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# Caesarean section rate as a process indicator of safe motherhood programmes: the case of Midlands Province

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## Abstract

**Objective:** To evaluate the Safe Motherhood Programme of Midlands Province by means of process indicators, in particular Caesarean Section Rates (CSR), in comparison with the commonly used outcome indicator Maternal Mortality Ratio (MMR).

**Design:** A cross sectional descriptive study.

**Setting:** Midlands Province, Zimbabwe.

**Main Outcome Measures:** Process indicators of the Safe Motherhood Programme of Midlands Province, and Maternal Mortality Ratio as an outcome indicator for the nation and the province.

**Results:** For Midlands province, a population based CSR of 3.1% was calculated for 1999, which is well below the internationally recommended 5%. The figures for the eight districts ranged considerably from 0.18 to 7.1%. The provincial institutional CSR for the same year was 8.7% (range: 0.53 to 34.5) with a significantly higher rate in private institutions (24%) as compared to government run hospitals (8%), (Chi-square 398.26,  $p < 0.05$ ).

The Ante Natal Care (ANC) coverage ranged from 43.9 to 75.4% with a provincial average of 62.8%. The provincial institutional delivery coverage figure was 55% (range: 49.9 to 63.6%). These findings differed from the figures obtained in the Demographic and Health Survey for the same year: ANC and institutional delivery coverages for the Midlands province were 95.2% and 73% respectively. The availability of obstetric services was well above the minimum acceptable level as defined by the World Health Organisation (WHO) guidelines.

**Conclusion:** MMR is not a very useful indicator to monitor progress in Safe Motherhood Programmes. The figures are unreliable, difficult to obtain if population based, and they show a wide range, even within one given year. Process indicators, especially CSR are easily accessible and give insight in the degree of unmet obstetric need and in referral patterns within one district and the province.

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## Introduction

More than 10 years after the launch of the Safe Motherhood Initiative in 1987 in Kenya, many African countries still experience high levels of maternal mortality. Although this is recognised by most stakeholders in the field of reproductive health, it is difficult to give an exact figure to express the seriousness of the problem. The magnitude of maternal mortality is unknown, although various figures are circulating. The range of the maternal mortality figures reflects the variety of methods used to measure maternal mortality: vital statistics, hospital statistics or population based surveys. Whatever the source is, these figures are

often unreliable, very expensive to obtain,<sup>1</sup> or not suitable for monitoring purposes at district level.<sup>2,3</sup> However, the availability of these figures played a very important role in the awareness of the tragedy of maternal deaths among the population of the 19th century in the industrialised countries. This awareness was consequently one of the triggers to create political pressure on the professionals to take measures to improve the situation. Together with the technical evolution of science this led to the gradual decline of maternal mortality ratios to levels as experienced now in most industrialised countries.<sup>4-6</sup>

It has been suggested that, instead of impact indicators such MMR, process indicators might serve the purpose of

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measuring progress in the reduction of maternal mortality.<sup>7</sup> This alternative approach consists of identifying indicators such as coverage, utilisation and performance, which are part of the 'process' of providing obstetrical care to pregnant women. Coverage indicators include the number of facilities providing essential obstetrical care<sup>†</sup> and comprehensive essential obstetrical care<sup>\*\*</sup> for every 500 000 population and the geographical distribution of these facilities. Examples of utilisation indicators are the proportion of all births in Basic and Comprehensive EOC facilities and the proportion of women with complications reaching these units. Performance indicators can be obtained by monitoring interventions such as Caesarean sections (CS) as a percentage of all births or case fatality rate of complicated cases.

It is suggested that all these indicators can be generated from facility-based records and that they can be analysed at facility level.<sup>7</sup> Theoretically, CS rates can be assessed reliably, since the number of CS done and the expected number of deliveries can be estimated accurately. The value of CS as a process indicator is further proven by the fact that it is also considered as an indicator of coverage of obstetrical need<sup>8</sup> and to measure access to health facilities.<sup>9</sup> In that way monitoring of CS rates is a way to take the pulse of obstetric practice and a key factor in any form of obstetric audit and international comparisons.<sup>10</sup> International organisations such as the World Health Organisation (WHO), United Nations Children's Fund (UNICEF) and United Nations Population Fund (UNFPA) jointly developed process indicators and arrived at an 'ideal range' of five to 15%: not less than 5% and not more than 15% of all births in the population should be CS.<sup>11</sup>

The general objective of this study was to evaluate the safe motherhood programme in Midlands Province by means of process indicators, as opposed to the impact indicator Maternal Mortality Ratio. Specific objectives were to review national MMR figures according to various sources, to calculate coverage indicators based on routinely available health information from Midlands province and to critically interpret the acquired data, with special focus on CS rates.

