are Dioila, Bla, Sikasso and Ségou, with a rural deficit below 60%. In two of these Cercles, there is a regional hospital; the other four have an evacuation system. In these Cercles the urban deficits, while not exceptionally low, are at any rate below 50%. Niono has the highest figure (48%), and, disregarding the negative figures for Bla and Sikasso, the lowest deficit is in Kadiolo (18%).

The other Cercles with an evacuation system have deficits ranging between 72% in Kolokani and 78% in Kangaba. Urban/rural contamination is possible in Kolokani and Bougouni, since the urban deficits are negative; but transferring these cases to rural areas would bring down the deficit only to 62% in Kolokani and would make little difference in Bougouni. In other Cercles, the urban deficits concern only four cases in Kangaba and ten in San.

For all other Cercles, the rural deficits are large both in relative figures and in numbers of interventions (**Table 11** and **Figure 3**). We can seek to summarise the analysis of these deficits in a number of more general observations:

- Some health formations are not fulfilling their role, since the high urban deficits observed cannot be attributed to problems of distance or inadequacy of resources. It seems essential, therefore, to analyse the functioning of these formations. The Cercles in question are Bafoulabé, Diéma, Yélimané, Nara, Macina, Gourma-Rharous and Niafunké, in which the deficits in urban areas are above 80%, and the Gao regional hospital, where it is 71%.
- Some hospitals and Cercle health centres respond reasonably well to the needs of patients living nearby, but the remoteness of rural areas is an essential problem still requiring resolution.
- In some cases, there is clearly urban/rural contamination. It would be desirable in future studies to lay stress from the outset on the quality of recording of the mother's usual place of residence.
- Cercles, which have established a referral system, seem to have lower deficits in rural areas. This last observation is the subject of more precise analysis in the following section.

**Figure 3. DEFICITS IN ABSOLUTE NUMBERS OF MAJOR OBSTETRIC INTERVENTIONS FOR ABSOLUTE MATERNAL INDICATIONS, RURAL AREAS, MALI, 1998**



The numbering of the Cercles refers to **Table 11**

**Table 11.** DEFICITS IN MAJOR OBSTETRIC INTERVENTIONS FOR ABSOLUTE MATERNAL INDICATIONS BY CERCLE, RURAL AREAS, MALI, 1998

Region	N°	Cercle	Expected births	MOI for AMI		Deficits	(%)
				Expected	Performed		
KAYES	1	BAFOULABE	6,834	82	6	76 (93%)	
	2	DIEMA	6,704	80	5	75 (94%)	
	3	KAYES	13,155	158	28	130 (82%)	
	4	KENIEBA	4,920	59	8	51 (86%)	
	5	KITA	10,990	132	14	118 (89%)	
	6	NIORO	9,608	115	3	112 (97%)	
	7	YELIMANE	6,257	75	5	70 (93%)	
KOULIKORO	8	BANAMBA**	3,525	42	12	30 (72%)	
	9	DIOILA*	14,456	173	84	89 (52%)	
	10	KANGABA*	3,058	37	8	29 (78%)	
	11	KATI	18,633	224	62	162 (72%)	
	12	KOLOKANI*	8,324	100	28	72 (72%)	
	13	KOULIKORO**	6,260	75	13	62 (83%)	
	14	NARA	7,924	95	7	88 (93%)	
SIKASSO	15	BOUGOUNI*	12,378	149	49	100 (67%)	
	16	KADIOLO**	4,786	57	26	31 (55%)	
	17	KOLONDIEBA*	6,415	77	23	54 (70%)	
	18	KOUTIALA	15,238	183	56	127 (69%)	
	19	SIKASSO	10,947	131	74	57 (44%)	
	20	YANFOLILA	7,511	90	23	67 (74%)	
	21	YOROSSO	5,961	72	17	55 (76%)	
SEGOU	22	BARAOUELI	6,933	83	20	63 (76%)	
	23	BLA*	9,008	108	52	56 (52%)	
	24	MACINA	8,632	104	17	87 (84%)	
	25	NIONO**	8,895	107	69	38 (35%)	
	26	SAN**	9,405	113	34	79 (70%)	
	27	SEGOU	14,028	168	75	93 (55%)	
	28	TOMINIAN	8,480	102	18	84 (82%)	
MOPTI	29	BANDIAGARA**	8,938	107	26	81 (76%)	
	30	BANKASS	7,654	92	8	84 (91%)	
	31	DJENNE*	5,790	69	23	46 (67%)	
	32	DOUMENTZA	8,158	98	13	85 (87%)	
	33	KORO	10,790	129	20	109 (85%)	
	34	MOPTI	13,981	168	23	145 (86%)	
	35	TENENKOU	Non available		1	/	
36	YOUAWAROU	Non available		8	/		
TOMBOU CTOU	37	DIRE	3,312	40	2	38 (95%)	
	38	GOUNDAM	7,927	95	6	89 (94%)	
	39	GOURMA-RHAROUS	4,655	56	2	54 (96%)	
	40	NIAFUNKE	5,498	66	0	66 (100%)	
	41	TOMBOUCTOU	2,971	36	2	34 (94%)	
GAO	42	ANSONGO	4,244	51	3	48 (94%)	
	43	BOUREM	3,950	47	5	42 (89%)	
	44	GAO	2,410	29	2	27 (93%)	
	45	MENAKA	3,152	38	0	38 (100%)	
<b>Total</b>			<b>342,695</b>	<b>4,112</b>	<b>985</b>	<b>3,127 (76%)</b>	

The total number of MOI/AMI observed includes cases in which the mother's Cercle of origin is not known.

