

Evaluation of the impact of free maternity and newborn care on the reduction of maternal and infant mortality in the Democratic Republic of Congo: Case of the Masi-Manimba General Reference Hospital

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ABSTRACT

Introduction

Despite World Health Organization (WHO) recommendations, the effect of nationwide free maternity care on maternal and neonatal mortality remains unquantified in the Democratic Republic of Congo.

Purpose

This study aims to evaluate the impact of free maternity and newborn care on reducing maternal and infant mortality in the Democratic Republic of Congo, using the Masi-Manimba General Reference Hospital as a case study. It tests the hypothesis that the introduction of free maternity and neonatal care reduces maternal and neonatal mortality at Masi-Manimba Hospital.

Methods

A retrospective comparative study of 363 births (83 before and 280 after implementation) was conducted, according to WHO mortality criteria. The chi-square test was used to compare mortality rates, with a significance threshold set at $p < 0.05$. Source documents included patient records and hospitalization registers. Data processing was conducted using Excel 2010.

Results

Deliveries increased from 83 to 280. Maternal deaths remained stable, while neonatal deaths decreased. Statistical analysis showed no significant difference in maternal mortality but indicated a reduction in neonatal deaths following the introduction of free healthcare. Among newborns, 26.7% were stillborn and 53.3% were apparently dead.

Conclusion

Although deliveries increased, there was no statistically significant change in maternal and neonatal mortality. To achieve measurable reductions in mortality, free healthcare must be combined with other quality improvement interventions.

INTRODUCTION

Maternal mortality is one of the most telling indicators of global health inequalities. According to the [World Health Organization \(WHO, 2023\)](#), approximately 295,000 women die each year from complications related to pregnancy and childbirth, 94% of them in low- and middle-income countries. This alarming situation has led to the inclusion of reducing maternal mortality among the Sustainable Development Goals (SDG 3.1), aiming for a reduction to fewer than 70 deaths per 100,000 live births by 2030.

The Democratic Republic of Congo (DRC) is no exception to this sad reality and may even rank among the highest in the world, a situation that conflicts with the SDGs ([Von Dadelszen et al., 2017](#)). According to WHO, as cited by [Falaye Fassirima Keita \(2022\)](#), maternal death is defined as any death of a woman occurring during pregnancy or within 42 days of its termination, regardless of the duration or location of the pregnancy and irrespective of the cause.

[Jean Noël Ba-Mweze \(2023\)](#) reports that in the DRC, out of 100,000 women who give birth, 500 die, and one in 35 newborns dies as a result of childbirth. Similarly, [Jeune Afrique \(2013\)](#) notes that at least every 30 minutes, a woman dies in a maternity ward in the DRC, resulting in approximately 15,000 maternal deaths annually.

[Dumont \(2016\)](#) highlights that women at the highest risk of maternal mortality are those who are most deprived, those living far from health facilities, and women with very low levels of education. According to [Wikipedia \(n.d.\)](#), the French Academy of Medicine defines childbirth as any natural expulsion of a viable fetus, either after six months of pregnancy or 24 weeks of amenorrhea. Delivery can occur in a full-term or preterm pregnancy, and labor may begin spontaneously or require medical intervention.

Childbirth is the culmination of a complex physiological process, which requires monitoring from start to finish. In most cases, childbirth proceeds without incident; however, complications may arise, endangering both mother and child. This underscores the importance of closely monitoring labor ([Bhutta et al., as cited in Maleya et al., 2019](#)).

[Maleya et al. \(2019\)](#) further emphasise that the health of a population and its level of development can be judged from

reliable indicators such as morbidity, mortality, and perinatal outcomes. In the DRC, the health system's shortcomings contribute to poor maternal and neonatal outcomes. Geographical barriers prevent many people from accessing healthcare, with some populations required to travel long distances on foot to reach health facilities ([Mboko Iyeti, 2019](#)). The DRC has only 393 general reference hospitals serving 516 health zones, leaving many areas underserved.

Financial barriers also limit access to care. Poverty, limited family resources, and delayed prenatal consultations are major contributors to high maternal and infant mortality rates ([Ba-Mweze, 2023](#)). In response, the government has introduced free maternity and newborn care to reduce maternal and neonatal mortality in the country.

