

# Assessment of Maternal Health Intervention Programme of Delta State, Nigeria: Application of the U.N Process Indicators

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## Abstract

Arguing from the standpoint that maternal mortality ratio (MMR) alone does not constitute a sufficient indicator for assessing the performance of a maternal health intervention, the paper calls for a multi-dimensional approach. Employing such an approach and utilizing mainly secondary data, the paper examined the performance of the Delta State's maternal-health intervention programme which commenced in 2007; cautiously comparing its pre- and since-intervention eras. Among others, it discovered that the raw statistical values tend to give an impression that the period prior to intervention witnessed far better maternal health conditions than the period since-intervention. The paper explains the apparent contradiction before comparing the extent to which various results achieved by the intervention programme compares with the specified indicators of the UN in pursuit of Millennium Development Goal No5. It concluded by recommending necessary research and complimenting policy that would ensure that the intervention achieve the desired purpose.

**Keywords:** Delta State, Maternal health intervention, Millennium development Goal, UN Indicators,

## Background to the Research Problem

While the quest to improve the state of health of the entire citizenry has become a major focus of health institutions and governments globally, their specific commitment to curb the rate of maternal death is more striking. The increasing concerns for women and children as vulnerable and marginalized groups in many societies is empowering the voice of advocacy to the advantage of maternal health issues, according it comparable prominence with other reproductive health issues. It is noteworthy that, as a global problem, the maternal mortality burden weighs heavily on the low income countries that generally lack the human, material and financial capacities to redress the problem; thus compelling them to look out for external support.

The involvement of external support in the sponsorship of the maternal mortality reduction programme inevitably creates at least two constituencies that the government must set out to persuade by some positive outcomes of such intervention. The first is her citizenry, with which the government has an explicit or implicit pact to facilitate among others, significant improvement in the nature of maternal health-care deliveries; while the other is the donor or group of donors providing either the technical and or financial resources that wholly or partly fund the intervention.

The mere fact that the World health Organisation (WHO) for communication simplicity expresses the end-product of an improved maternal health-care service by the level of reduction achieved in its maternal mortality ratio (MMR), seems to have influenced rather negatively, the attention focus of most implementers of maternal health-care interventions. Driven by the erroneous understanding that improvement in maternal health care delivery implies an exclusive improvement in the MMR parameter, most implementers of interventions are incognizant of other evaluative parameters for investigating whether or not an intervention has achieved a holistic and sustainable improvement in the maternal health-care system.

To be specific, the partial reliance on the use of maternal mortality ratio (MMR) undermines the relevance of other indicators which would have assisted in assessing the real worth of a given measure of reduction in the maternal mortality ratio. In other words, a given degree of success achieved on maternal mortality reduction over a period of time, must have been an expression of some changes in either the manpower or the technical or equipment resource-components deployed to the system or both. Besides, changes in the spatial configuration of

the maternal health-service provision, as well as in the information-communication resources employed to elicit behaviours that favour the attainment of specified intervention goal(s), are individually critical, and may have to be so examined to have a clearer insight of the real import of a given change in the MMR.

The point being made here is that two maternal health intervention programmes may produce similar reductions in the level of maternal mortality and yet differ in the quantum of human, technical and material resources invested to produce the obtained results. Besides, two areas may exhibit similarities in the degrees of reduction achieved in their maternal mortality rate or ratio due to an intervention; and yet differ in terms of the degree to which such an intervention permeated its population segments as well as its geographical or cultural regions. Such a scenario questions the practice of employing maternal mortality rate or ratio as the sole assessment indicator of any intervention programme designed to improve on the maternal health services enjoyed by affected women in a given political region.