\* Cercles with an operational evacuation/referral system

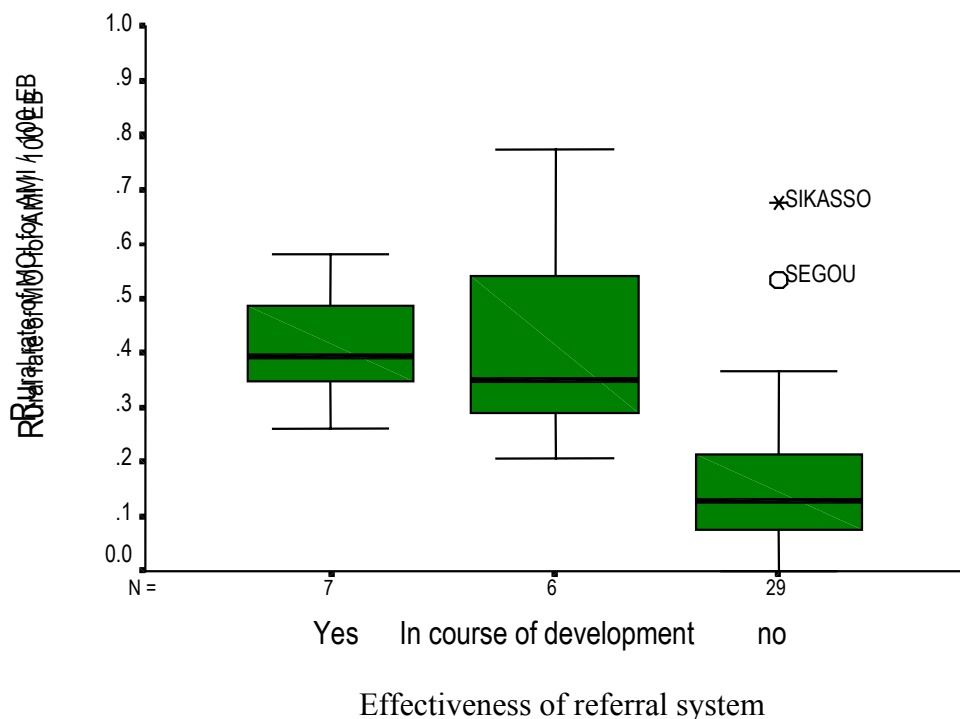
\*\* Cercles with an evacuation/referral system in course of installation

### A referral/evacuation system: a necessary but not sufficient solution

In order to check whether a referral/evacuation system for obstetric emergencies is an effective means of improving women's accessibility to hospital, an analysis of rates of MOI/AMI in rural areas according to whether or not such a system exists is summarised in **Figure 4**.

The differences between Cercles, which have a service of this kind and those, which do not are significant<sup>24</sup>.

**Figure 4.** COMPARISON OF MOI/AMI RATES IN RURAL AREAS ACCORDING TO LEVEL OF DEVELOPMENT OF AN EVACUATION SYSTEM FOR OBSTETRIC EMERGENCIES, MALI, 1998



The rate range, for Cercles in which the system is operational, between 0.26 in Kangaba and 0.58 in Dioila and Bla, with a median of 0.39 MOI/AMI per 100 expected births.

For Cercles in which the system is in course of development the rate range between 0.21 in Koulikoro and 0.78 in Niono, with a median of 0.35 MOI/AMI per 100 expected births.

For Cercles which have no evacuation system the rates range between 0 in Niafunké and 0.68 in Sikasso (and 0.53 in Ségou), with a median of 0.13.

The establishment of a system for the evacuation of emergencies here shows its effectiveness, at any rate from the point of view of the accessibility of the health formations. But it must nevertheless be remarked that this is not sufficient either to meet the deficits or to improve accessibility to the point of wiping out the difference between urban and rural areas.

There are also disparities between types of area from the point of view of the gravity of the interventions performed and the probabilities of death for the mother and child. A study of cases of uterine rupture, causes of the mother's death and early perinatal mortality will bring out these disparities.

<sup>24</sup> Confidence interval round median: evacuation system: 0.252; 0.539. In course of development: 0.1373; 0.5647. No referral system organised: 0.08163; 0.1724.

*Uterine ruptures*

A total of 290 uterine ruptures was recorded, in 52 of which (18%) the mother died (**Table 12**). As noted above, uterine ruptures constitute 6% of indications in urban areas and 18% in rural areas. In urban areas, only a low proportion of these ruptures (3%) necessitated a hysterectomy; in rural areas, on the other hand, 13% of ruptures necessitated a hysterectomy.

**Table 12.** UTERINE RUPTURES: TYPES OF INTERVENTION AND NUMBER OF MATERNAL DEATHS ACCORDING TO TYPE OF AREA, MALI, 1998

	Urban area		Rural area		Total	
	Number	Deaths	Number	Deaths	Number	Deaths
Hysterectomy	3	0	25	3	28	3
Laparotomy	93	8	161	29	254	37
Mother died before intervention	2	2	6	6	8	8
<b>Total</b>	<b>98</b>	<b>11*</b>	<b>192</b>	<b>40*</b>	<b>290</b>	<b>52*</b>

\* These totals do not include 3 cases for which the type of intervention is not known and one case in which the mother's area of origin is not known.

Of all the cases of foeto-pelvic disproportion or abnormal presentation presenting in hospitals, 1 in 5 is complicated by uterine rupture in rural areas, while in urban areas the proportion is only 1 in 13. This shows that women living in rural areas are slower to go to a health formation in the event of a problem with the birth (assuming that the uterine ruptures do not occur in the hospital itself). Moreover, as is shown by the proportion of hysterectomies (3% of uterine ruptures in urban areas against 13% in rural areas) and of deaths (11% of uterine ruptures in urban areas against 21% in rural areas), when these women make up their minds to go to an obstetric department it is often too late to confine the intervention to a laparotomy, or even to hope to save the mother's life.

If the Bamako cases are excluded from the analysis the proportion of deaths from uterine rupture in urban areas is 14% (8 deaths from 58 interventions, including 3 hysterectomies and 55 laparotomies). Even though the situation is more favourable in urban areas in the interior of the country, mothers with a grave obstetric problem are slow to go to a health formation, while in the capital this decision seems to be taken much sooner.

