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Commentary

# Dynamics of the 'free' maternal healthcare policy intervention in Ghana; Facility delivery utilization and neonatal mortality indices from a developing country setting

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## Abstract

The one conceptual key to improving newborn healthcare outcomes is thought to be bridging the access gap to care, particularly in sub-Saharan Africa. However, recent studies have reported conflicting results relative to establishing a link between outcomes and access to care intervention programs.

This commentary follows an on-going protocol being implemented to measure any link between policy implementation and neonatal outcomes under the 'free' maternal healthcare intervention in Ghana.

It provides an update on its finding relative to neonatal mortality, and comment on the implications thereof for policymakers and researchers.

**Keywords:** Impact; Neonatal mortality; Policy intervention; Outcomes; Facility delivery

## Introduction

Ghana, like other developing countries in Africa, implemented the 'free' maternal healthcare policies for all pregnant mothers in 2008 *via* the free registration of all medically confirmed pregnant women to the National Health Insurance Scheme (NHIS), as an enabler to broadening access to maternal healthcare in anticipation of reducing maternal and newborn mortalities as a medium to long term goal [1,2]. The policy package covered comprehensive care to mother and child up to 3 months post childbirth. Since its implementation, attention focused more on maternal healthcare outcomes, but less on neonatal healthcare outcomes relative to the 'free' policy.

Around 2015, the estimated neonatal mortality rate for Ghana stood at 30 per 1000 live births, using merged figures of the preceding two rounds of Ghana demographic and health survey (DHS) data sets, 2008/2014. This is consistent with the 29 deaths per 1000 live births and 38 perinatal deaths per 1000 live births as captured in the 2014 DHS report for Ghana [3]. In 2019, the rates further reduced to 23 per 1000 live births and although this represents a gradual improvement from the 59.4 per 1000 live births since 1970, the figures are still high as compared to other jurisdiction and represent a challenge towards the realization of the 12 per 1000 live births target as set by the World Health Organization to be achieved by the year 2030 [4,5].

This commentary takes a closer look at how neonatal mortalities among facility deliveries in Ghana compare with home deliveries following the 'free' maternal healthcare policy intervention in Ghana since 2008 [4]. It follows an ethically cleared protocol which analyzed historical data sets of Ghana as originally published under the title "impact of 'free' maternal health care policy on maternal healthcare utilization and perinatal mortality in Ghana: protocol design for historical cohort study" [6]. The comment briefly provides new update, specific to the intervention impact on neonatal mortality since its publication. You will find aspects of the results in Tables 1 and 2 of the analysis of Ghana DHS data sets to underpin the comments.