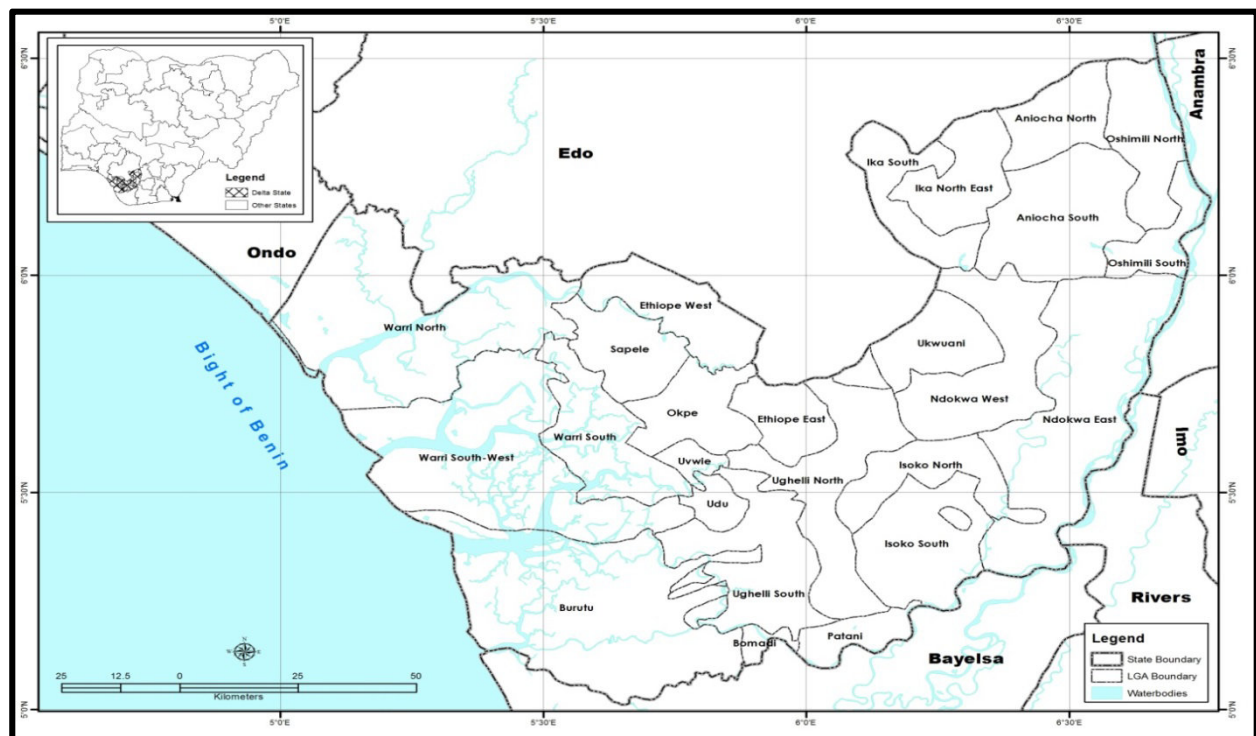
It is in the context of the foregoing that the present study examines the maternal health intervention programme of the Delta State government in Nigeria, posing two questions on the basis of which the acknowledged intervention achievements would be objectively assessed. One, to what extent is the service level of maternal health service delivery discernible prior to the intervention and what does it suggest? Two, given the explicit goal of the Delta State government to significantly improve the state of maternal health delivery, to what extent has the intervention gone in achieving a holistic improvement as envisaged by the United Nations' documentation. In other words, how much success has the Delta intervention programme brought to bear on the various indicators of maternal health service, besides the MMR parameters that had attracted the singular focus of analysts' interest to date?

### **The Statement of Research Problem**

As Fig. 1 below illustrates, Delta State, carved out of the defunct Bendel state, is one of Nigeria's littoral and oil-rich states. The state government, challenged by the apparent poor state of its maternal health in 2007 committed itself to the task of transforming the services and outcomes of maternal health in the state. It declared a maternal health enhancement programme which among others intended to reduce the maternal mortality rate of women in the state by half within the first 5 years of the programme. Given the assumption that poverty is the dominant factor constraining access to maternal healthcare, the programme was designed to provide 100 per cent free antenatal, post natal, laboratory, pharmaceutical and surgical services right from conception to six weeks after delivery, inclusive of caesarean section. Further strategies proposed to achieve improvement in service delivery was to increase the size of its medical personnel, provision of blood for the needy and construction of Integrated Mother and Child Care Centres. These ideas were in line with the Millennium Development Goal No. 5 which aims at reducing maternal mortality ratio significantly by the year 2015.