Uterine ruptures thus constitute the most frequent cause of maternal death in hospital in rural areas. In urban areas, the principal causes of death are haemorrhages (35%).

*Intra-hospital maternal deaths*

The area of origin of the mother and the type of complication associated with the death have been identified in 159 cases of intra-hospital maternal death (**Table 13**). In rural areas haemorrhages represent only 24% of the causes of maternal death: that is, relatively less than in towns (35%). Expressed as rates, deaths in hospital from haemorrhage occurred in 1.4 cases per 10,000 expected births in urban areas and 0.73 cases per 10,000 expected births in rural areas, or half as many. One of the explanations for this difference is probably the time which women in rural areas take in getting to hospital in the event of problems. Given the rapidity with which women die from most of these haemorrhages<sup>25</sup>, these mothers very probably die before reaching a health formation competent to provide the necessary care.

<sup>25</sup> An average delay before death from an ante-partum haemorrhage is 12 hours, and from a post-partum haemorrhage 2 hours (Abou Zakr and Berer 1999).

**Table 13.** INTRA-HOSPITAL MATERNAL DEATHS ACCORDING TO INDICATIONS (MOI AND NON-MOI), MALI, 1998

	Urban area		Rural area	
	Number	(%)	Number	(%)
Uterine rupture	11	(21%)	40	(38%)
Transverse, facial and front presentation	9	(17%)	16	(15%)
Foeto-pelvic disproportion and pre-rupture	14	(26%)	25	(24%)
Ante-partum haemorrhage	5	(9%)	7	(7%)
Severe haemorrhage	14	(26%)	18	(17%)
<b>Total</b>	<b>53</b>	<b>(100%)</b>	<b>106</b>	<b>(100%)</b>

Not including 14 women who died before any intervention

**Table 14** corroborates the hypotheses put forward above: although in urban areas maternal mortality is mainly observed after a caesarean (74%), in rural areas this association is much less frequent; deaths after a caesarean represent only 51% of cases and laparotomies (most frequently for uterine rupture) 39% of cases.

**Table 14.** INTRA-HOSPITAL MATERNAL DEATHS ACCORDING TO TYPE OF INTERVENTION FOR ABSOLUTE MATERNAL INDICATIONS AND ACCORDING TO TYPE OF AREA, MALI, 1998

	Urban area		Rural area	
	Number	(%)	Number	(%)
C-section	25	(73.5%)	40	(51%)
Hysterectomy	0		3	(4%)
Laparotomy	8	(23.5%)	31	(39%)
Version – extraction	1	(3.0%)	3	(4%)
Craniotomy	0		2	(2%)
<b>Total</b>	<b>34</b>	<b>(100%)</b>	<b>79</b>	<b>(100%)</b>

Major obstetric interventions are also performed for indications not included in the list of absolute maternal indications. Among these are toxæmia and eclampsias (83 cases in urban areas and 15 in rural areas). In spite of the operation performed 6 of these women (7%) died in urban areas and 2 in rural areas. Other causes of death following an intervention are unfortunately so rarely recorded in the file that it is impossible to make any analysis of these cases. **Table 15** shows that the average risk of dying in an AMI case (4.3%) is one and a half time higher than in a non-AMI case (2.8%). The problem is mainly of importance in rural areas, whether in an AMI case (8%) or a non-AMI case (6.5%).

**Table 15.** MATERNAL DEATHS AFTER MOI ACCORDING TO GROUP OF INDICATIONS (AMI AGAINST NON-AMI) AND TO TYPE OF AREA, MALI, 1998

	AMI			Non AMI		
	Number of MOI	Number of deaths	(%)	Number of MOI	Number of deaths	(%)
Urban	1,617	34	(2.1%)	884	16	(1.8%)
Rural	985	79	(8.0%)	231	15	(6.5%)
Unknown	55	2	(3.6%)	12	0	(0%)
<b>Total</b>	<b>2,657</b>	<b>115</b>	<b>(4.3%)</b>	<b>1,127</b>	<b>31</b>	<b>(2.8%)</b>

### Child deaths

Early perinatal mortality reaches dramatic levels both in urban and in rural areas. In rural areas, in spite of the fact that the mother is taken into surgical care, almost half the children die in utero or within 24 hours of birth (**Table 16**).

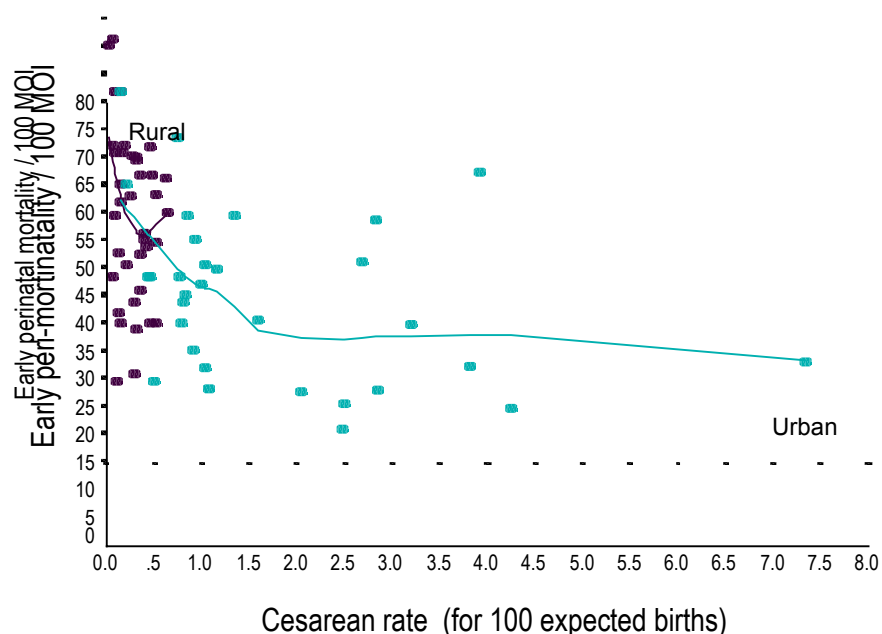
**Table 16.** NUMBER OF CHILDREN STILL-BORN AND DYING WITHIN 24 HOURS OF AN MOI, ACCORDING TO GROUP OF INDICATIONS AND TYPE OF AREA, MALI, 1998