| Perinatal death Variable | Poisson regression with Linearized std. error | | | Binary logistics regression with linearized std. error | | | Negative binomial regression with linearized std. error | | |
|---|---|---|---|---|---|---|---|---|---|
| | **aIRR** | **(CI: 95%)** | **P-Value** | **aRR** | **(CI: 95%)** | **P-Value** | **aIRR** | **(CI: 95%)** | **P-Value** |
| No_FMHCP | 1 | | | 1 | | | 1 | | |
| **FMHCP** | 1.32 | (1.08-1.62) | 0.006* | 2.09 | (1.31-3.34) | 0.002* | 1.32 | (1.08-1.62) | 0.006* |
| Age | 1.01 | (0.99-1.02) | 0.366 | 1.01 | (0.98-1.05) | 0.356 | 1.01 | (0.99-1.02) | 0.366 |
| **Twin** | | | | | | | | | |
| Singleton | 1 | | | 1 | | | 1 | | |
| 1st set of twins | 1.14 | (0.87-1.47) | 0.326 | 1.41 | (0.66-3.02) | 0.365 | 1.14 | (0.87-1.47) | 0.326 |
| 2nd set of twins | 1.21 | (0.89-1.62) | 0.226 | 1.73 | (0.63-4.78) | 0.283 | 1.21 | (0.89-1.62) | 0.226 |
| 3rd set of twins | 1.24 | (0.93-1.63) | 0.128 | 1 | - | - | 1.24 | (0.93-1.63) | 0.128 |
| **C/S** | | | | | | | | | |
| No | 1 | | | 1 | | | 1 | | |
| Yes | 1.28 | (1.02-1.61) | 0.029 | 2.35 | (1.00-5.52) | 0.049 | 1.28 | (1.02-1.61) | 0.029 |
| **Abortion** | | | | | | | | | |
| No | 1 | | | 1 | | | 1 | | |
| Yes | 1.16 | (0.96-1.40) | 0.114 | 1.61 | (0.89-2.90) | 0.111 | 1.16 | (0.96-1.40) | 0.114 |
| **Area of residence** | | | | | | | | | |
| Urban | 1 | | | 1 | | | 1 | | |
| Rural | 1.10 | (0.87-1.38) | 0.412 | 1.21 | (0.65-2.24) | 0.536 | 1.10 | (0.87-1.38) | 0.412 |
| **Education** | | | | | | | | | |
| No education | 1 | | | 1 | | | 1 | | |
| Primary | 0.99 | (0.74-1.31) | 0.948 | 0.98 | (0.51-1.8) | 0.975 | 0.99 | (0.74-1.31) | 0.948 |
| Secondary | 1.23 | (0.94-1.62) | 0.125 | 1.80 | (0.91-3.59) | 0.090 | 1.23 | (0.94-1.62) | 0.125 |
| Tertiary | 0.53 | (0.21-1.31) | 0.169 | 0.21 | (0.04-1.20) | 0.081 | 0.53 | (0.21-1.31) | 0.169 |
| **Wealth index** | | | | | | | | | |
| Poorest | 1 | | | 1 | | | 1 | | |
| Poorer | 0.75 | (0.55-1.03) | 0.081 | 0.46 | (0.21-1.02) | 0.057 | 0.75 | (0.55-1.03) | 0.081 |
| Middle | 0.86 | (0.63-1.18) | 0.371 | 0.66 | (0.27-1.60) | 0.366 | 0.86 | (0.63-1.18) | 0.371 |
| Richer | 0.90 | (0.64-1.27) | 0.572 | 0.70 | (0.26-1.92) | 0.500 | 0.90 | (0.64-1.27) | 0.572 |
| Richest | 0.95 | (0.65-1.39) | 0.818 | 0.88 | (0.27-2.86) | 0.832 | 0.95 | (0.65-1.39) | 0.818 |
| **Region** | | | | | | | | | |
| Western | 1 | | | 1 | | | 1 | | |
| Central | 0.68 | (0.47-0.97) | 0.038 | 0.40 | (0.14-1.10) | 0.077 | 0.68 | (0.47-0.97) | 0.038 |
| G. Accra | 0.93 | (0.63-1.39) | 0.746 | 0.89 | (0.25-3.17) | 0.860 | 0.93 | (0.63-1.39) | 0.746 |
| Volta | 1.24 | (0.91-1.69) | 0.158 | 3.28 | (0.82-13.0) | 0.091 | 1.24 | (0.91-1.69) | 0.158 |
| Eastern | 0.95 | (0.68-1.32) | 0.769 | 0.87 | (0.29-2.54) | 0.801 | 0.95 | (0.68-1.32) | 0.769 |
| Ashanti | 0.86 | (0.61-1.20) | 0.377 | 0.64 | (0.22-1.84) | 0.410 | 0.86 | (0.61-1.20) | 0.377 |
| Brong-Ahafo | 0.92 | (0.65-1.30) | 0.662 | 0.80 | (0.26-2.2.47) | 0.709 | 0.92 | (0.65-1.30) | 0.662 |
| Northern | 0.61 | (0.41-0.90) | 0.014 | 0.33 | (0.11-0.97) | 0.045 | 0.61 | (0.41-0.90) | 0.014 |
| Upper East | 0.86 | (0.50-1.46) | 0.583 | 0.63 | (0.15-2.55) | 0.519 | 0.86 | (0.50-1.46) | 0.583 |
| Upper West | 0.68 | (0.46-1.01) | 0.058 | 0.38 | (0.12-1.14) | 0.086 | 0.68 | (0.46-1.01) | 0.058 |

*p<0.05; 1: reference; aIRR: adjusted Incident Risk Ratio; aRR: adjusted Relative Risk