Across Africa, high maternal and infant mortality rates have prompted several countries to implement free maternal and neonatal care policies, with varying results. For instance, in Benin, free caesarean sections increased the caesarean rate from 2.38% to 48.8% between 2009 and 2011 ([Ouedraogo et al., 2013](#)). [Dumont \(2016\)](#) also reports that free caesarean sections in Senegal led to increased use of services. However, these successes are often accompanied by challenges related to the quality of care, availability of human resources, and financial sustainability of health systems.

Recent scientific literature presents mixed results regarding the effectiveness of free care policies. While some studies report significant reductions in maternal mortality, others find no statistically significant association between free care and maternal survival. These discrepancies may be explained by differences in methodology, observation periods, and socioeconomic contexts.

Evaluating the local impact of free maternal care policies is therefore crucial to optimize interventions. Despite the importance of this issue, few studies have rigorously documented the effect of free maternal care in specific hospital settings, particularly in sub-Saharan Africa, where the challenges are greatest. To our knowledge, no study has evaluated the nationwide impact of free maternity care on maternal and neonatal mortality in the DRC.

Study Goals

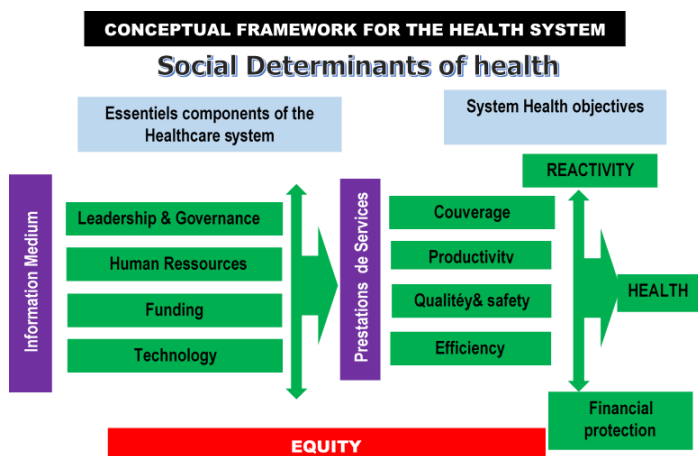
This study aims to assess the impact of free maternity and neonatal care on maternal and neonatal mortality at Masi-Manimba General Reference Hospital by:

- Analysing the evolution of the number of births before and after the introduction of free care,
- Assessing the impact on maternal mortality rates, and
- Determining the statistical significance of the observed changes.

This analysis will enrich the evidence base needed to guide maternal and newborn health policies in similar contexts.

Conceptual Framework

Figure 1:
Conceptual framework



Source: Ministry of Health DRC (<http://www.minisanterdc.cd>)

Hypotheses

- Free care will increase institutional deliveries.
- Free care will reduce maternal and neonatal mortality rates.

Choice and Relevance of Study

This study evaluates whether government measures to reduce maternal and infant mortality in the DRC are effective. Maternal death is an emotionally charged event, and understanding the effectiveness of free maternity and newborn care is essential. Removing financial barriers is expected to increase admissions, improve management of complications, and reduce maternal and infant mortality. If results are suboptimal, further investigation is warranted to identify and implement corrective measures.

METHODS

Study Design

A two-period comparative study was conducted to assess the effectiveness of free maternity and newborn care in reducing maternal and neonatal mortality. The before-and-after approach allowed comparison of maternal and neonatal health indicators prior to and following the introduction of the free care policy. Poverty remains a major barrier limiting the use of maternity services in the DRC; this study evaluates whether free care can overcome this barrier and impact maternal and neonatal deaths.

Parameters

The study considered the following parameters:

- Age
- Parity
- Gravidity
- Level of education
- Origin of women giving birth
- Total number of births per period
- Maternal deaths occurring during hospitalization or within 42 days of delivery

Population and Sampling

All pregnant women and parturients admitted to the Gynecology and Obstetrics Department of Masi-Manimba General Reference Hospital during the two study periods were included. A total of 363 women with complete medical records were analysed.

Data Collection

Data were collected manually from patient records and hospitalization registers. Incomplete files were excluded. Women who died outside of pregnancy or childbirth were not included.