	AMI			Non AMI			Total		
	Number of MOI	Number of deaths	(%)	Number of MOI	Number of deaths	(%)	Number of MOI	Number of deaths	(%)
Urban	1,617	377	(23%)	884	79	(9%)	2,501	456	(18%)
Rural	985	488	(50%)	231	73	(32%)	1,216	561	(46%)
Unknown	55	19	(35%)	12	1		67	20	(30%)
<b>Total</b>	<b>2,657</b>	<b>884</b>	<b>(33%)</b>	<b>1,127</b>	<b>133</b>	<b>(12%)</b>	<b>3,784</b>	<b>986</b>	<b>(26%)</b>

While 27% of these deaths (including two-thirds in rural areas) occur following a uterine rupture, problems of obstructed labour are responsible for 38% of child deaths in urban areas and 43% in rural areas. This shows once again that in rural areas delay in getting to a maternity hospital in case of problems plays a major part.

Caesareans save not only the mother's life but also the child's. However, as **Figure 5** shows, below an average caesarean rate of 1.5% a child's probability of dying falls from 75% (when the caesarean rate is near 0) to 25%. Then beyond 1.5 caesareans per 100 expected births the benefit to the child in terms of survival does not much increase.

**Figure 5.** MORTINATALITY AND NEONATAL MORTALITY WITHIN 24 HOURS AMONG WOMEN WHO HAVE HAD AN MOI (CAESAREAN AND MOI/AMI) ACCORDING TO CAESAREAN RATE, MALI, 1998



This graph also shows that in rural areas the association between caesarean rate and early perinatal mortality is very low: it can be seen that around a caesarean rate of 0.5 per 100 expected births, perinatal mortality ranges between 15 and 57% for children whose mother has had an MOI. It is probable that the child is already dead on the mother's admission to the health formation; for it can be observed that in 26% of cases in rural areas the child is still-born, compared with 12% in urban areas. If to these cases are added all the children dying (in utero) because of a uterine rupture it is found that the proportion of stillborn children among all AMI

cases is 44% in rural areas and 22% in urban areas. It is thus frequently already too late to save the child, and the operations are performed only in the hope of saving the mother's life.

The children thus also pay a heavy price for delay in the decision to go to a health formation. As we have seen, it is frequently too late to save the mother's life, but this happens much more frequently in relation to the survival of the child.

The above findings have not yet fully taken account of the hospital formations and their ability to deal with obstetric emergencies. Frequently problems of human and material resources take prime place among the causes of poor results in health care.

#### *Work load and resources*

In Mali, however, almost all districts have a hospital structure with an operating suite and at least one doctor capable of performing obstetric interventions.

In spite of this relatively good health coverage, the proportions of births in hospital are still, as **Table 17** shows, very low everywhere. The two exceptions are Koulikoro, where four of the seven Cercles have organised an evacuation system, and Bamako, the country's capital. In Gao, which has only one hospital with facilities for performing interventions, less than one woman in a hundred is delivered in hospital.

**Table 17.** HOSPITAL ACTIVITIES BY REGION, MALI, 1998

	Expected births (EB)	Hospital births	
		Number	% of EB
Kayes	75,350	5,987	8%
Koulikoro	75,558	9,021	12%
Sikasso	86,349	17,229	8%
Segou	83,312	27,789	8%
Mopti	74,902	4,454	6%
Tombouctou	27,164	31,191	4%
Gao	17,199	111	0.6%
Bamako	49,978	412,081	13%
<b>Total</b>	<b>489,812</b>	<b>47,863</b>	<b>9%</b>

1 Data for Sikasso regional hospital lacking

2 Data for Ségou HC lacking

4 For Gabriel Touré hospital the data relate to the number of admissions to the maternity hospital and not the real number of births. There is thus a slight over-estimate of the number of deliveries

Apart from the regional hospitals, where the proportions of hospital births lie between 7 and 18%, only the hospitals in nine Cercles are above the average (7%), six of which have an organised referral system. Even if this is intended for obstetric emergencies, its effectiveness may give the population greater confidence in the health formation.

What are we to make of the problem of the inadequacy and poor distribution of health personnel which is frequently put forward as a major cause of poor results in health matters? **Table 18** enables us to assess the volume of activities carried out by medical and paramedical staff in the health structures concerned. The data set out below relates to deliveries and operations performed in the health formations of each Cercle, whatever the mother's Cercle of origin. These figures are thus slightly different from those in previous tables, which presented the data according to the Cercle of origin of the mother; for certain women are operated on in hospitals outside their Cercle of origin, either because they have been referred there or on their own initiative.

**Table 18.** VOLUME OF DELIVERIES AND MAJOR OBSTETRIC INTERVENTIONS BY HEALTH FORMATION AND STATUS OF THE FORMATION, MALI, 1998