Although current official records give the impression that the government has made significant strides in line with its proposed objectives, two major evidences seem to suggest that the acclaimed level of success may be suspect. First, records by the state's health agency – see for example Delta State (2005) and (2008) and Otumara (2013) - have consistently relied on the use of the Maternal Mortality Ratio (MMR) as its sole indicator of improved maternal health care in the state. A dependence on just a single indicator to assess the performance of a multi-dimensional intervention programme, which has other evaluation parameters, may give the impression that the other unreported performance indicators were unfavourable and were therefore deliberately omitted.

Second, the data which was relied upon, in determining the degree of success attained by the intervention programme is flawed with a methodological problem. Specifically, the various results showing progress made so far were based exclusively on the outcomes of maternal health services dispensed by the different categories of government hospitals, which provided maternal health-service to the citizenry. In other words, the results excluded those who patronized non-government maternal health facilities; which in many developing societies constitute significant proportions of the maternal-health clients. Indeed, the extent to which an intervention-driven improvement in the indicator of maternal-health service is a reliable estimate depends on whether such an intervention, has relevant incentives that could persuade those who had avoided the patronage of orthodox maternal medical services to date. As its persuasive strategy, the government made maternal health service cost-free for the entire pre- and post-natal care periods; expecting that such a gesture would automatically draw every maternal-health service seeker into its net.



**Figure 1: Delta State: The Study Area (inset is Nigeria showing State)**

Such a gesture may however not achieve significant alteration in the pattern of maternal-health service patronage between the orthodox and the informal sectors at least for three reasons. One, the magnitude of expansion in the maternal-health service demand due to its cost-free policy, may ultimately depreciate the quality of service to such an intolerable level that becomes a disincentive to some segments of its clients. Two, employees within the health system may fail to work in tandem with the free-cost policy, by surreptitiously introducing bottlenecks that would make the free-cost policy a mirage. To discourage such practices among the health workforce, governments in such countries may have to put in place implementation-monitoring committees, or expend funds meant for such committees as commitment incentive on its health employees, in order not to compromise the cost-free strategy. Finally, if government fails to put in place strong and effective information and communication strategies that would vigorously educate the citizenry on the sincerity of its intention, thus ignorantly encouraging the possibility of political misinformation, which has been documented of some previous health-related interventions (Renne (1994), Kaler (2004) and Babatola (2012)).

It is obvious at this point that the requisite responsibilities entailed in a maternal health improvement-intervention are a herculean one, often requiring enormous resources that task the financial capability of the affected countries. Indeed, while there seems to be a consensus on the need to justify the quantity of expended resources by investigating and publicizing the outcome of such intervention, the need to do so using more than one assessment indicator appears only poorly appreciated. The fact is that improvement in maternal health service is multi-dimensional and encompasses more than a mere analysis of the Maternal Mortality Rate/Ratio. It addresses other related objectives, ascertaining which will portray in clearer light the real worth of an advertised MMR indicator.

It is against this background that the present paper examines the outcomes of Delta State maternal health intervention programme, examining among others, the extent to which the advertised MMR indicator is a testimony of a multi-dimensional achievement in maternal health service delivery in the state over the period of the intervention.

### **Literature Review and Analytical framework**

Although the need for evidence-based monitoring and evaluation of health interventions policies and programmes is being strongly articulated, as evidenced by the work of Ezzati, Utzinger, Cairncross, Cohen and Singer (2005), studies which focus on the assessment of maternal mortality intervention programmes in particular, are few to come by. The scarcity of empirical researches in this domain of health analysis is

understandable; given that programmatic interventions, designed to curtail the challenge of maternal mortality is a practice that is rather recent, in contrast to other health intervention programmes. Bustreo, Say, Koblinsky, Pullum, Temmerman and Pablos-Méndez (2013)'s study corroborates this assertion. Indeed most of the analyses conducted on maternal mortality to date fall into two categories that are not concerned with programme evaluation. The first group, of which the works of Shiffman and Okonofua, (2006), Shiffman and Ved (2007) and Bustreo, Say, Koblinsky, Pullum, Temmerman and Pablos-Méndez (2013) are characteristic, are reports advocating for increasing intervention on maternal mortality reduction; while those in the other group exemplified by the works of Khan, Wojdyla, Say, Gulmezoglu and Look (2006) and Ronsmans and Graham (2006) explored specified patterns and correlates of maternal mortality.