**Table 1:** Adjusted analysis of neonatal mortality using multiple regression models.

| | **Bootstrap sampling** | | | | | |
|---|---|---|---|---|---|---|
| **Neonatal mortality Variable** | **Model I** | | | **Model II** | | |
| | **aTET** | **(CI: 95%)** | **P-value** | **aTET** | **(CI: 95%)** | **P-value** |
| **No_fmhcp** | 1 | | | 1 | | |
| **Fmhcp** | 0.14 | (0.05-0.23) | 0.001** | 0.15 | (0.05-0.23) | 0.001** |
| Age | -0.02 | (-0.05-0.001) | 0.065 | -0.02 | (-0.05-0.001) | 0.065 |
| **C/S** | | | | | | |
| No | 1 | | | 1 | | |
| Yes | 0.37 | (-0.8-1.45) | 0.081 | 0.68 | (-0.8-1.45) | 0.081 |
| **Twin** | | | | | | |
| No | 1 | | | 1 | | |
| Yes | -0.09 | (-0.53-0.21) | 0.398 | -0.16 | (-0.53-0.21) | 0.398 |
| **Abortion** | | | | | | |
| No | 1 | | | 1 | | |
| Yes | -0.02 | (-0.54-0.48) | 0.909 | -0.02 | (-0.54-0.48) | 0.909 |
| **Area of residence** | | | | | | |
| Urban | 1 | | | 1 | | |
| Rural | -0.19 | (-0.87-0.20) | 0.225 | -0.33 | (-0.87-0.20) | 0.225 |
| **Education** | | | | | | |
| No education | 1 | | | 1 | | |
| Primary | 0.22 | (-0.20-0.94) | 0.211 | 0.36 | (-0.20-0.94) | 0.211 |
| Secondary | 0.46 | (0.20-1.36) | 0.008* | 0.78 | (0.20-1.36) | 0.008* |
| Tertiary | -0.03 | (-1.53-1.37) | 0.915 | -0.07 | (-1.53-1.37) | 0.915 |
| **Wealth index** | | | | | | |
| Poorest | 1 | | | 1 | | |
| Poorer | 0.25 | (-0.15-1.06) | 0.146 | 0.45 | (-0.15-1.06) | 0.146 |
| Middle | 0.26 | (-0.25-1.13) | 0.211 | 0.44 | (-0.25-1.13) | 0.211 |
| Richer | 0.72 | (0.36-2.10) | 0.006* | 1.23 | (0.36-2.10) | 0.006* |
| Richest | 0.99 | (0.55-2.76) | 0.002* | 1.66 | (0.55-2.76) | 0.002* |
| **Region** | | | | | | |
| Western | 1 | | | 1 | | |
| Central | -0.63 | (-2.13- -0.02) | 0.044* | -1.08 | (-2.13- -0.02) | 0.044* |
| G. Accra | -1.09 | (-3.07-0.59) | 0.004* | -1.83 | (-3.07-0.59) | 0.004* |
| Volta | 0.22 | (-0.85-1.53) | 0.574 | 0.34 | (-0.85-1.53) | 0.574 |
| Eastern | 0.05 | (-0.96-1.18) | 0.843 | 0.10 | (-0.96-1.18) | 0.843 |
| Ashanti | -0.52 | (-1.90-0.14) | 0.091 | -0.88 | (-1.90-0.14) | 0.091 |
| Brong-Ahafo | 0.36 | (-0.57-1.73) | 0.323 | 0.58 | (-0.57-1.73) | 0.323 |
| Northern | -0.03 | (-1.05-1.01) | 0.970 | -0.01 | (-1.05-1.01) | 0.970 |
| Upper East | 0.39 | (-0.52-2.01) | 0.251 | 0.74 | (-0.52-2.01) | 0.251 |
| Upper West | 0.65 | (0.003-2.17) | 0.049* | 1.09 | (0.003-2.17) | 0.049* |
| *p<0.05; **p<0.001; aTET: average Treatment Effect on the Treated. | | | | | | |

**Table 2:** Impact of 'free' maternal healthcare policy on neonatal mortality using propensity score matching with probit and logit model.

## Global Neonatal Mortality Burden

As newborn care outcomes remain key among the determinants of in-country health system readiness, the one indicator that has received prominence and interest is neonatal mortality [7,8].

Despite significant strides following the then MDG5 interventions across countries, neonatal mortality rates are still unacceptably high and characterized by wide disparities across the globe, affecting mainly middle and lower-income countries with a staggering 98% of deaths being reported in developing countries [9,10]. Of the global under 5 mortality rates, 40% is accounted for by neonatal mortality figures and this is projected to hit 45% or more by the year 2030 if care is not taken [10]. What next! policymakers turned their attention to fixing the threat through interventions to increase access to quality healthcare so that, the gains so achieved are not eroded.

Therefore, neonatal mortality is being examined in a series of analysis among healthcare facility deliveries in the on-going study, as an outcome of interest using statistical models, following the implementation of the 'free' maternal healthcare policy in Ghana [6].