Statistical Analyses

Data processing was conducted using Excel 2010. The primary test was Fisher's exact test (two-tailed) due to small numbers and cells with low expected counts. Supplementary tests included chi-square (with/without Yates) and z-tests for transparency.

Ethical Considerations

Anonymized secondary data were used; therefore, formal ethical approval was not required. All procedures adhered

to public health research ethical principles, ensuring confidentiality and anonymity.

Context and Population Studied

The study took place in the Gynecology and Obstetrics Department of Masi-Manimba General Reference Hospital, which has six general practitioners and 24 nurses, but no obstetrics specialists. The hospital has 16 buildings with 250 beds, including departments of Internal Medicine, Surgery, Pediatrics, Ophthalmology, Dentistry, Administration, Laundry, Imaging, and a morgue.

Inclusion Criteria

- Records of maternal deaths meeting WHO criteria during the study period

Exclusion Criteria

- Deaths outside pregnancy, childbirth, or postpartum
- Records outside the Gynecology and Obstetrics Department
- Women who arrived at the hospital already deceased

The study assessed six months of free maternity and newborn care, comparing the same months before and after implementation to account for seasonal variations. All women meeting the criteria during the relevant periods were included; no power calculation was performed.

RESULTS

Throughout the study period, the Obstetrics and Gynecology Department recorded 363 deliveries. During the period before the introduction of free maternity care, there were 5 maternal deaths and 8 neonatal deaths. The results are presented below.

Table 1:
Births Before and After Free Care

Month	Before Free	After Free
October 2022	11	
November 2022	13	
December 2022	17	
January 2023	15	
February 2023	11	
March 2023	16	
October 2023		15
November 2023		18
December 2023		46

Month	Before Free	After Free
January 2024		65
February 2024		67
March 2024		69
Total	83	280

There was a substantial increase in deliveries following the introduction of free maternity care, from 83 births before implementation to 280 births after.

Graph I:
Comparison of births before and after free delivery

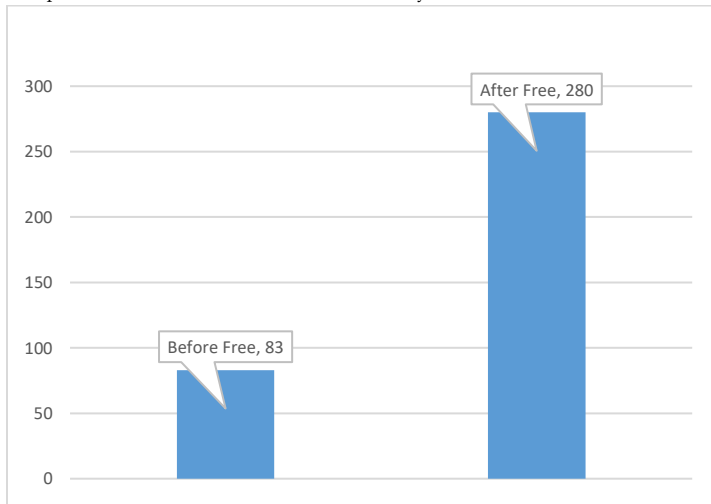


Table 2:
Maternal Deaths Before and After Free Care

Month	Before Free	After Free
October 2022	1	
November 2022	0	
December 2022	1	
January 2023	2	
February 2023	0	
March 2023	1	
October 2023		2
November 2023		1
December 2023		0
January 2024		2
February 2024		1
Total	5	8

Maternal deaths increased in absolute number from 5 to 8 after free care; however, when adjusted for the larger number of births, the maternal mortality rate decreased.

Table 3:
Summary Comparison of Maternal Mortality

Measure	Value
Rate Before	6.02% (95% CI 2.60 - 13.34%)
Rate After	2.86% (95% CI 1.45 - 5.54%)
Relative Risk After vs Before	0.47 (95% CI 0.16 - 1.41)
Chi-square (without Yates)	$\chi^2 = 1.860$; $df = 1$; $p = 0.1727$
Chi-square (with Yates)	$\chi^2 = 1.056$; $df = 1$; $p = 0.3042$
Fisher's exact test (two-tailed)	$p = 0.1837$
Z-test of proportions	$z = 1.364$; $p = 0.1727$

The maternal mortality rate decreased from 6.02% (95% CI: 2.60–13.34%) to 2.86% (95% CI: 1.45–5.54%) after implementation of free care. The relative risk was 0.47 (95% CI: 0.16–1.41). The reduction was not statistically significant (chi-square with Yates correction: $\chi^2 = 1.056$, $p = 0.304$; Fisher's exact test, $p = 0.184$).