Regardless of the scarcity of research focusing on the evaluation of maternal-health intervention programme, its desirability is very evident. Among others, it is the sure way of knowing if such programmes are on track and the extent to which such programmes compare with others in terms of efficiency of employed resources. Indeed it is in this context that the various governments and their principal health agencies employ the maternal mortality ratio (MMR) as a way of evaluating their performance on maternal mortality reduction over a specified period of time.

The truth, however, is that the MMR alone does not offer an adequate intervention evaluation parameter, given the degree of analytical progress already attained on intervention programme assessment, either in the general area of health, or in the more restricted area of reproductive health. Specifically, the Countdown Working Group on Health Policy and Health Systems (2008) appropriately favours a multi-indicator approach, in that it reflects the consciousness that most health-intervention programmes consist of multi- stage or -dimensional events that are related either horizontally or vertically.

Tackled as a holistic exercise, assessment of a maternal health intervention programme would conform to the pattern canvassed by the Countdown Group, which has at least four distinct components on the basis of which the performance rating of a maternal intervention programme may be analyzed. They are, the enhancement in the quality of maternal-health service, engendered by additional technical equipment procured solely for maternal-health service, in the pursuit of the purpose of the intervention; the reduction in commuting time, cost and stress engendered by the provision of more centres to enhance accessibility to services by maternal clients; improvement in the quantity and quality of medical expertise to reduce the average duration of maternal health service; and the financial implications of the afore-mentioned improvements. Analysis of the financial component, is however, prone to flexibility, given that it may be analyzed in the context of the total expended intervention costs, or comparatively, between components of the intervention; for example, says between fixed and recurrent costs of the intervention. The main intention, however is to determine the extent to which the additional cost occasioned by the intervention is competitive when compared to possible alternatives to that intervention, or in comparison to similar intervention programmes elsewhere. To some extent the works of Russell, Gold, Siegel *et al.* (1996) and Weinstein, Siegel, Gold *et al.* (1996) address aspects of this issue.

The present study however is not designed to undertake such a holistic exercise as outlined by the Countdown Group. Its scope is micro in nature. It examines whether or not the positive achievement claim, in the form of a declining MMR indicator, ascribed to the intervention programme by the government, is indeed substantiated by other equally-relevant indicators used elsewhere, and which though have the tacit approval of the World Health organization, has been largely ignored.

In essence, this paper aims at utilizing other existing demographic data to compute other maternal health service-assessment indicators besides the MMR. The computed indicators are to be compared with their corresponding benchmarks specified by the global health organization, as a way of determining the extent to which the measure of success associated with the Delta state maternal health intervention, can be rightly described either as a single or a multi-dimension achievement.

## Methods

This paper is an offshoot of a large study which employed both primary and secondary data sets and sources. The primary data consist of Focus Group discussions with the target population being mid-wives from all the Local Government Areas in the state, as well as one on one interviews with medical doctors in at least one hospital in the six major ethnic groups in the state.

Analysis in the present paper relies primarily on the use of the secondary data component of the study. First of the major secondary data employed is the population figures for the state and its administrative and political subdivisions from the 2006 census publication. Given that the fieldwork occurred between the years 2008 and 2010,

the data specified as total population as well as the maternal population for the covered years, were based on demographic projection relying on 2006 population statistics. Another major component of the secondary data is the statistics on existing health facilities that is, the Primary Health Centres as well as the Comprehensive Health Centres and the records of maternal deliveries undertaken by them during the period covered by this study.