Cercle	Hospital status	Expected births (EB)	Hospital births Number and % of EB	MOI	
				Number and % of hospital births	IOM/IMA Number and % of MOI
Bafoulabé	Public	8,943	99 (1%)	8 (8%)	8 (100%)
Diéma	Public	7,549	224 (3%)	7 (3%)	7 (100%)
Kayes	Public	17,923	3,208 (18%)	145 (5%)	86 (59%)
	Private		Not available	Not available	Not available
Keniéba	Public	5,927	361 (6%)	9 (2%)	9 (100%)
Kita	Public	13,875	1,035 (7%)	33 (3%)	30 (91%)
Nioro	Public	13,643	780 (6%)	4 (0%)	3 (75%)
Yelimané	Public	7,490	280 (4%)	5 (2%)	5 (100%)
Banamba	Public	6,176	822 (13%)	29 (4%)	27 (93%)
Dioila	Public	16,985	1,315 (8%)	109 (8%)	95 (87%)
	Public		850 (5%)	13 (2%)	10 (77%)
Kangaba	Public	3,601	328 (9%)	19 (6%)	9 (47%)
Kati	Public	22,113	3,728 (17%)	32 (1%)	28 (88%)
Kolokani	Public	9,396	781 (8%)	76 (10%)	47 (62%)
Koulikoro	Public	7,506	741 (10%)	70 (9%)	49 (70%)
Nara	Public	9,781	456 (5%)	12 (3%)	10 (83%)
Bougouni	Public	13,796	1,026 (7%)	91 (9%)	60 (66%)
Kadiolo	Public	6,925	910 (13%)	40 (4%)	34 (85%)
Kolondiéba	Public	7,512	524 (7%)	38 (7%)	29 (76%)
Koutiala	Public	20,263	1,956 (10%)	116 (6%)	107 (92%)
Sikasso	Public	20,638	1,350 (7%)	263 (19%)	234 (89%)
	Private		Not available	Not available	Not available
Yanfolila	Public	10,668	648 (6%)	33 (5%)	31 (94%)
	Public		563 (5%)	20 (4%)	13 (65%)
Yorosso	Public	6,547	252 (4%)	25 (10%)	21 (84%)
Baraouéli	Public	8,007	918 (11%)	23 (3%)	22 (96%)
Bla	Public	9,938	131 (1%)	80 (61%)	73 (91%)
Macina	Public	9,444	308 (3%)	1 (0%)	1 (100%)
Niono	Public	11,593	1,253 (11%)	49 (4%)	41 (84%)
San	Public	12,605	1,660 (13%)	98 (6%)	80 (82%)
Ségou	Public	23,245	3,344 (14%)	226 (7%)	192 (85%)
	Public		Non available	45 (%)	34 (76%)
Tominian	Public	8,480	175 (2%)	Operating theatre not functional	
Bandiagara	Public	10,975	313 (3%)	31 (10%)	23 (74%)
	Public		300 (3%)	14 (5%)	7 (50%)
Bankass	Public	8,874	420 (5%)	27 (6%)	13 (48%)
Djenné	Public	7,432	234 (3%)	40 (17%)	25 (63%)
Douentza	Public	8,158	422 (5%)	Operating theatre not functional	
Koro	Public	12,393	632 (5%)	37 (6%)	28 (76%)
Mopti	Public	15,508	1,941 (13%)	204 (11%)	131 (64%)
Tenenkou	Public	7,485	139 (2%)	Operating theatre not functional	
Youawarou	Public	4,077	53 (1%)	Operating theatre not functional	
Diré	Public	4,175	270 (6%)	9 (3%)	9 (100%)
Goundam	Public	7,927	215 (3%)	Operating theatre not functional	
Gourma-Rharous	Public	5,299	63 (1%)	1 (2%)	0 (0%)
Niafunké	Public	6,205	167 (3%)	3 (2%)	2 (67%)
Tombouctou	Public	3,558	476 (13%)	36 (8%)	19 (53%)
Ansongo	Public	4,244	Non available	Operating theatre not functional	
Bourem	Public	3,950	Non available	Operating theatre not functional	
Gao	Public	5,853	111 (2%)	27 (24%)	22 (82%)
Ménaka	Public	3,152	Non available	Operating theatre not functional	

Bamako	Point G	Public		987 (2%)	228 (23%)	143 (63%)
	G Touré	Public		612 <sup>1</sup> (1%)	590 (96%)	386 (65%)
	Commune V	Public	49,978	5,289 (11%)	598 (11%)	312 (52%)
	Commune IV	Public		Non available	42 (1%)	28 (67%)
		Private		432 (1%)	178 (41%)	113 (64%)
<b>Total</b>			<b>489,812</b>	<b>43,102 (9%)</b>	<b>3,784 (9%)</b>	<b>2,656 (70%)</b>

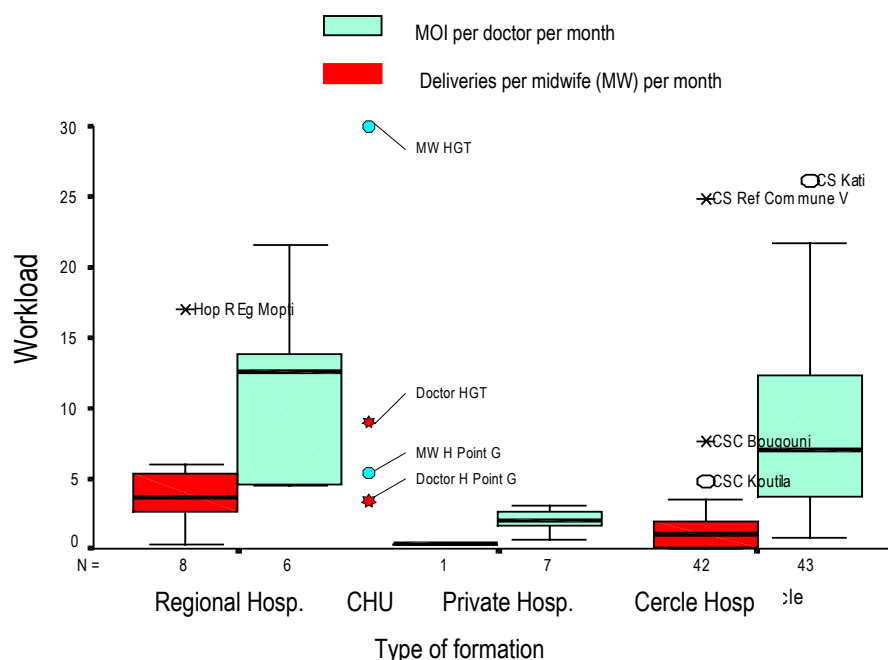
1 Only dystocic births

The workload, shown in **Figure 6**, varies very considerably between one formation and another: some doctors (49 out of the 99 practising in the public sector) perform fewer than 3 major obstetric interventions per month. For others the average is 6 MOI a month (2 in Niono, where there are two doctors; 17 in Mopti, where there is only one gynaecologist; and 25 in Bamako's Commune V, where there are 1 gynaecologist and 1 surgeon, with almost 600 interventions annually).