### **Background Information.**

Midlands province is centrally situated on the Zimbabwean plateau. It stretches from Mberengwa in the Southwest to Gokwe North in the North. Other districts are Gweru (including the provincial capital and hospital), Chirumhanzu, Shurugwi, Kwekwe, Zvishavane and Gokwe

South. The health system is organised according to the primary health care principles with a strong three tier system. The first line health services are provided in clinics, manned by nurses. The second line is composed of district and mission hospitals with at least one resident general practitioner. Specialised care is provided at the tertiary level provincial hospital, situated in Gweru. Rural health centres have in-patient capacity but no resident doctor, and can be considered as an intermediary level between the first and the second line. The private sector offers first line facilities (general practitioners) and second level care in three hospitals, situated in Gweru, Kwekwe and Zvishavane.

The total population of Midlands Province in 1999 was estimated at 1 658 191, as extrapolated from the 1992 census. This population is served by a total of 228 health facilities, owned by various authorities. The total in-patient capacity is 3 304 beds or an average of two beds per 1000 inhabitants.

The transport and communication networks vary considerably from district to district. The telephone and radio coverage of the health facilities ranges from 5.1% in Gokwe districts to 100% in Zvishavane.

## **Materials and Methods**

### **Data Collection.**

Besides international literature, data were obtained from the provincial health information department,<sup>12</sup> from the district health information departments and from the theatre registers and delivery books of all the hospitals performing CS. The period under review for the provincial data was the year 1999.

All the eight District Nursing Officers were interviewed on the availability of health facilities and their states of use. Annual reports submitted to the province by the health institutions were used to verify the data gathered.

Institutional CS rates were calculated as a rate of the total number of deliveries carried out in that institution during the year 1999.

The denominator for the population based CS rates was obtained from the expected deliveries in that particular district for 1999. Expected deliveries were calculated as 4% of the total population. The numerator was the total number of CS carried out in any hospital within the geographical area of the district during 1999.

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<sup>†</sup>Basic essential Obstetric Care (EOC): The elements of obstetric care needed to manage major obstetric complications that can be safely provided at peripheral health centres, including: medical treatment of sepsis, shock, eclampsia and anaemia; removal of placenta; repair of episiotomies and perineal tears; vacuum extraction; labour monitoring; management of severe anaemia, diabetes, and other indirect complications; and neonatal resuscitation.

<sup>\*\*</sup>Comprehensive EOC: The complete elements that should be available at the district hospital, which include basic EOC as well as: surgical obstetrics (Caesarean delivery, treatment of sepsis, repair of high vaginal and cervical tears; laparotomy, removal of ectopic pregnancy, evacuation of uterus, intravenous oxytocin, amniotomy, craniotomy, symphysiotomy; anaesthesia, and blood replacement.

## Results

### 1. Maternal Mortality Ratios for Zimbabwe according to various sources.

Table I: MMR for Zimbabwe, 1986 to 1998.

MMR	'86	'87	'88	'89	'90	'91	'92	'93	'94	'95	'96	'97	'80-98
DYB	70				81								
UNDP			77						330				
UNICEF					570								400
DHS							283		303				
WHO					570								
COMM						168		316					
NHIS		73							150		169		140

DYB: Demographic Yearbook 1995 (United Nations). Original source of figures: vital statistics. For Zimbabwe the publication only mentions absolute figures: 1986:237;1990:293. Figures in the table are the result of own calculations, based on total population and crude birth rates for the years concerned.

UNDP: United Nations Development Fund. Original source of figures; WHO. No figures available after 1994 for neither country.