The non-availability of reliable secondary data to cover the intervention period and the prohibitive nature of the cost to generate them, within the funding scope of the present research, informed the decision to focus only on data from the designated intervention centres. The decision solved the challenge of access to relevant and reliable data specifically for the 'intervention period, spanning 2007b – 2010. In essence, the 54 health facilities designated by the government as pilot centres for the demonstration and monitoring of the intervention provided the focal points for data acquisition, and on which analysis was based for the intervention period. The affected 54 intervention centres distributed amongst 25 Local Government Areas in the study area represent 15% of total Essential Obstetric Care (EOC) facilities in the state. 46 (85%) of the designated centres are equipped to function as Comprehensive Obstetrics Care (CEOC) centres. Secondary data acquired and analyzed in varying degrees and contexts include the following: the number of basic and comprehensive obstetrics centres, the total population, expected births, number of deliveries, number of women with obstetric complications, number of caesarean deliveries, normal deliveries, antenatal and post natal care patronage. Derivative measures of maternal mortality, namely, the maternal mortality ratio(MMR) and the maternal mortality rate (MM rate), as well as the 2 standardized proxy indicators of maternal health, that is, the case fatality rate(CFR) and life time risk(LTR) were calculated from obtained statistics using appropriate demographic procedures.

### Analysis

Differences in the relative availability of the needed data affected the direction of the current analysis. Specifically, the quality of the required hospital-based records from which important maternal indicators were to be computed was suspect, particularly for the pre-intervention period, that is, 2003 to 2007a. Likewise, the state of relevant hospital-based data during the intervention period has some limitations. As earlier stated, the focus of data acquisition on maternal health-care during the intervention years was on the 54 designated pilot hospitals, which constituted roughly 15% of the entire hospitals in the state, to the neglect of the remaining 85% non-designated centres. These notable contrasts in the acquisition frames, as well as in the reliability status respectively of the maternal health statistics of the pre- and since-intervention periods, informed the decision to be cautious with the degree of comparison carried out on maternal health indicators between the two periods. In essence, the strength of the analysis is focused on comparing the major indicators of maternal health, primarily within the intervention period, to show the implication of such variations, particularly in the context of possible lapses associated with the intervention, which may be deduced from the values of other indicators, besides the MMR.

The entire analysis in essence falls into two parts. The first part undertakes a slight comparative analysis of the maternal health indicators for the two periods. It goes further to do an incisive analysis of the essential demographic and obstetric data for Delta state between 2007b and 2010. The purpose of the analysis was to explore the changes occurring to both the generally-known MMR and other indicator parameters, in the context of assessing whether or not the intervention was a multi-objective achiever. The second part compares the values of the six intervention indicators to the benchmarks specified by the United Nations health-related agencies, to ascertain the gap successfully bridged, and the objectives on which the intervention is rating poorly, at a time when the programme has progressed far beyond the mid-term stage.

Table 1 below shows the set of indicators and the benchmarks specified by the United Nations, and which the present study employs in varying degrees to assess the maternal health intervention. The benchmarks specified for the Basic or Essential Obstetric (BEOC) is that there should be a minimum of 4 facilities to half a million people, compared to 1 Comprehensive obstetric facility serving half-a-million maternal clients. In terms of geographical distribution, the entire geographical area of the state is expected to have effective coverage. The present analysis would not be delving so much into this aspect given that on its own, analysis of the spatial efficacy of facility-distribution constitutes a sufficient research problem that need not be muddled with other research questions. The next indicator is the percentage of all births that takes place in the EOC, which is stipulated at 15%. The fourth indicator is the Met need for EOC: that is, the proportions of women estimated to have complications and are treated in EOC facilities. The benchmark is 100 of all those involved. Ideally, where pre-natal care has been effective, it is expected that the 100% should not exceed 15% of all births. The fifth indicator is the percentage of Caesarean sections. Realizing the possibility of abuse, the UN specified a minimum of 5% and a maximum of 15%. The sixth indicator is the Case Fatality Rate, that is, the proportion of