Some formations, including three regional hospitals (Gao, Mopti and Tombouctou), have only one doctor capable of dealing with obstetric emergencies permanently available. Even if their workload is not high, this means that they must be there 24 hours a day throughout the year in order to maintain a continuous service.

The problem of inadequacy and poor distribution of medical staff does not seem a major one in view of the workload; but account must be taken of the obligatory hours of presence of the doctors on whom alone the functioning of a hospital depends.

**Figure 6.** MONTHLY WORK LOAD OF MEDICAL AND PARAMEDICAL STAFF, MALI, 1998



HGT= Gabriel Touré National Hospital, H Point G= Point G National Hospital, SF= midwife

Apart from the Tombouctou regional hospital (which has only one matrone) all health formations have at least two paramedical staff able to carry out deliveries. The median is 6 PPMCG<sup>26</sup> per structure.

<sup>26</sup> PPMCG = personnel paramédical à compétence gynécologique (paramedical personnel with gynaecological competence).

Little information has been collected about equipment. Some formation (14), including particularly the Tombouctou hospital, have neither vacuum extractors nor forceps. The others have at least one forceps and/or mechanical vacuum extractor; the only electric vacuum extractor is in the Kayes hospital.

#### **4. UTILISATION OF RESULTS**

One of the objectives of the study was to confront staff working in the health system with the scale of the maternal mortality problem in their area of activity – not only to inform them but also to stimulate consideration, based on a concrete situation, which might lead to changes and to action programmes aimed at reducing the extent of maternal mortality.

One of the means of involving health workers in a study of this kind was to get them to take part in the collection of information and thus enable them to calculate the deficits in their own district. Later, after a more complete analysis of the results, retro-information seminars were held in almost all the regions concerned.

#### ***Retro-information***

During this process the members of the co-ordinating team did not merely present the results of the study to the staff of the Cercles: in addition documents on the organisation of medical staffs and organisation charts for dealing with problems connected with pregnancy were sent to all participants.

In connection more particularly with the UON study, the statistical data on the deficits in each Cercle, coupled with data on the available human resources, was presented and compared with the figures for other regions. Stress was also placed on the performance of Cercles, which had established an evacuation system, and on the results for the various hospitals. Working groups were set up which enabled all concerned to analyse these results, discuss them and suggest methods of improving them.

These various seminars produced a number of general recommendations, relating particularly to the need to establish referral systems in all Cercles. The low rate of frequentation of health formations calls for action to make the population, and particularly women, aware of the help, which the emergency services, can give. A third line of action suggested relates to the improvement of human and material resources, in particular the supply of the necessary medical equipment to all operating suites, the reinforcement of medical and paramedical staff and the extension of health coverage.

The result of this retro-information remains limited. The method of approach by presenting the bare figures, without the dynamic that might lead to a constructive debate, is perhaps not the best way of going about it.

Here the unduly directive method used and the lack of stimulus to consider certain essential lines of development (which were discussed at the preliminary meetings with a member of the UON network) limited the extent of such consideration. Comparative analyses based on experiments tried in other Cercles and on the very different results achieved by some health formations with similar conditions regarding human and material resources would no doubt have made it possible to bring out more clearly the most positive lines of action for improving results, not only in the field of maternal mortality but also in health care in general.

This national retro-information process brought the same problems to light; but it also led to consideration of the quality of care and the motivation of personnel. These two factors are considered as having contributed to improving the results in certain districts in which an evacuation system has not yet been established.

From the national retro-information process have emerged a number of main strategic axes for the improvement of obstetric coverage. As regards public bodies, it has been suggested

in particular that an attempt should be made by operational research to determine what socio-cultural factors limit women's access to health services in the perinatal period, and that these communities should be involved in establishing evacuation systems. Other lines of action relate mainly to the staff of health formations (decentralised formations, distribution and motivation of staff, joint action with professional associations) and the material resources required for performing blood transfusions.

All these recommendations are an integral part of the perinatal programme introduced in Mali in recent years. What, then, is the benefit of a study of this kind? To answer this question it is essential to analyse the interviews carried out, for they show that the presentation of a problem of such concern as maternal mortality in terms of lives lost, and not merely summarised by a global indicator (the national rate of maternal mortality per 100,000 live births) does work on people's minds.

## **Perception**

### *Methodological note*

For the "research" part of the UON approach, it is planned to carry out interviews with key persons concerned with the problems of maternal health and/or in decisions on health policy in the wider sense. This includes not only members of the country's Ministry of Health (at both national and regional level), but also members of women's organisations, professional associations, international organisations and bilateral co-operation agencies. Unfortunately, in Mali, these selection criteria have not been adopted<sup>27</sup>, and representatives of the main international organisations involved in the campaign against maternal mortality were not contacted. Six of the 11 persons interviewed are on the staff of the Ministry of Health at central level and one at regional level. The other interviews involve two midwives working in big hospitals in the capital, a representative of a co-operation agency and a representative of an international research organisation. All the persons concerned are of Malian nationality (see Annex 3).

An interview form (see Annex 4), standardised for all countries, took up questions concerning two fields of particular interest to the research: one, fairly general, relating to maternal health, the other more particularly concerned with the UON study.

### *Results*

The persons questioned, all concerned at different levels with maternal health, approve of this research study, for it has enabled all working in this field, by the presentation of results for each Cercle, to realise the importance of maternal mortality in their own area of action. The study, supplying results in terms of lives, which have probably been lost, has made staff conscious of their responsibility and given them the feeling of being more involved.