Table 4:
Observed Maternal Data

Period	Dead Women	Undeceased Women	Total Line
Before Free	5	78	83
After Free	8	272	280
Total Column	13	350	363

Of 83 deliveries before free care, 5 women died (6.02%), while 8 deaths occurred among 280 deliveries after free care (2.86%). The lower mortality rate post-implementation reflects the larger sample size.

Table 5:
Expected Frequencies (E_{ij})

Period	Dead Women	Undeceased Women
Before Free	2.972	80.028
After Free	10.028	269.972

Table 6:
Contributions to Chi-square ($(O_{ij} - E_{ij})^2 / E_{ij}$)

Period	Dead Women	Undeceased Women
Before Free	1.383	0.051
After Free	0.410	0.015

From **Tables 5 & 6**, the chi-square analysis shows that the largest contribution to the difference was from higher than expected deaths before free care. Overall, the chi-square statistic did not indicate a significant association between free care and maternal death.

Table 7:
Chi-square Test Result

Statistic	df	p-value
1.860	1	0.1727

Chi-square test confirmed the absence of a statistically significant difference in maternal mortality ($\chi^2 = 1.860$, $df = 1$, $p = 0.304$). Free maternity and newborn care did not result in a statistically significant reduction in maternal mortality.

Table 8:
Neonatal Deaths Before and After Free Care (<28 days)

Month	Before Free	After Free
October 2022	0	
November 2022	2	
December 2022	1	
January 2023	5	
February 2023	1	
March 2023	1	
October 2023		0
November 2023		2
December 2023		1
January 2024		1
February 2024		5
Total	8	7

Neonatal deaths decreased from 8 before implementation to 7 after implementation, corresponding to a notable reduction in mortality rate.

Table 9:
Summary Comparison of Neonatal Mortality

Measure	Value
Rate Before	9.64% (95% CI 4.97 - 17.88%)
Rate After	2.50% (95% CI 1.22 - 5.07%)
Relative Risk After vs Before	0.26 (95% CI 0.10 - 0.69)
Chi-square (without Yates)	$\chi^2 = 8.236$; $df = 1$; $p = 0.0041$
Chi-square (with Yates)	$\chi^2 = 6.532$; $df = 1$; $p = 0.0106$
Fisher's exact test (two-sided)	$p = 0.0086$
Z-test of proportions	$z = 2.870$; $p = 0.0041$

Neonatal mortality declined from 9.64% (95% CI: 4.97–17.88%) to 2.50% (95% CI: 1.22–5.07%). The relative risk was 0.26 (95% CI: 0.10–0.69). This reduction was statistically significant (chi-square without Yates: $\chi^2 = 8.236$, $p = 0.004$; Fisher's exact test: $p = 0.009$).

Table 10:
Observed Neonatal Data

Period	Neonatal Death	Newborns Alive	Total Line
Before Free	8	75	83
After Free	7	273	280
Total Column	15	348	363

The proportion of neonatal deaths was substantially lower after free care, indicating a protective effect.

Table 11:
Expected Frequencies for Neonatal Mortality

Period	Neonatal Death	Newborns Alive
Before Free	3.430	79.570
After Free	11.570	268.430

Table 12:
Contributions to Chi-square $(O_{ij} - E_{ij})^2 / E_{ij}$

Period	Neonatal Death	Newborns Alive
Before Free	6.090	0.262
After Free	1.805	0.078

From **Tables 11 & 12**, observed neonatal deaths before free care exceeded expectations, while deaths after free care were fewer than expected, driving the significant chi-square result.

Table 13:
Chi-square Test Result for Neonatal Mortality

Statistic	df	p-value
8.236	1	0.0041

The chi-square statistic confirmed a significant reduction in neonatal mortality ($\chi^2 = 8.236$, $df = 1$, $p = 0.004$).