**Table 1:-The Six UN Process Indicators and Recommended Levels**

UN Process Indicator	Definition	Benchmark(s)
(1).Amount of essential obstetric care (EOC) <sup>3</sup> Basic EOC(BEOC) facilities <b>Comprehensive EOC(CEOC) facilities</b>	Number of facilities that provide EOC	<b>Minimum:</b> 1 CEOC facility / 500,000 people,Minimum: At least 4 B EOC facilities /500,000
(2). Geographical distribution of EOC facilities	Facilities providing EOC well distributed at sub-national level	<b>Minimum:</b> 100% of sub national areas have the minimum acceptable numbers of (BEOC&CEOC)
(3). Proportion of all births in EOC facilities	The proportion of all births in a given population which takes place in EOC facilities(BEOC and CEOC)	<b>Minimum:</b> 15%
4. Met need for EOC: The proportion of women estimated to have complications who are treated in EOC facilities	The proportion of women with obstetric complications treated in EOC facilities	100 % (estimated as 15% of expected births)
5. Caesarean sections as a percentage of all births	Caesarean deliveries as a proportion of all births in the population	<b>Minimum 5% , maximum 15%</b>
6. Case fatality rate (CFR)	Proportion of women with obstetric complications admitted to a facility who die	<b>Maximum 1%</b>

In this table, Essential Obstetric Care ( EOC) refers to what is called Emergency Obstetric Care (EmOC) elsewhere in this study<sup>3</sup> .SOURCE: UNFPA, 2002 / Meyers,Lobis and Dakkak

women with obstetric complications that die after being admitted into an health facility. The maximum allowed by the UN indicator is 1%.

## Results and Discussion

### Pre-intervention versus Since-intervention

Table 2 below displays the computed results of the different maternal reproductive statistics, including the obtained values of maternal health service indicators. To start with, the interpretation and comparison of the pre- and since-intervention periods should be done with caution, as earlier forewarned. The statistics recorded under the Pre-intervention from item 3 to item 7 represent what occurred in all the 359 Basic and Comprehensive obstetrics facilities in the whole state, while records in the since-intervention capture statistics of the maternal reproductive parameters for the 54 basic and comprehensive health facilities selected for intervention programme, which constitute 15% of maternal health service centers in the state.

Despite the obvious differences in the inventorial base of the two data sets, a number of limited but valid comparisons shall be carried out. First, the 65,914 number of births in just 15% of all health facilities, which represents 1220 births/health facility in the state at the intervention period, is a vast improvement on the 90,420 births or roughly 252 births/maternal health facility in the total maternal health facilities in the state prior to intervention.

The number of obstetric (maternal) deaths (104) at the pre-intervention is very low compared to the corresponding value of 267 deaths at the intervention era. Similar divergences associate with the maternal mortality rates and Maternal Mortality Ratio, in which the values recorded under the since-intervention phase exhibit a worsening scenario. Indeed the most obvious question that agitates the mind is what could have led to a

worsening maternal health record at a period of intervention? The answer lies beyond the superficial maternal death records.

The most probable explanation is that the larger turn out of maternal clients per facility during the intervention phase, which was 1220/facility compared to 252/facility during the pre-intervention phase might have overwhelmed the capacities of designated centres leading to higher levels of maternal mortality. Second, it is also reasonable to expect that many who belonged to the abjectly-poor class, and had poor and health-distressing ante-natal care, and would not have patronized the orthodox clinics, but for its cost-free offer, could have swelled the rank of maternal death victims while giving birth. On the other hand, the group of maternal clients