UNICEF: United Nations Children's Fund Figures published in "The progress of nations" (1996). Original source of figures: WHO

DHS: Demographic and Health Survey, Zimbabwe 1994. Community based survey.

WHO: World Health Organisation "Revised 1990 estimates of maternal mortality", 1996.

COMM: Community based surveys: 1991: 85/100000: rural based figure (Fawcus, 1995). 1993:sisterhood method applied in Gutu District. Figure applicable to 1981 (Oosthuis, 1993).

NHIS: Maternal deaths reported through the routine National Health Information System.

Table I presents MMR figures, the most commonly used outcome indicator for safe motherhood programmes, from various sources for Zimbabwe.

What is striking is the very wide range of the figures, and the inconsistency, even within one given year. The only valid conclusion one can draw from the tables is that maternal mortality is not a useful indicator to monitor progress in the field of reproductive health or to monitor trends over time.

### 2. Availability and use of basic Essential Obstetric Care facilities.

Out of 199 first level health centres 85 (42.7%) offer basic essential obstetric services. These centres offer deliveries and refer complicated cases to the next level.

### 3. Availability and level of utilisation of Comprehensive Obstetric Care facilities.

Twelve hospitals offer blood transfusions, operative deliveries and CS; There is at least one doctor at any of these hospitals.

The private institutions have the highest institutional CSR: out of 1 307 deliveries, 313 (24%) were CS. 2 194 CS were performed in government institutions, out of a total of 27 492 deliveries (8%). This difference is statistically significant (Yates corrected Chi-square 398.26,  $p < 0.05$ ).

Among the district hospitals Kwekwe has the highest rate, whilst Shurugwi has the lowest. The very low CS rate for Shurugwi is the consequence of logistical factors (availability of doctors) and the proximity of Shurugwi to Gweru (38 km): patients simply by-pass the district hospital to go straight to the provincial hospital. Musume and Munene mission hospitals both are situated in Mberengwa district. The CS rates indicate that Munene operates as the referral centre for complicated deliveries from all over the district and that Musume acts more as a rural hospital for the nearby catchment population. The same applies to Muonde (referral centre for Chirumhanzu district) and St Theresa (mission hospital in the same district).

Table II: CSR per district and hospital (1999).

District	Population	Hospital	Institutional deliveries	Expected deliveries	C/S	CSR Institutional (%)	CS population based (%)
Chirumhanzu	88 504	Muonde	572	3 540	59	10.3	3.6
		St Theresa	936		42	4.5	
Gokwe	506 755	Gokwe	9 169	20 270	376	4.1	3
Gweru	276 110	Gweru	5 565	11 044	685	12.3	7.1
		Private hospital 1	284		98	34.5	
Kwekwe	323 649	Kwekwe	3 039	12 946	530	17.4	
		Private hospital 2	550		87	15.5	
Mberengwa	228 977	Munene Mission	1 460	9 159	217	14.9	3.6
		Musume mission	2 184		85	3.9	
Shurugwi	108 547	Shurugwi	1 519	4 342	8	0.5	0.18
Zvishavane	125 649	Private hospital 3	473	5 026	128	27.1	4.8
		Zvishavane	3 048		192	6.3	
Province	1 658 191		28 799	66 328	2 507	8.7	3.1

Institutional CSR = CS done in the hospital/total deliveries.

Population based CSR = Total CS done in the district/expected deliveries.

Table III: MMR and process indicators for Midlands' Safe Motherhood Programme (1999).

	MMR	CSR population based (%)	Basic EOC facilities		Comprehensive EOC facilities		ANC coverage (%)	Institutional delivery coverage (%)
			Number	Nr/500 000	Number	Nr/500 000		
Chirumhanzu	0	3.6	9	50	2	11	73.9	63.6
Gokwe	111	0.54	18	18	1	1	75.4	63
Gweru	90	7.1	10	18	2	4	43.9	51.7
Kwekwe	39	4.8	23	35	2	3	67.2	59.3
Mberengwa	162	3.6	8	17	2	4	58.3	49.9
Shurugwi	66	0.18	7	32	2	9	53.4	35.4
Zvishavane	0	4.8	10	40	1	4	51.3	62.4
Province	76	3.1	85	26	12	4	62.8	55.0
Minimum acceptable level for every 500 000 people		5-15%		at least 4		at least 1 institutional	>80% births should be	at least 15% of all

Gokwe comprises of two districts (Gokwe North and South) but the routine statistics are not subdivided.