The fact that Cercle health teams were involved in the collection of data, the analysis of results and consideration of the lessons to be learned was a major advantage. The study and its results are anchored in the reality of work in the field. This has sometimes given rise to a certain incredulity: to know that maternal mortality is a problem at national level in one thing, but to realise that many women in the town or Cercle where you work are dying for lack of care makes a much greater impression. Some of the persons questioned propose, indeed, to make this study a routine exercise for each Cercle team.

<sup>27</sup> The main reason was connected with a change in the two persons who had been selected to carry out these interviews: they were successively appointed to positions of responsibility which prevented them continuing with this work. The only other persons with the competence and the opportunity to do the interviewing had no longer time to carry out the full programme of interviews proposed.

The study seems also to have proved convincing because of its participatory aspect. For some of those concerned it was their first experience of the collection and analysis of data in which they had taken part and for which the central officers responsible had taken the trouble to come and give them feedback at the level of their region. This participatory aspect was considered by some of them as a stimulus to look for reasons for any deficits and possible solutions.

Most of the health workers concerned – and all those persons who were questioned but one – were surprised by the size of the deficits, and were rather disappointed to observe that even where a referral and evacuation system had been organised this was not sufficient to wipe out the deficits.

Finally, the method of calculating the deficits was found attractive by some of the persons questioned, who considered it an interesting methodological advance for Cercle teams.

## **5. CONCLUSION**

In Mali the fundamental switch from a national strategy directed towards detecting risks in a system of ante-natal care based on traditional unqualified midwives to a strategy firmly directed towards improving the accessibility of complete essential obstetric care had taken place before the introduction of the UON approach. It had already been realised that a preventive strategy without the support of hospital care is ineffective. The UON approach was introduced on the request and under the direction of the officers responsible centrally for the perinatal programme, who were concerned to know what progress had been made in meeting obstetric needs.

This approach had the advantage of making all health personnel aware of the problems, at several stages in the process: during the collection of data the district teams were involved, and learned to measure MOI rates and Unmet Obstetric Needs; during the national retro-information process, when responsible officers in the districts were able to take part, in the working groups with representatives of ASACO, in considering what were the “determinants” of the deficits; and during the regional retro-information processes, when some of them had the opportunity of going further into the details of planning. This is certainly the most important point in the whole approach: making the Cercle directing teams aware that, on the basis of data they have themselves collected, they can analyse a situation, make a diagnosis, put forward possible solutions (interventions that can be undertaken to solve the problem) and later measure how far progress has been achieved.

The results of the study show that coverage is still far from satisfactory. However, the strategy envisaged in recent years, i.e. the development of evacuation and referral systems, is potentially effective if other conditions are met. What conditions? The study offers no answers, but draws attention to a number of lines of approach which must be considered: the production of qualified health personnel and their training and supervision; the improvement of quality of care in hospitals; a service more directed towards the patient which can measure the degree of satisfaction of women with the care they receive and can adapt itself to the context; and permanent supporting mechanisms for financing access to hospital care. In this respect the study has met the objectives set by DSF-C.

**ANNEX 1: QUESTIONNAIRE FOR WOMEN**

Date of survey \_\_\_\_/\_\_\_\_/99 Interviewer

Questionnaire Nr \_\_\_\_\_

**Q0 – Region:** \_\_\_\_\_ **Q00 – Group/Commune:** \_\_\_\_\_**Q1 – Codification:** ----- /-----/ Nr of the region and Nr of Group**Q2 - Category of hospital**

1 = regional hospital

2 = secondary hospital

3 = health centre

4 = other

**Q3 - Number of file:** \_\_\_\_/\_\_\_\_/\_\_\_\_/ (nr of operating theatre protocol)**Q4 - Name and Christian name of the mother:** \_\_\_\_\_**Q5 - Date of admission:** \_\_\_\_/\_\_\_\_/\_\_\_\_/**Q6 - Age of the mother:** \_\_\_\_\_**Q7 - Ethnic group of the mother:** \_\_\_\_\_**Q8 - Matrimonial status:** \_\_\_\_\_

1 = Married

2 = Single

3 = Other

**Q9 - Occupation:** \_\_\_\_\_

1 = worker

2 = housewife

3 = shopkeeper/trader

4 = office job

**Q10 – Living standard:** \_\_\_\_\_**Q11 – Husband's job:** \_\_\_\_\_

1 = worker

2 = farmer

3 = shopkeeper/trader

4 = office job

**Q12 – Area of origin**

Urban = health formation situated within a radius of 15 km from CHC

Rural = health formation situated within a radius of 15 km from CHC

1 = urban            2 = rural (CHC/village)

**Q13 – Place of origin** (health formation depending on CHC/**CSAR**): \_\_\_\_\_**Q14 – Type of access to maternity ward**

1 = direct            2 = health referral (evacuated from CHC to referral HC)

3 = Re-admission            4 = 1 + 3            5 = 2 + 3

**Q15 - Date of intervention:** \_\_\_\_/\_\_\_\_/\_\_\_\_/**Q16 – Type of intervention**

1 = caesarean

2 = laparotomy

3 = hysterectomy

4 = craniotomy

5 = version and extraction

6 = others, specify

**Q17 – Indication**

1 = uterine rupture

2 = uterine pre-rupture

3 = placenta praevia

4 = haematoma retro-placental

5 = severe post-partum haemorrhage

6 = foeto-pelvic disproportion

7 = transverse presentation

8 = frontal presentation

9 = facial presentation

10 = others

**Q18 – If severe post-partum haemorrhage, specify the cause : .....****Q19 – If foeto-pelvic disproportion :**

1 = narrow pelvis

2 = hydrocephalic foetus

3 = macrosomia

4 = other

**Q20 – Results for the mother on leaving**

1 = alive without complications      2 = alive with complications

3 = death      8 = not specified

**Q21 – If complications specify which ones:** \_\_\_\_\_

**Q22 – Results for the baby**

1 = Alive      2 = died within 24 hours      3 = Stillborn without maceration

4 = Stillborn with maceration      5 = reanimated and alive      8 = not specified