**Table 2: Statistical Profile: Essential Demographic and Obstetric Parameters (2003-2010)**

	Essential Demographic and Obstetric data	Pre-intervention	Since-intervention
		2003-2007a	2007b-2010
1	Total population (2006 (census) & 2010 (projected))	4,098,391	4,582,411
2	Reproductive age population(15-49) (2006 &2010)	576,864	644,992
3	Antenatal care attendance (ANC)	666,962	628,960
4	Skilled deliveries (SBA) in EOC	90,420	65,914
5	Reported Cases of obstetric complications	4,133	8,998
6	Complicated cases expected (minimum)	90,420	65,914
7	Obstetric (maternal) deaths in the hospitals	104	267
8	Number of basic EOC in entire State	319	8
9	Number of comprehensive EOC	40	46
10	Case fatality rate (CFR)	2.50%	2.96%
11	Maternal mortality ratio(MM Ratio)	115/100,000	405/100,000 deliveries
12	General fatality rate (GFR)	157	102
13	Maternal mortality rate (MM Rate)	18 per 1000	41per 1000
14	Life time risk (LTR)	1 in 42	1 in 36

Source: Computed from Census document and hospital records

who have health-conducive ante-natal care, having low-risk expectation of death, but faced with the reality of congestion in ante-natal service might opt out for fee-paying clinics, where they receive timely attention. In essence, it portrays a picture in which a stream which is at a low-risk of death, discontented with depreciating service opt out to the private service system to be replaced by the 'at high-risk' group that swelled the parameters of maternal mortality during the intervention era.

#### **Intervention outcomes vis-à-vis the UN's indicators**

Table 3 compares the obtained maternal statistics with the UN process indicators. It highlights the specified indicator and shows the current service or facility level. It goes further to show the shortfall that is required to meet the specified UN's benchmark where there is a shortfall, or the degree by which it supersedes as the case may be. The final column is a remark as to whether or not the state government through the intervention can be said to have attained the UN target over the period of intervention.

The first indicator shows that when all the available number of maternal health facilities are reckoned with, the current level of provision would exceed the benchmark of 4: 500, 000 or 1:500 000 respectively for the Basic and comprehensive obstetrics facilities required by the UN indicator. About the second indicator, it is only reasonable to assume – except where there is any peculiar problem of spatial anomaly in the pattern of population distribution by settlements – that once there is a satisfaction of the first indicator, it is almost certain that the spatial pattern of obstetric facility distribution would also comply with the UN's standard. The third indicator that is, the proportion of expected births in EOC Centres in the population has only attained 10.5% which is lower than the 15% minimum benchmark. The fourth indicator is somehow controversial. The fact that the percentage of complication cases is less than 15% may suggest that many who normally experience

complications at child birth do not show up at the point of delivery. On the other hand, Ronsmans, Campbell, McDermott, and Koblinsky (2002) have shown that the true percentage of what should constitute complication cases among the pool of delivery cases remains inconclusive based on reported studies.

**Table 3: Results: United Nations (U.N) Process Indicators for Delta State (2007-2010)**

UN Process Indicator	Current service use level/Level of met need	Number to be acceptable (Recommended Level)	Acceptable? (Yes or No)
(1).Amount of essential obstetric care (EOC) facilities	BEOC- 8 CEOC-46	<b>Minimum:</b> 1 comprehensive & at least 4 basic EOC facilities/ 500,000 population	<b>YES</b>
(2). Geographical distribution of EOC (well distributed at sub-national level)	5KM buffer around facilities shows CEOC facilities cover adjoining areas of comparable population	<b>Minimum</b> :100% of sub national areas have the minimum acceptable numbers of (4, BEOC & 1, CEOC facilities /500,000 population)	<b>YES</b>
(3). Proportion of expected births in EOC Centres in the population	<b>10.5%</b>	<b>Minimum:</b> 15%	<b>NO</b>
(4). Met need by EOC: Proportion of women estimated to have complications who are treated in EOC facilities	<b>13.7%</b> (8998/65914*100)	At least 100 % of women estimated to have obstetric complications are treated in EOC facilities	<b>NO</b>
(5). Quality of critical services -Caesarean sections as a percentage of all births in the population	<b>10.9%</b> (7198/65914*100)	<b>Minimum</b> = at least 5% , maximum 15%	<b>YES</b>
(6). Quality of care - Case fatality rate (CFR) (Proportion of women with obstetric complications admitted to a facility who die)	<b>3.0% =</b> (267/8998*100)	<b>Maximum</b> 1%	<b>NO</b>

The level of critical service utilisation by the way of caesarean operation lies between the two extreme percentage indicator values of 5% and 15% respectively and thus is adequate by the UN standard. The quality of care on the other hand shows a negative compliance with the UN's benchmark as the specified 1% maximum percentage of maternal death during complications is exceeded by the 3% level recorded in the state.