MMR: maternal deaths/100 000 live births.

ANC coverage = 1st ANC visit x 100/expected pregnancies (5% of total pop.).

Population based CSR= Total CS done / expected deliveries.

Institutional delivery coverage: total institutional deliveries X 100/ expected deliveries(4% of total pop.).

With regards to the population based CSR only Gweru district where the provincial referral centre is situated, reaches the threshold of 5%. The very low figure for Shurugwi district has been explained above.

Table III lists all studied process indicators in comparison with the MMR as the outcome indicator for 1999. The availability of the obstetric services are given together with minimum acceptable levels according to WHO guidelines.

The figures demonstrate that the health care delivery system is covering most parts of the province: there are acceptable numbers of health centres and the geographical distribution seems to be satisfactory. The MMR rate varies enormously between districts, showing a range from zero to 162. Besides the known low CS rate of Shurugwi, Gokwe districts show the lowest CS rate. On the contrary the same district has the highest ANC coverages (75.4%) whilst Gweru has the lowest (43.9%). There is a much smaller range in institutional delivery coverage: from 49.9% (Mberengwa) to 63.6% (Mvuma).

The provincial Antenatal Clinic coverage of 62.8% is an under estimate of the true figure, because routine statistics only include mothers who attend government institutions. In the Demographic and Health Survey (DHS) carried out in the same year 1999, it was found that 95.2% of respondents for Midlands Province, received *antenatal* care from a doctor (11%) or a trained nurse/midwife (84.2%) for the last live births in the five years preceding the survey.<sup>13</sup> The sample included mothers who visited municipality clinics and private practitioners and health care providers who are excluded from the routine health information system of the government facilities.

This might explain the wide range between Gokwe (rural, few private practitioners) and Gweru (urban and semi-urban, 22 private practitioners) districts.

Besides that the denominator used in the National Health Information System to calculate ANC coverage, (5% of

the total population) seems to be rather high taking into consideration a birth rate of 3.3%.

The same remarks can be made concerning the institutional delivery coverage: the DHS found that 73 % of live births preceding the survey took place in a health facility, be it government or privately run.

## Discussion

Although one would think of Maternal Mortality Ratio as the most logical health outcome indicator for safe motherhood programmes, it's usefulness is very limited. The main limitations are that hospital based statistics are suffering from under reporting and are only counting those patients that are arriving at the hospital. Population based surveys are expensive to carry out because of the relatively rare event of a maternal death, and the surveys are producing retrospective estimates which are not useful for monitoring purposes; combined methods like the estimations of the WHO/UNICEF models do not show changes over time in observed maternal deaths but in changes in the model inputs of, among others, Gross Fertility Rate.<sup>1</sup> At country level, MMR does not measure change, but delivers a snapshot of an existing situation, not even necessarily of the present reality, but of a flash back of a decade ago. At district level, MMR figures vary enormously between districts (from zero to 162) so that no inter-district comparison can be made.

What about CS rates as an alternative? The overall figure of 3.1% for Midlands province is below the recommended 5%, accepted as the minimum to meet the obstetric needs of the women in the catchment areas of these hospitals.

World-wide an estimated 40% of pregnancies develop complications, 15% of which are life-threatening emergencies,<sup>7</sup> requiring assistance in a comprehensive EOC and eventually an operative delivery. The overall low figure is an indication of an unmet obstetric need, despite

the good availability and distribution of basic EOCs. Inter-district comparisons of CS rates have led to better understanding of referral patterns within the district and the province and this has been taken into consideration in the allocation of resources. It was part of the evidence on the basis of which decisions were taken as to where to deploy doctors and nurses, where to increase maternity beds and where to improve the communication system. It further helped in the planning of support visits by the consultant obstetrician, in the identification of training needs and in the design and the geographical implementation of targeted safe motherhood programmes. It is hoped that the annual monitoring of CS rates will reflect the introduced changes and interventions.