Table 14:
Distribution of Women Giving Birth by Age Group

Age Group	Effective	Percentage
<20 years	4	30.7
21-25	3	23.1
26-30	2	15.3
31-35	1	7.6
36+	5	23.1
Total	13	100

The highest frequency of maternal deaths occurred in women under 20 years of age (30.7%).

Table 15:
Distribution of Deceased Women by Profession

Occupation	Effective	Percentage
Housewife	7	54.0
Housekeeper	1	7.7
Student	2	15.3
Official	3	23.0
Total	13	100

Housewives accounted for the majority of maternal deaths (54%).

Table 16:
Distribution by Marital Status

Marital Status	Effective	Percentage
Married	8	61
Single	5	39
Total	13	100

Maternal deaths were more frequent among married women (61%).

Table 17:
Distribution by Education Level

Education Level	Effective	Percentage
None	6	46.1
Primary	4	30.8
Secondary	3	23.1
Upper	0	0
Total	13	100

Women without formal education represented the largest proportion of deaths (46.1%).

Table 18:
Distribution by Gestation

Gestation Type	Effective	Percentage
Primigravidae	7	54
Multigravidae	4	30.7
Paucigravidae	2	15.3
Total	13	100

Primigravidae were the most affected group, representing 54% of maternal deaths.

Table 19:
Distribution by Parity

Parity	Effective	Percentage
Nulliparous	3	23

Parity	Effective	Percentage
Primiparous	2	15.4
Pauciparous	2	15.4
Multiparous	6	46.2
Total	13	100

Multiparous women accounted for the largest proportion of maternal deaths (46.2%).

Table 20:
Distribution by Cause of Death

Diagnosis at Entry	Effective	Percentage
Preeclampsia/Eclampsia	4	30.7
Hemorrhage	2	15.3
Placenta Previa	1	7.6
Sepsis	2	15.3
Feto-pelvic Disproportion	1	7.6
MFIU with Coagulation Disorder	1	7.6
Malaria	2	15.3
Total	13	100

Eclampsia was the leading cause (30.7%), followed by hemorrhage, sepsis, and malaria (each 15.3%).

Table 21:
Distribution by Origin (Health Area)

Health Area	Effective	Percentage
Lukula	2	15.3
Bibodi	2	15.3
Mabundu	5	23.1
Nzombi	1	7.6
Kangamiesi	2	15.3
Bimbembo	1	7.6
Kikata	2	15.3
Total	13	100

The Mabundu health area recorded the highest frequency of maternal deaths (23.1%).

Table 22:
Means of Transport and Time of Death

Means of Transport	Effective	Percentage
Motorcycle	9	69.2
Whaler	2	15.3
On Foot	2	15.3
Total	13	100

Most women (69.2%) arrived at the hospital by motorcycle.

Table 23:
Condition of Newborns at Birth

Newborn at Birth	Effective	Percentage
Fresh Stillborn	4	26.7
Macerated Stillborn	3	20
Live Newborns	8	53.3
Total	15	100

Of the 15 newborns who died, 53.3% were live-born at birth, while 26.7% were fresh stillborn and 20% were macerated stillborn.

DISCUSSION

Methodological Considerations

This study was retrospective, descriptive, and comparative, designed to evaluate the impact of free maternity and newborn care on maternal and neonatal mortality. Retrospective studies present specific challenges, including:

- Poor maintenance of source documents, such as files and registers.
- Lack of training among personnel responsible for record-keeping.
- Missing or incomplete information in patient records, rendering some files unusable.

Approximately six months after the introduction of free maternity and newborn care nationwide, this mid-term evaluation was conducted to assess progress. Free maternity care aims primarily to remove financial barriers and increase accessibility to maternal services (Dumont, 2016). Similar strategies have been implemented in other African countries, targeting maternal and neonatal mortality, either through universal free childbirth or specific services such as free caesarean sections (Dzakpasu et al., 2012; Fournier et al., 2014).

Effects of Free Services on Service Utilization

The number of deliveries in the study hospital increased markedly following the introduction of free care, from 83 to 280 births. This demonstrates the first positive impact of the policy: households perceive financial relief, which improves access to services (Dumont, 2016).