**Q23 – If mother dead, specify when she died**

1 = before intervention

2 = during intervention

3 = within 24 h after intervention

4 = 2-3 days after intervention

5 = more than 3 days after intervention

8 = not specified

**Q24– Cause of death of mother**

1 = Hypertensive complications      2 = severe haemorrhage

3 = severe infection

4 = not known

5 = uterine rupture

6 = other, specify

**Q24A– If Hypertensive disorder**

1 = eclampsia

2 = Stroke

**Q24B – If severe haemorrhage**

1 = retro-placental haematoma

2 = haemorrhage for placenta praevia

3 = post-partum haemorrhage

**Q25 – Length of stay expressed in number of days:** \_\_\_/\_\_\_/\_\_\_/

## ANNEX 2: QUESTIONNAIRE FOR HEALTH FORMATION

Date of survey \_\_\_\_/\_\_\_\_/2001 Interviewers

Questionnaire N° \_\_\_\_\_

Identification of health formation

### Q1 - Region

### Q2 - Circle/Commune

### Q3 – Type of health formation

1 = Regional hospital                      2 = Secondary hospital

3 = Health centre                              4 = Other

### Equipment

Q4 \_ Number of beds in maternity ward

Q5 \_ Number of beds for gynaecology-obstetrical ward

Q6 \_ Total number of beds for health formation

Q7 \_ Number of operating theatres

Q8 \_ Number of obstetrical operating theatres

Q9 \_ Number de mechanical extractors in use

Q10 \_ Number of vacuum extractors in use

Q11 \_ Number of forceps in use

Q12 \_ Number of ambulances

### Personnel

#### Medical

Q13 \_ Number of gynaecologists

Q14 \_ Number of surgeons

Q15 \_ Number of physicians with surgical skill

Q16 \_ Number of trainees (obstetricians-gynaecologists)

Q17 \_ If others, specify

#### Paramedical

Q18 \_ Number of midwives

Q19 \_ Number of nurses obstetricians

Q20 \_ Number of *matrones*

Q21 \_ Number of care attendants

Q22 \_ Number of anaesthetist

Q23 \_ Number of surgical assistants

#### Activities

Q24 \_ Number of admissions to maternity ward

Q25 \_ Total number of births

Q26 \_ Of which total number of dystocic deliveries

Q27 \_ Of which total number of normal deliveries

Q28 \_ Total number of stillbirths

Q29 \_ Total number of maternal deaths

Q30 \_ Total number of caesareans

Q31 \_ Total number of uterine ruptures

### **ANNEX 3. LIST OF MAIN DOCUMENTS PUBLISHED BY THE UON STUDY IN MALI**

#### **Ministry of Health, Mali**

Décembre 2000, Division Santé Familiale et Communautaire L'approche des besoins obstétricaux non couverts au Mali, Rapport final, 94 p.

Décembre 2000, Division Santé Familiale et Communautaire Synthèse de la documentation des politiques, des stratégies et des pratiques de lutte contre la mortalité maternelle au Mali, 4 p

Juin 2000, Division Santé Familiale et Communautaire Rapport de restitution régionale sur les Besoins Obstétricaux Non Couverts à Kayes, 6 p.

Juin 2000, Division Santé Familiale et Communautaire Rapport de restitution régionale sur les Besoins Obstétricaux Non Couverts à Koulikoro, 6 p.

Mai 2000, Division Santé Familiale et Communautaire Rapport de restitution nationale sur les Besoins Obstétricaux Non Couverts au Mali, 7 p.

Mars 2000, Division Santé Familiale et Communautaire Rapport sur les Besoins Obstétricaux Non Couverts, octobre 1998 – janvier 2000, Rapport provisoire pour la réunion d'Abidjan, 8 p.

Mars 2000, Division Santé Familiale et Communautaire Rapport sur les Besoins Obstétricaux Non Couverts, mai 1998 – juin 1999, 2 p.

Décembre 1999, Bamba, S. Les Besoins Obstétricaux Non Couverts : Mission d'appui à la collecte et à l'analyse des données dans la région de Ségou, Résultats préliminaires, 26 p.

Septembre 1998, Division Santé Familiale et Communautaire Evaluation du système de référence/évacuation du cercle de Bougouni, 36 p.

Août 1999, Sangaré, M. Protocole de recherche sur les Besoins Obstétricaux Non Couverts au Mali, 10 p.

() Temé, S., Ba, O., Papa, E., Dembele, A., Keita, N. Les Besoins Obstétricaux Non Couverts dans le cercle de Kadiolo, République du Mali. Année 1998, 9 p.

() Division Santé Familiale et Communautaire Une stratégie pour améliorer la qualité des soins obstétricaux, 24 p.

#### **L'équipe de coordination**

Décembre 2000, Litt, V. Amélioration de la qualité des soins obstétricaux (1998-2000) Synthèse finale, 5 p.

Septembre 1999, Litt, V. Mission de suivi du volet Besoins Obstétricaux Non Couverts, 20 au 28 septembre 1999, 10 p.

Février 1999, Litt, V., Derveeuw, M. Mission de suivi du volet Besoins Obstétricaux Non Couverts, 1 au 8 février 1998, 11 p.

Avril 2000, Litt, V. Mission de suivi du volet Besoins Obstétricaux Non Couverts, 3 au 14 avril 2000, 8 p.

#### **Autres documents**

Janvier 2000, Direction Nationale de la Santé Publique Rapport d'activités de la Direction Nationale de la Santé Publique 1999, 82p.

Novembre 1997, De Brouwere, V. Appui à la mise en œuvre et à l'évaluation du système de référence avec la périnatalité comme porte d'entrée dans les Cercles, Mission de pré-évaluation, 32p.