The use of the CS rate as an indicator implies not only the need to define a minimum, but also a maximum acceptable level. In the mid to late 1980s CS rates showed wide variation, with the highest documented rates being the USA with a quarter of the births and Brazil with almost one third of the births.<sup>10</sup> Since then there are clear signs that CS rates have begun to level off to rates between 10 and 15% in most industrialised countries. It is now accepted that CS should not account for more than 15% of all deliveries. In our study this figure was exceeded in three private institutions (out of three) and one other hospital (out of nine district/mission hospitals). Three groups of determinants commonly referred to as 'physician factors', 'patient factors', and 'institutional factors' play a role in the decision to perform an operative delivery. The mode of payment or non-payment, largely determined by the socio-economic class of the parturient, has come to the fore as a hidden but important determinant belonging both to the group of 'patient factors' and 'physician factors'.

This observation is not new in the obstetrical world and was demonstrated, among other countries, in Italy,<sup>14</sup> the USA,<sup>10</sup> and England.<sup>11</sup> Various reasons are quoted to influence directly or indirectly the clinical decision such as the financial incentives of fee-for-service practice that favour higher CS rates, greater social congruity between obstetricians and middle class parturients and congruence of physician interest with that of the hospital (long hospital stay after CS...).

If the mode of payment can be considered as a determinant for CS rates, one should also mention the risk of the mode of payment being a barrier to the utilisation of CS as a necessary intervention. If the patient and physician factors are both important in pushing up CS rates for nonclinical reasons, one can only hope that the physician factor is not a determinant for the low CS rates among patients with a different mode of payment. With the increasing privatisation of health services financial barriers are becoming more and more important as determinants for the accessibility of the health system. The same could apply for the accessibility of certain interventions within one health institution. M. Loeffler, who studied high CS rates in Nairobi hospital, a largely privatised facility, which shows rates that are

comparable with private hospitals in industrialised countries argues in 'the Nairobi hospital proceedings' that what are commonly called 'bad reasons' – monetary incentives, convenience, defensive practice or inexperience – may be implicated, but that an unknown number of rich and well insured mothers may prefer operative delivery as a convenient high tech method of child birth.<sup>18</sup>

The foregoing suggests that at provincial level it is definitely the low CS rate that is the cause for concern in the Midlands. Rather than attempt to reduce the CS rate, one would be tempted to recommend an increase of the rate for the whole province, as there is a proven unmet obstetric need in the rural areas. But one should immediately add that an increase in the use of CS may not be without negative effects. A CS maternal mortality rate of 3% in rural areas and 1% in teaching hospitals has been reported in other African settings.<sup>19</sup> As efforts are being made to increase utilisation of CS as an intervention, the safety of the procedure needs to be addressed as well.

Other process indicators besides CS rates, as proposed by UNICEF, are coverage indicators. The situation in Midlands province seems very satisfactory as compared to the recommended ratio of one comprehensive EOC facility and four basic EOC facilities per 500 000 people.<sup>12</sup>

Although the ANC coverage reaches figures well over 90% according to the DHS, the activities carried out at the *antenatal* consultation are now widely accepted as of limited benefit in predicting life-threatening complications.<sup>19</sup>

The low coverage of institutional deliveries further illustrates the poor transport system for those women in whom complications occur *intra-* or *post partum*: if they would all reach a centre where they can receive essential obstetric care, the coverage would be much higher. It must be added, however, that an institutional delivery coverage of 55% is well above the African average (42%) and the average in Asia (53%) and Oceania (52%). If one considers the more comprehensive DHS figure of 72%, the Midlands coverage approaches the level of Latin-America (75%).<sup>13</sup>

In conclusion, this study shows that in Zimbabwe routinely available data can be used for evaluation purposes without many extra inputs. It has become clear that national figures for process indicators and definitely for outcome indicators like MMR, are not very meaningful and even sometimes contradictory. An easy to measure indicator such as CS has proven to be a useful alternative. From the present analysis one can safely conclude that there is a definite unmet obstetric need, especially in rural areas, as expressed by population based CS rates. Interesting conclusions could be drawn from inter-district and inter-hospital comparisons that lead to evidence based management of safe motherhood programmes. Future monitoring and analysis should make clear whether this indicator could measure change over short time intervals without using limited resources for expensive survey.

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