However, the sudden increase in service utilization also created challenges, such as insufficient beds for women in labor and their newborns. In Benin, for instance, free

caesarean services increased caesarean rates from 2.38% to 48.8% between 2009 and 2011 (Ouedraogo et al., 2013). In Ghana's Brong Ahafo region, free childbirth led to a substantial increase in deliveries, particularly among poorer households (Dzakpasu et al., 2012, as cited in Nkougou Ngoa, 2020).

Not all countries experienced increased service utilization with free maternity policies; in South Africa and Malawi, service uptake did not significantly improve (Nkougou Ngoa, 2020). Even when utilization increases, free care alone is insufficient to address all quality-of-care issues; perceptions of poor quality and inability to demand better services remain challenges (Ilboudo & Siri, 2022).

Effects on Maternal Mortality

The comparison of maternal mortality before and after the introduction of free care, using the chi-square test ($\chi^2 = 1.860$, $df = 1$), showed no statistically significant difference. The Fisher's exact test, suitable for small samples, confirmed this conclusion. Despite a tripling in the number of deliveries, maternal mortality remained stable, suggesting that free care has at least prevented an increase in deaths, likely due to effective medical monitoring and complication management (Sylla Cheickna et al., 2021).

Effects on Neonatal Mortality

Neonatal mortality decreased significantly following the introduction of free care. The chi-square test yielded $\chi^2 = 8.236$ ($df = 1$), indicating a statistically significant reduction. Although births increased, neonatal deaths remained stable, highlighting a positive impact of the free maternity policy on newborn outcomes.

Effects on Household Costs

Free maternity and newborn care provided substantial financial relief. Previously, a caesarean section cost approximately 290,000 Congolese francs (USD 104), and a eutocic delivery cost 26,000 Congolese francs (USD 10). With free services, households experienced a notable reduction in out-of-pocket expenditure.

Sociodemographic Considerations

The mean age of deceased women was 22 years (range: 15–36 years). The most affected age group was under 20 years (30.1%), primarily teenagers and young adults with limited education and low awareness of contraception, increasing

the risk of unwanted pregnancies and complications (Diawara et al., 2014; Dumont, 2016).

Women without formal education accounted for 46.1% of deaths. Housewives represented 54%, and married women 61% of maternal deaths. These findings align with previous studies indicating higher maternal risk among younger, less educated, and socioeconomically disadvantaged women (Diawara et al., 2014).

Clinical Considerations

Primigravidae comprised 30.7% of maternal deaths, largely overlapping with the younger age group, while multiparous women accounted for 46% of deaths, supporting the "too early, too late, too many" reproductive risk theory (Keita, 2022).

Eclampsia was the leading cause of maternal death (30.7%), followed by hemorrhage (15.3%). These findings are comparable to studies conducted in Mali and Senegal, where eclampsia and hemorrhage were predominant causes of maternal death (Keita, 2022; Koucoï, 2008).

Transportation remains a major barrier; motorcycles were the primary mode for 69.2% of women arriving at the hospital, reflecting limited emergency transport infrastructure.

CONCLUSION

This study evaluated the impact of free maternity and newborn care on maternal and neonatal mortality at Masi-Manimba General Referral Hospital, DR Congo. Key conclusions include:

- Free care substantially increased service utilization, with the number of births tripling.
- Maternal mortality rates remained stable, while neonatal mortality decreased significantly.
- Free care alone is insufficient; combining it with quality improvement strategies is essential for reducing maternal and neonatal mortality further.

Recommendations

1. Political, administrative, and health authorities:

- Allocate adequate health sector budgets and ensure full implementation.
- Address systemic healthcare challenges, including infrastructure, staffing, and equipment shortages.

2. Healthcare providers:

- Promote health education and involve communities in healthcare improvement.
- Ensure patient-centered care that respects dignity and quality.

3. Communities:

- Engage actively in maintaining health and protecting healthcare infrastructure.
- Form mutual health insurance schemes to share healthcare costs.
- Organize initiatives to reduce poverty and improve access to care.

4. Hospital Management (HGR Masi-Manimba):

- Repair and deploy ambulances to improve transport for women in labor.
- Reduce reliance on motorcycles for emergency obstetric transfers.

Ethical Approval: Nil required.

Conflicts of Interest: None declared.

ORCID iDs:

Mayala, T.: Nil identified

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