### Summary and Recommendations

This study set out to assess the maternal health intervention programme by the Delta State government, which commenced in the fourth quarter of 2007. The pre-intervention period covered 2003 to the third quarter of year 2007. The part of the research analyzed in this report is based on secondary data component of the study, which employed official population census figures in conjunction with hospital maternal-health records. Among others, the paper argued against the practice that limits the success assessment of maternal health intervention to the use of Maternal Mortality Ratio (MMR) or Rate (MM Rate), arguing that success attainment in such an exercise is a multi-dimensional one. While noting the limitation involved in comparing indicator data between the pre- and since-intervention periods, the study proceeded to highlight some valid inferences which appear incontrovertible, at least from the state of the data available.

The study among others found out that the intervention period has recorded larger patronage than pre-intervention era. Among others, inferences from the maternal health statistics for the two periods show that the apparent picture of better indicators recorded during the pre-intervention is deceptive, as it most likely betrays the low level of patronage of the formal health-care system. The low patronage made it difficult to have the



reliable data on the actual magnitude of maternal mortality in the population during that time. In other words, the reliability of the officially documented maternal-health service statistics is very limited, as it captured only those that patronized that formal health sub-system, excluding an indeterminable percentage of those who did not patronize it. Hence, the various parameter values quoted in the official publication for MMR and MMrate, as well as other derived values, such as the Case Fatality rate (CFR) and the Lifetime Risk (LTR) grossly under-represent the actual poor state of maternal health prior to intervention.

Looking solely at the intervention period suggests among others that many who previously did not patronize the formal maternal health centres were attracted by its free-cost service implication, as it removed the financial burden from them. However, the increasing rate of mortality shown by the hospital records, most likely, signifies that a phenomenon of patronage substitution is taking place. In other words, while clients who had no means of paying are trooping in and causing congestion in the system, the financially-well-off clients, who had patronized the system before the intervention appeared to opting out, in view of the congestion in the service caused by the new entrants into the system. Furthermore, the increasing level of maternal mortality during the intervention period, suggests that the quality of home-based health care received during pregnancy by the new, free-cost-attracted maternal clients, was grossly inadequate, and subjected many of them to low chances of survival at childbirth. Besides, it is also highly probable that the size of the maternal population attracted by the free-cost service, overwhelmed the available capacity of the intervention, leading to poor maternal-health service outcomes depicted by the various parameters of maternal health service during the era of intervention.

The scenario opens up a number of issues which border on the changes occurring to the pattern of maternal health-service patronage in the state, and the accompanying question of social equity, about which only further research may clarify. First, it is necessary to determine the veracity of the findings which in the present study suggest that streams of financially-well-off clients appear to be migrating out of the public maternal health facilities, while another group that contrast with them are migrating into the system. If it is so confirmed, research should follow up to determine whether or not those being 'forced' out, most likely by poorer services, are not exposed to declining maternal survival rate in the alternative maternal health service option. Such a scenario would depict that the intervention at present lacks Pareto optimality; an indication that government must strive to address this inadequacy. Second, the higher records of increasing maternal mortality rate ought to be researched into, so that government might explore the possibility of interventions that address the issue of home-based adequate care for women during pregnancy. Such an additional intervention, which if innovatively designed, requires no extra financial commitment by the government, would go a long way to reduce the level of at-risk to, and the actual occurrences of maternal death during delivery in line with objective of the Goal 5 of the of the Millennium Development Goals (MDGs).

In essence, the level of maternal mortality ratio achieved so far by the intervention is still relatively high, being above 400/100,000 maternal births. However, determined progressive steps taken along the recommended research and low-cost intervention strategies would go a long way to ensure that the Delta state's intervention achieves the multi-objective goal envisaged by the UN's maternal intervention programme.

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