## Method

The DHS data of two rounds were merged*, i.e.,* 2008/2014 using Stata 15 for the analysis. Neonatal deaths within the period of 2003 to 2014 were then isolated from the data sets through the construction of binary outcome of 1 to represent all newborn deaths within 28 days of life, and 0 for all other deaths after 28 days but within 5 preceding years. Poisson and multiple logistics regression were then used to estimate the incident risk ratio of neonatal mortality for the outcomes of 1=yes and 0=no, representing mortalities and no mortalities respectively, against neonates born under the 'free' policy and those born without the 'free' policy.

Sample weighting preceded the statistical analysis by the application of the Taylor linearization technique for reduced standard error, and this ensured that clustering and stratification were adjusted, to take into account the complex data nature of DHS data sets. The negative binomial regression model was also fitted to check for overdispersion, a situation where conditional variance exceeds conditional mean, and also serve to test for sensitivity of the other models. In the final stage of the analysis, the study fitted logit and probit models with bootstrap sampling to measure the treatment difference on neonatal mortality through nearest-neighbor matching using the propensity scores of mothers who received the 'free' policy intervention compared to mothers who did not receive the policy. Covariates such as age, twin delivery, abortion history, rural/urban area of residence, educational status, wealth index, and region of residence were included in the models and adjusted for confounding [11–14].

## Results

The study found that neonates born to mothers under the 'free' policy were more likely to die compared to neonates born to mothers who did not receive the policy, aIRR: 1.32; 95% CI (1.08-1.62); p=0.006, and aRR: 2.1; 95% CI (1.31-3.34); p=0.002, and aIRR: 1.32; 95% CI (1.08-1.62); p=0.006, for Poisson regression, multiple logistics regression, and negative binomial regression respectively. The analysis of intervention impact (table 1.2) showed a positive regression coefficient, contributing 14% and 15% treatment difference for model 1 and 2, respectively, treatment coefficient 0.14; 95% CI (0.05-0.23); p=0.001, and 0.15; 95% CI (0.05-0.23); p=0.001, respectively.

## Comments

From the forgone analysis, and within the context of the 'Free' maternal health care policy, a neonate is not less likely to die because it was born in a healthcare facility compared to been born at home. Essentially, healthcare facilities in Ghana ranges from Community-based Health Planning and Service Centres (CHPS) which has the services of at least a trained midwife to tier 3 hospitals with the services of consultant obstetricians and a legion of midwives and midwifery consultants [15,16].

By implication, maternal healthcare utilization policy interventions in themselves, are perhaps inadequate in mitigating the devastating consequences of inadequate access to newborn care, and therefore may not lead to direct desired impact on newborn care outcomes in developing country setting. Mortality causes are perhaps multifaceted. Hypothetically, health policy interventions geared toward increasing utilization, a current phenomenon for developing countries overburdens the inadequate workforce, overcrowd the limited healthcare space and worsen the weak healthcare system, if implemented in isolation from other critical sectors [17,18].

Significantly, global neonatal mortality indices are driven by neonatal sepsis, asphyxia and preterm births and, Ghana does not depart from these causalities, however, a holistic clinical auditing of neonatal mortality occurrences within the context of the 'free' policy will probably add clarity to the conundrum. Under the circumstance, the results are probably a litmus test of neonatal healthcare quality in a developing country setting, and also, an assessment of the resilience of Ghana's healthcare system in a wider sense. Perhaps, it isn't a question of how much can come to the healthcare system, rather, it is a question of how much can the healthcare system take [19,20].

The impact of the 'free policy may compare better in other studies, particularly with countries of similar settings yet, this current analysis offers a dimension through which the policy may be examined optimally vis a vis neonatal healthcare quality for maximum impact [4,21].

Suffice to say, no social intervention policy program can singularly tackle neonatal mortality issues by themselves, giving the complexity of a health system. Arguably, complicated pregnancies are more likely to end in a healthcare facility to give birth, and therefore increases the risk of neonatal death among facility deliveries compared to home deliveries.

## Conclusion

This study is on-going, and the concluding findings of the full protocol will perhaps proffer some recommendations which perhaps will be useful for policy alignment and restructuring and, support the search for a responsive healthcare system for developing countries in sub-Saharan Africa. Nevertheless, the initial findings appear to invite a critical examination of neonatal healthcare quality in Ghana within the context of the 'free' policy among service provider facilities.

## Conflict of Interest

The author has no competing interest to declare.

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